

Laboratory-Directed Research and Development Program

FY2017 Program Plan



Thomas Jefferson National Accelerator Facility
Newport News, Virginia

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Introduction

The Thomas Jefferson National Accelerator Facility (Jefferson Lab) Laboratory-Directed Research and Development (LDRD) program was planned through a formal management process consistent with DOE Order 413.2C. The process is directed toward allocating resources for Jefferson Lab to maintain capability in responding to timely scientific and technological opportunities that also support DOE's research and development mission. This program is consistent with both the DOE framework and Jefferson Science Associates' (JSA's) operations and management role for Jefferson Lab. The program plan is prepared in accordance with this LDRD plan and supporting documents: our LDRD Proposal Guidance, Proposal Template, and Budget Template. The final plan will be subject to DOE site office for concurrence.

LDRD Program Objectives

The Jefferson Lab LDRD program is a critical tool for directing the Laboratory's forefront scientific research capabilities towards vital, excellent, and emerging scientific challenges. The program provides the resources for Jefferson Lab scientists to make rapid and significant contributions to critical national science and technology problems of mission relevance to Jefferson Lab and the DOE. LDRD also advances the Laboratory's core scientific capability and permits seeding and exploration of exciting new opportunities.

LDRD Program Plan

The purpose of this plan is to provide a management framework and information about Jefferson Lab's LDRD program to assure that the program contributes to the Laboratory's mission and as well aligns with research areas relevant to DOE mission needs and strategic objectives. The plan includes Jefferson Lab's criteria for project selection. Approval for the FY2017 LDRD program and allocation is requested and the research areas targeted for support are identified.

Laboratory Mission and Perspective

The Thomas Jefferson National Accelerator Facility (Jefferson Lab) is operated by Jefferson Science Associates for the Department of Energy's Office of Science. Jefferson Lab's primary mission is to explore the fundamental nature of confined states of quarks and gluons, including the nucleons that comprise 98% of the mass of the visible universe. Much of this exploration utilizes the laboratory's Continuous Electron Beam Accelerator Facility (CEBAF), a continuous wave electron accelerator whose upgrade from a maximum beam energy of 6 GeV to 12 GeV is nearly complete. Over 1500 scientists from the U.S. and 29 other countries around the world make use of Jefferson Lab's facilities for their research. Jefferson Lab is also a world-leader in the development of the superconducting radio-frequency (SRF) technology utilized for CEBAF. This technology is the basis for an increasing array of applications here, at other DOE labs, and by the international scientific community. The advancement of SRF technology at Jefferson Lab has enabled the 12 GeV Upgrade Project, which is nearing completion (CD-4A was achieved on July 30, 2014); it will double the energy of CEBAF. In addition, it facilitated the development of our Free Electron Laser (FEL) and Energy Recovery Linac (ERL), key future state-of-the-art techniques to support Office of Science projects. Jefferson Lab's present core capabilities are: experimental, theoretical and computational nuclear physics; accelerator science; and large scale user facilities/advanced instrumentation.

LDRD Program

As a mechanism for directing the Laboratory's forefront scientific research capabilities towards vital and emerging scientific challenges and opportunities, the LDRD program provides the resources for Jefferson Lab scientists to make rapid and significant contributions in research aligned with solving critical national science and technology problems. The LDRD program contributes to the Laboratory's scientific staff capability and vitality by supporting of initial and exploratory work in forefront areas of science and technology that enrich Laboratory research and development core capabilities.

Areas eligible for support include:

- advanced study of new hypotheses, new concepts, and innovative approaches to scientific or technical problems;
- experiments directed towards "proof-of-principle" or early determination of the utility of new scientific ideas, technical concepts, or devices; and
- conception and preliminary technical analysis of experimental facilities or devices.

Within these eligible research areas, the LDRD program is conducted with a scale of effort typically utilizing existing research facilities. The projects can be characterized as:

- small-scale research and development activities or pilot projects;

- bench-scale research projects; or
- computer modeling, conceptual design and feasibility studies.

