

LDRD

2014 Annual Report

Laboratory Directed Research & Development Program Assessment



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Introduction

Each year, Brookhaven National Laboratory (BNL) is required to provide a program description and overview of its Laboratory Directed Research and Development Program (LDRD) to the Department of Energy in accordance with DOE Order 413.2B dated April 19, 2006. This report fulfills that requirement.

Brookhaven National Laboratory is managed by Brookhaven Science Associates, LLC, (BSA) under contract with the U. S. Department of Energy (DOE). BNL is a multidisciplinary Laboratory that maintains a primary mission focus in the physical, energy, and life sciences, with additional expertise in environmental sciences, energy technologies, and national security. In Fiscal Year (FY) 2014, there were 2846 employees and more than 4,200 facility users, guest scientists, and students who come to use the Laboratory's facilities and work with the staff. Total Laboratory spending was \$636M excluding funds from other laboratories and users (\$560M excluding construction), of which \$9.6M was invested in LDRD projects.

To remain at the leading edge of science and technology (S&T), it is important to continuously foster exploratory scientific research that aims to renew the Laboratory's research agenda in areas of S&T that support BNL's mission, vision, and strategy. The LDRD program is vital in this regard. The LDRD program seeks to fund the highest quality projects through the use of calls for proposals from all qualified staff and of a highly selective review process based on peer review to ensure that only the highest quality proposals are funded. The competition for LDRD funds stimulates Laboratory scientists to think in new and creative ways and to develop cross-disciplinary collaborations, which are a major factor in achieving and sustaining research excellence and a means to address National needs within the overall mission of the DOE and BNL. By fostering high-risk, exploratory research, the LDRD program helps BNL to respond to new scientific opportunities within existing mission areas, as well as to develop new research mission areas in response to DOE and National needs. As the largest expense in BNL's LDRD program is the support of graduate students, postdoctoral research associates, and young scientists, LDRD provides the basis for continually refreshing the research staff as well as the education and training of the next generation of scientists. Hence, LDRD is essential to the scientific health and vitality of the Laboratory.

This report provides an overview of the BNL LDRD program and a summary of the management processes, project peer review, a financial overview, and the relation of the portfolio of LDRD projects to BNL's mission, initiatives, and strategic plan. Also included are a summary of success indicators and a self-assessment.

Management Process

PROGRAM ADMINISTRATION:

Overall Coordination:

Overall responsibility for coordination, oversight, and administration of BNL's LDRD Program resides with the Laboratory Director. Day-to-day responsibilities regarding funding, oversight, proposal evaluation, and report preparation for the LDRD Program reside with the Director of the Planning, Performance and Quality Management Office (PPQM)¹. The Office of the Associate Laboratory Director (ALD) for Business Services (ALDB) assists in the administration of the program, including administering the program budget and establishing project accounts.

Program Structure:

The overall objectives of the LDRD Program are met through the use of two broad methods for soliciting proposals. One is an open call for LDRDs and the other is through the development of Strategic LDRDs (S-LDRD).

Open call LDRDs – “Open call” LDRD projects are those that are competitively awarded based on an open call for proposals without restriction to the area of science being proposed. Proposals are typically solicited annually for review and approval concurrent with the beginning of the fiscal year, October 1. The competition is open to all BNL staff in scientific and technological areas. Researchers submit their project proposals through their respective ALD to the PPQM Director. An LDRD Project Selection Committee, comprised of the ALDs, an equal number of scientists from the Brookhaven Council, and the PPQM Director (or her delegate), review the proposals submitted in response to the solicitation against specific, documented review criteria.

Strategic LDRDs – Annually, a portion of the LDRD budget may be held for the S-LDRD category. These funds are used to establish and enhance initiatives that are consistent with Laboratory priorities and are focused on specific research areas. Projects in this category focus on innovative R&D activities that are likely to develop new core competencies within BNL’s mission responsibilities and enhance the Laboratory’s S&T base. The Laboratory Director entertains requests or articulates the need for S-LDRD funds at any time.