Consistent with DOE policy, construction line-item, maintenance projects, and general purpose equipment acquisitions are not allowed. Projects may not substitute for, or increase the budget of, projects or tasks funded by DOE or other sponsors.

We have identified several areas of strategic value to the future of the Laboratory that would benefit from R&D. These particular areas are

- addressing the remaining R&D issues for the Jefferson Lab Electron Ion Collider design,
- utilizing heterogeneous architecture in scientific computing beyond LQCD, an essential element of advancing computing to the exascale,
- further development of the detector group in the medical and biological imaging fields, and
- addressing R&D issues relevant for new research directions using our existing facilities.

The TJNAF call for LDRD proposals does not specify particular directions, as we prefer to receive proposals on a wide selection of potential topics. However, relevance to these strategic areas is given strong consideration in the evaluation of the LDRD proposals. In addition, while the LDRD program is viewed as a positive motivator for staff, particularly younger staff, to receive funding and recognition for their work, it is not used specifically for recruitment or retention of staff.

Significance of LDRD

The LDRD program supports Jefferson Lab's mission in many ways. Because LDRD funds can be allocated in a relatively short timeframe, Jefferson Lab researchers can support the mission of DOE and serve the needs of the nation by quickly responding to forefront scientific problems. The LDRD program also enables the Laboratory to attract and retain highly qualified scientists and to support their efforts to carry out world-leading research. In addition, the LDRD program supports research that frequently involves graduate students or postdoctoral fellows, thus contributing to the education mission of the Laboratory.

Although only a small percentage of the Laboratory's funding, the LDRD program provides significant leverage of research dollars. The LDRD program may provide sufficient funds for scientists to demonstrate proof-of-principle for a new idea or methodology or to develop enough data to support a field task proposal or grant application. LDRD is an important strategic program that will result in significant benefits for Jefferson Lab, DOE, and other agencies.

LDRD Process

Jefferson Lab has developed a formal process for allocation of funds for LDRD. The process relies on individual scientific investigators and the scientific leadership of the Laboratory identifying opportunities that will contribute to scientific and institutional goals. From year-to-year, the distribution of funds among the scientific program areas will change. This flexibility optimizes the Laboratory's ability to respond to research opportunities and challenges. It is possible that in addition to building core competencies that support the DOE missions, the LDRD projects may also conduct scientific research and development that support the missions of other federal agencies.

The process requires an annual report describing the program costs, number of projects, how the program supports the Laboratory's and DOE's missions and project summaries of project objectives, purpose, progress and benefits to the Laboratory and DOE. The second such annual report from Jefferson Lab was published at the end of FY2015, and a report on our third year of LDRD will be forthcoming at the end of FY2016.

Management and Administrative Process

LDRD policy and program decisions are the ultimate responsibility of the Laboratory Director. Administration and reporting on the LDRD program is supported by the laboratory's LDRD Program Manager. LDRD accounting procedures and financial management are consistent with the Laboratory's accounting principles and stipulations under the contract between Jefferson Science Associates and the Department of Energy, with accounting maintained through the Laboratory's Chief Financial Officer/Business Services Manager.

The Laboratory LDRD program internal guidelines and procedures are managed consistent with DOE Order 413.2C. A formal schedule for proposals, guidance, review, and reporting is developed and issued annually. In addition, the LDRD Program Manager works with Division Offices and the Chief Financial Officer/Business Services Manager to monitor funded LDRD projects throughout the fiscal year to track budgetary allocations, the separation of Program funding and LDRD support, and full compliance with DOE Orders, Directives, and contract requirements.

Annually the Jefferson Lab Director issues a general call for proposals to research and development senior staff for proposals. Staff are encouraged to discuss the proposals with the relevant Associate Director, and encouraged to submit a brief Letter of Intent for evaluation of their ideas prior to developing a complete proposal.