These Projects are driven by special opportunities, including

- Research project(s) in support of a Laboratory strategic hire,
- Evolution of Program Development activities into R&D activities,
- ALD proposal(s) to the Director to support unique research opportunities,
- Research project(s) in support of Laboratory strategic initiatives as defined and articulated in the BNL Laboratory Strategic Plan.

¹ The PPQM Office includes the Office of Policy and Strategic Planning, which administers the LDRD Program. The PPQM Director also serves as the Interim Manager of the Policy and Strategic Planning Office.

Allocating Funds:

There are several decisions to be made each year concerning the allocation of funds for the LDRD Program. These are: (1) the overall budget for the LDRD Program; (2) the amount to be allocated between the two categories, and (3) how much should go to each competing project or proposal. Senior-level management makes all of these decisions.

For each fiscal year, the Laboratory Director, on recommendation from the Deputy Director for Science and Technology (DDST), the PPQM Director, and in consultation with the ALDB, develops an overall level of funding for the LDRD Program. The budgeted amount is incorporated into the Laboratory's LDRD Plan, which formally requests authorization from the DOE to expend funds for the LDRD Program up to that authorization.

Generally, projects are authorized for funding at the start of the fiscal year. In addition, projects can be authorized throughout the fiscal year, as long as funds are available and the approved ceiling for the LDRD Program is not exceeded.

The actual level expended in the LDRD program, which may be less than authorized, is determined during the course of the year and is affected by several considerations including: the specific merits of the various project proposals, as determined by Laboratory management and the members of the LDRD Project Selection Committee; the overall financial health of the Laboratory; and a number of budgetary tradeoffs between LDRD and other overhead expenses.

Open call LDRD Selection Process:

Responsibility for the review and selection of proposals lies with a management-level group called the LDRD Project Selection Committee. In FY 2014, the Project Committee, which selected the new FY 2015 projects, consisted of ten members. The Assistant Laboratory Director for Policy and Strategic Planning (PSP) chaired the Committee; the other members were the four scientific ALDs and five members of the Brookhaven Council (BC). The DDST, the Special Assistant to the Director, and the DOE Brookhaven Site Office (BHSO) LDRD Program Manager also attended the meetings.

2014 LDRD PROJECT SELECTION COMMITTEE

Berndt Mueller	Nuclear & Particle Physics (ALD)
Qun Shen	Photon Sciences (ALD Delegate)
James Misewich	Basic Energy Sciences (ALD)
Martin Schoonen	Environmental, Biology, Nuclear Science and Nonproliferation (ALD)
Elaine DiMasi	Photon Sciences (BC)
Robert Pisarski	Nuclear & Particle Physics (BC)
Oleg Chubar	Photon Sciences (BC)
Robert McGraw	Environmental, Biology, Nuclear Science and Nonproliferation (BC)
Ping Liu	Basic Energy Sciences (BC)

Request for Proposals:

The availability of discretionary funds for research under the LDRD Program is well publicized throughout the Laboratory. Each year a call letter is sent to the Scientific Staff and as a separate memorandum to the ALDs and Department/Division Chairs. The memo for the FY 2015 call, issued in March 2014, is attached as Exhibit A.

The call references the BNL LDRD Standards-Based Management System (SBMS) Subject Area, which is accessible to all employees on the web and is attached as Exhibit D. In addition to the solicitation email, the LDRD program is publicized through feature articles on the Lab website or Monday Memo. The process that solicits and encourages the development of proposals also identifies the current LDRD Strategic Focus Area (if any) in which Laboratory management wishes to invest.

The LDRD SBMS Subject Area specifies the requirements necessary for participation in the program. It states the program's purpose, general characteristics, procedures for submitting proposals, and restrictions. A request for funding, i.e., a project proposal, takes the form of a completed "Proposal Information Questionnaire (PIQ)," Exhibit B. A proposal must be approved through the appropriate management levels, which include the initiator's Department/Division Business Operations Manager, the Department Chair/Division Head, and the ALD.

The ALD runs the LDRD process for his Directorate. The proposed LDRD projects should support the organization's scientific goals and objectives as outlined in its Program Execution Plan, as well as the Laboratory's strategic objectives, although other innovative ideas are also encouraged. Each ALD, along with his management team determines the best method for screening proposals for ultimate submission to the PPQM Director. The ALD is responsible for developing a preliminary review process internal to that Directorate that includes peer review and addresses the selection criteria and certain minimum requirements pertaining to the DOE and BNL LDRD policies. For the FY 2015 Selection process conducted in FY 2014, each ALD was asked to submit a maximum of eight proposals to the open solicitation.

The Chair/Division Head reviews the PIQ for completeness, which includes the review of responses to questions on alignment with the Laboratory strategy, opportunities for follow-on funding, the National Environmental Policy Act and Environment, Safety, and Health. He/she also ensures that the principal investigator's (PI) regularly funded programs would not be impacted by the proposed LDRD project.

Proposal Review:

Once the ALDs approve the proposals, they are forwarded to the PPQM Director who transmits a copy of all proposals received to the LDRD Project Selection Committee. The Selection Committee considers all proposals submitted by the ALDs. Each member is assigned a subset of proposals to review as the designated "Reader." During the Selection Committee Meetings, the Readers provide an oral summary of the proposed research and a summary of his/her impressions of the research.

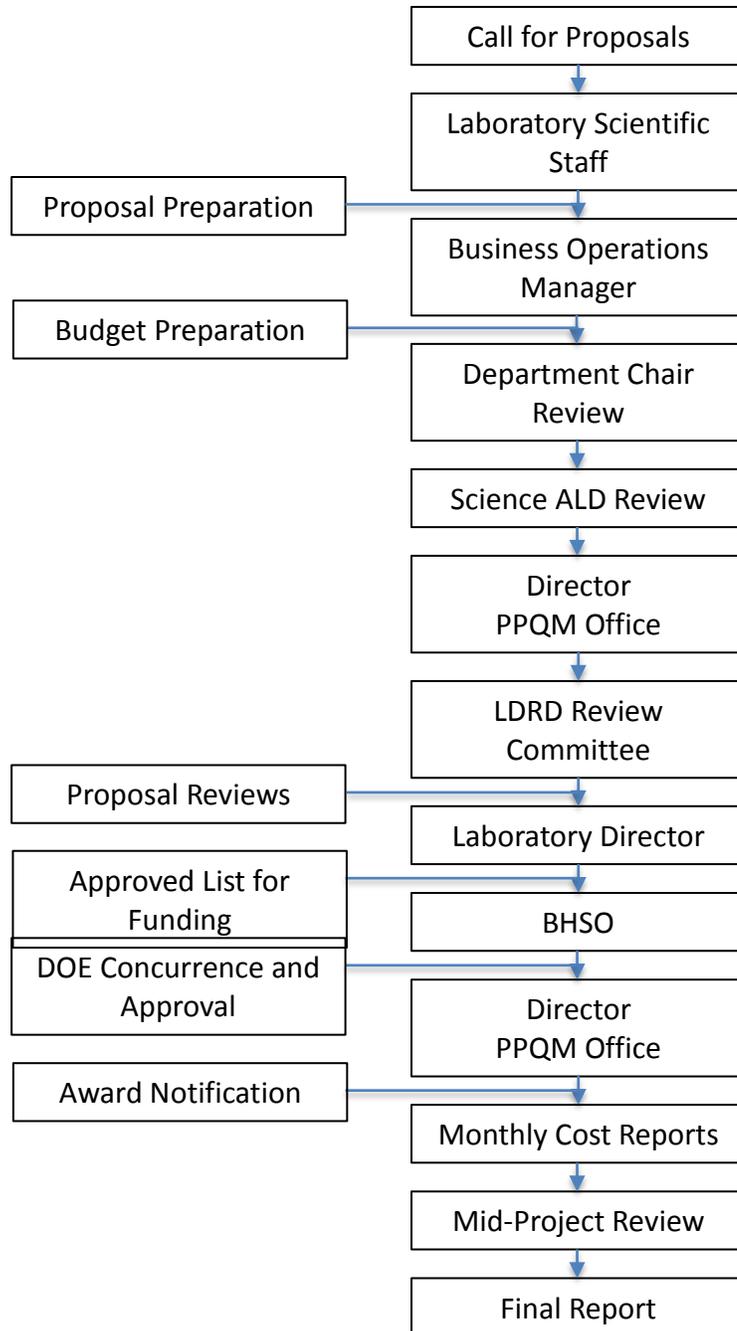
A description of the process is outlined in the Figure on the next page. All Committee members have several weeks to review the proposals and prepare for a full discussion of each proposal. The DOE BHSO Program Manager is invited to the Committee evaluation sessions as an observer.