The subject and focus of the solicitation in each of the calls for proposals we have issued since our LDRD program began in FY2014 have been quite general in nature. In

future years we may issue a call for two separate categories of proposals: one general in nature and a second aimed at initiating and/or developing major new strategic directions in a particular focus area identified by the Director.

Investigators submit proposal concepts to the LDRD Program Manager, who manages a process for review and prioritization of the proposals. This review is carried out by our LDRD Project Review team, which consists of the Deputy Director for Science, the LDRD Program Manager, the Associate and Deputy Directors for the Accelerator and Physics Divisions, the Associate Directors of the Engineering and Theory Divisions, and the laboratory's Head of Scientific Computing and a Senior Scientist in the Accelerator Division with FEL expertise. This group includes the key technical leadership at the laboratory.

The LDRD Project Review Team begins by checking the proposals for:

- consistency with the guidelines of the DOE order;
- unusual EHS&Q considerations;
- fit to the laboratory's organizational structure; and
- the feasibility of completing the project's aims within the timeline and requested budget.

Then the proposals are evaluated and ranked based on:

- their level of innovation and scientific and technical merit;
- their strategic value to and potential impact on the laboratory;
- the value of the proposed deliverables at the end of the funding period;
- the likelihood of achieving the stated goals; and
- the prospects for attracting future funding (beyond LDRD).

The review and evaluation process includes the solicitation of advice and supplementary reviews by subject-matter experts as appropriate. Proposals for the continuation of multi-year funding that started in an earlier year are reviewed and ranked along with proposals for new research.

The Director then selects the proposals to be funded and submits project data sheets to the DOE Jefferson Lab Site Office for concurrence. Outside the annual call, the Director may also identify other opportunities to fund projects in a timely fashion, which meet the LDRD criteria. The projects normally do not exceed three years. Exceptions will be forwarded to the Office of Science for concurrence.

All projects funded by LDRD must meet Jefferson Lab environment, health, and safety requirements. Typically, projects supported by the LDRD program are bench-scale research or conceptual designs and do not involve modification to buildings or other structures. Consistent with NEPA goals, each LDRD proposal is subjected to a review per

ES&H Manual Chapter 8012 in order to determine the level of NEPA documentation, if any, that is required. Should the project involve modification to experiments in the Experimental Halls or the Free Electron Laser, the project will be subjected to either the CEBAF Experimental Review Process (ES&H Manual Chapter 3120) or the FEL Experiment Safety Review Process (ES&H Manual Chapter 3130). All work activities are subjected to Jefferson Lab's work planning and control process (ES&H Manual Chapter 3210). The LDRD Program Manager reviews all LDRD activities for consistency with the LDRD Program Plan and Guidance.

Jefferson Lab FY2017 LDRD Program

FY2017 Funding Request

The Thomas Jefferson National Accelerator Facility requests an operating allocation of \$0.80M for the FY2017 Laboratory-Directed Research and Development program. This allocation would be 0.683% if there is a CR for FY2017 for the entire year, and 0.646% of the FY2017 budget as included in the President's FY2017 Budget Submission to Congress, which excludes line item construction projects consistent with DOE direction. An allocation of this level will enable the Laboratory to continue to initiate new research directions through its LDRD program; we would anticipate continuing it for the near future at less than the 1% level.

Proposals for Consideration for FY2017

Eight proposals (two of which were for continuation of projects started in FY2016) totaling \$1.03M from all areas of Jefferson Lab's mission were received by April 29, 2016. The preliminary review and rating of these projects by the laboratory's LDRD Project Review Team was carried out in May thru July, 2016, and the Director has received our recommendations along with written reviews of the proposals. The Director, will finalize the selection then submit the successful proposals to the Jefferson Lab Site Office for concurrence by early September, enabling funding by October 1, 2016.

The FY2017 LDRD program will provide new opportunities in these exploratory and forefront research areas consistent with DOE's national mission.