Selection Criteria:

Minimum requirements for each proposal are: (1) consistency with program purpose; (2) consistency with the missions of BNL and DOE; (3) approval by Department Chair/Division Head and cognizant ALD; (4) assurance of satisfactory continuation of PI's regularly funded programs; (5) limited to no more than 3 years; (6) will not substitute for, supplement, or extend funding for tasks normally funded by DOE/NNSA; (7) will not create a commitment of future multi-year funding to reach a useful stage of completion; and (8) will not fund construction of line-item projects, facility maintenance, or general purpose capital equipment.

The broad selection criteria used to evaluate and rank individual proposals are stated in the LDRD SBMS Subject Area and are as follows: (1) scientific or technological merit, (2) innovation, (3) compliance with minimum requirements, (4) proposal cost as compared to the amount of available funding, and (5) potential for follow-on funding. The requirements of DOE Order 413.2B are also carefully considered during the selection process to ensure that proposals are consistent with DOE criteria.

Process for Open Call LDRD Projects



Open Call Project Selection:

Proposal abstracts are reviewed by all the Committee Members prior to the Selection Committee Meetings. At the Meetings, a brief discussion of each proposal is led by the proposal Readers who have reviewed the full proposal according to the Selection Criteria. A discussion of the proposal's merits and weaknesses is conducted and each of the proposals is ranked (coarsely). After screening each proposal, the Committee iterates further in order to reduce the number of proposals recommended for funding to a short list. Final recommendations for funding are made by concurrence of the Committee Members with input from the ALDs.

In general, some funding may be held in reserve for a potential investment in proposals submitted "off-cycle" for which a compelling case can be made. In addition, the funding amount requested in any proposal may be changed or adjusted during the approval process. The Committee's recommendation is then submitted to the Laboratory Director for approval. After approval by the Director, all new projects are submitted to the DOE BHSO for concurrence by the DOE Program Manager prior to start. The ALDB then sets up a separate Laboratory overhead account to budget and collect the costs for each project.

Strategic LDRDs Selection Process:

Responsibility for the allocation of resources and the review and the overall selection of proposals lies with the PPQM Director, the DDST, and the Laboratory Director as stated in the section of the SBMS LDRD Subject Area devoted to S-LDRD. One of the uses of S-LDRD is to support research and development of Laboratory strategic initiatives as defined and articulated in the BNL Laboratory Strategic Plan.

Request for Proposals:

The availability of special funds for research under the Strategic LDRD Program is disseminated to the ALDs by the Laboratory Director.

The LDRD SBMS Subject Area (under the section on Preparing, Submitting, Reviewing, and Approving Strategic LDRD Proposals) specifies the requirements necessary for participation in the program. It states the program's purpose, general characteristics, procedures for submitting a proposal, and restrictions. Like the openly competed proposals, a request for funding, i.e., a project proposal, takes the form of a completed PIQ, Exhibit B. A proposal must be approved through the appropriate management levels, which includes the initiator's Department/Division Business Operations Manager, the Department Chair/Division Head, and the ALD.

The Chair/Division Head reviews the PIQ for completeness. This includes the review of responses to questions on alignment with the Laboratory strategy, opportunities for follow-on funding, the National Environmental Policy Act and Environment, Safety, and Health.

Proposal Review:

Once the cognizant line managers approve the proposals, they are forwarded to the PPQM Director. The PPQM Director examines the proposal for compliance with the LDRD requirements as stated in DOE Order 413.2B and the LDRD SBMS Subject Area. This includes arranging for the appropriate peer review in accordance with the Director's guidance for utilizing S-LDRD.

Project Approval:

All LDRD projects that are recommended for funding, new and continuing, are submitted to the Laboratory Director for approval. After approval by the Director, the same group of projects is submitted to the DOE BHSO for concurrence by the DOE Program Manager prior to start. The ALDB then sets up a separate Laboratory overhead account to budget and collect the costs for each project.

Project Supervision:

For all LDRD categories, the PPQM Director carries out overall oversight of projects. Supervision over the actual performance of LDRD projects is carried out in the same way as other research projects at the Laboratory. Each PI is assigned to an organizational unit (Department/Division) that is supervised by a Chair/Division Head.

Each Chair/Division Head is responsible for seeing that the obligations of the PI are satisfactorily fulfilled and that the research itself is carried out according to standard expectations of professionalism and scientific method. The PPQM Director monitors the project's status, schedule, and progress in coordination with the Chair/Division Head.

The PPQM Director (or her delegate) organizes a mid-project review of all projects and at her discretion, may conduct others. Each PI presents a progress report on the status of his/her project. In general, in attendance are the PPQM Director, the DDST, the cognizant ALD and Department Chair/Division Head, a representative from the ALDB and DOE-BHSO, the Special Assistant to the Director, and other subject matter experts, where appropriate. This review assesses the progress of the project including its funding schedule. This allows the PPQM Director to ensure that the work will be completed in a timely manner. If adequate progress has not been made, a project can be terminated at this time.

In addition, the PPQM Director conducts meetings as necessary with the DOE BHSO LDRD Program Manager to update the progress of the program and to solicit assistance to verify that the BNL LDRD Program is meeting the overall LDRD requirements. This includes providing the DOE BHSO with copies of all funded proposals, an LDRD Program database, and a project funding and schedule summary report.

Project Reporting:

Routine documentation of each project funded under the LDRD Program consists of a file containing: (1) a copy of the written proposal; (2) all interim status reports; (3) notification of changes in research direction, if any; (4) the mid-project review presentation and (5) reports on costs incurred. Also, a formal LDRD Plan, Program Assessment Report, and the Annual LDRD Report are submitted to BNL management and the DOE summarizing research progress, accomplishments, and status for all projects.

Documentation for the overall Program consists of (1) various program history files, (2) a running list of all proposals with their acceptance/rejection status, (3) funding schedule and summary reports for all approved projects, (4) permanent records on cost accounting, and a database containing information on each funded project (description, funding by fiscal year, status and accomplishments, follow-on funding, publications, etc.), (5) midyear review progress reports. A Data Collection Form (Exhibit C) is also utilized to formally collect information on the impacts of the projects. Also, LDRD data is input to the DOE Chief Financial Officer's

Laboratory/Plant/Site Directed Research and Development Web Site (<https://ldrd.rpt.doe.gov>) to support DOE reporting of LDRD to Congress.

The Chair of the BNL Operations Security Working Committee reviews all selected projects for classification and operational security considerations. The Office of Technology Commercialization and Partnerships also reviews them for potential intellectual property and patentable inventions or discoveries.

Peer Review

LDRD projects are peer reviewed in several different ways. Primarily, LDRD research is managed and reviewed by the cognizant Department/Division manager. These projects are a part of the research effort of the respective Department/Divisions in which the investigators reside. For the open call LDRD projects, the members of the LDRD Project Section Committee are considered to have sufficient technical knowledge to perform peer reviews of projects during the initial selection process. For the S-LDRD projects, more formal peer review is performed on each project prior to final approval. This can include external peer review.

Also, all LDRD projects undergo at least one formal mid-project review (described in the previous section under project supervision) conducted by the PPQM Director (or her delegate) that the DDST, the Chair/Division Head, cognizant ALD, the Special Assistant to the Director, a representative from the ALDB, and the DOE BHSO LDRD Program Manager attend. Other scientists and subject matter experts assist in reviews, as necessary.

In addition, external advisory committees review BNL LDRD results as part of Department, Division, and Directorate program reviews. One such group is the BSA Science and Technology Steering Committee, which performs peer reviews of Laboratory programs. Periodic scientific reviews are also conducted by various offices of DOE, where research performed under an LDRD may be presented.

Financial Overview

Operating expenses for the LDRD program are funded through the Laboratory's overhead budget, which is derived from a uniform assessment against all programmatic and Work for Others (now called Strategic Partnership Projects) activities performed at the Laboratory. In March 2006, the DOE Chief Financial Officer (CFO) issued guidance that the LDRD Program will be "treated in a manner consistent with the method for distributing the general and administrative (G&A) expenses of a site." Therefore, BNL removed LDRD from the G&A pool and implemented a separate LDRD burden in order to obtain its funds.

At BNL, the LDRD authorization has been increased over the past ten years from \$9.5M in FY 2004 to \$17.0M in FY 2014. During this same period, LDRD spending ranged from \$7.2M in FY 2004 to a high of \$12.2M in FY 2011 and to \$9.6M in FY 2014. The cost in FY 2014 was about 1.7% of the Laboratory cost of \$560M (excluding construction). See Appendix A for a complete list of FY 2014 projects and the Project Activities Report for more details. This investment funded 40 projects, of which 8 were new starts. The target is to increase the level to about 4%, which would still be less than the DOE maximum ceiling of 6% (Exhibit E).

LDRD investment is vital to the exploration and development of research directions that will become the hallmarks of the BNL of the future in support of the Lab's mission, vision, and strategy. The BNL LDRD Program is funding 43 projects in FY 2015. Of these, 12 are new starts. So far, \$10.4M has been authorized. A summary of the financial history of BNL's LDRD program is shown below.

History of LDRD at BNL

FY	DOE AUTH. \$K	BNL AUTH. \$K	COSTED \$K	NO. RECD.	NEW STARTS	TOTAL FUNDED
1985	4,000	1,842	1,819	39	13	13
1986	4,500	2,552	2,515	22	15	25
1987	4,000	1,451	1,443	29	8	17
1988	4,000	1,545	1,510	46	14	23
1989	4,000	2,676	2,666	42	21	29
1990	4,000	2,008	1,941	47	9	26
1991	2,000	1,353	1,321	23	14	21
1992	2,500	1,892	1,865	30	14	25
1993	2,500	2,073	2,006	35	14	28
1994	2,500	2,334	2,323	44	15	27
1995	2,500	2,486	2,478	46	13	31
1996	3,500	3,500	3,050	47	17	31
1997	4,500	4,500	3,459	71	10	28
1998	3,500	4,000	2,564	53	4	20
1999	4,750	4,612	4,526	67	25	33
2000	6,000	6,000	5,534	93	21	45
2001	6,000	6,000	5,345	97	38	70
2002	7,000	7,000	6,732	87	29	70
2003	8,500	8,482	7,830	153	44	83
2004	9,500	8,550	7,209	107	19	72
2005	10,500	9,073	8,379	114	41	78
2006	11,500	11,460	11,460*	96	28	85
2007	15,500	13,338	11,849	99	36	74
2008	16,000	12,826	12,026	62	10	69
2009	16,500	12,137	11,673	17	6	57
2010	16,500	13,360	11,272	58	28	51
2011	16,500	12,961	12,227	40	21	50
2012	16,500	11,700	10,021	38	14	52
2013	16,500	8,925	7,596	38	15	42
2014	17,000	9,760	9,616	39	8	40
TOTALS	242,750	190,396	162,795	1,779	564	1,315

*Per DOE directive effective FY2006, all LDRD projects were assessed full G&A burdens

Relatedness of LDRD to Laboratory Programs and Scientific Outcomes

BNL's mission is to produce excellent science and advanced technologies safely, securely, and environmentally responsibly, with the cooperation and involvement of the local, national, and scientific communities. Twelve core capabilities that can be grouped into five categories underpin activities at BNL:

1. Nuclear Physics, Particle Physics, Applied Nuclear Science and Technology;
2. Condensed Matter Physics and Materials Science, Chemical and Molecular Science;
3. Applied Materials Science and Technology. Chemical Engineering;
4. Climate Change Science, Biological Systems Science;
5. Accelerator Science, Large Scale User Facilities/Advanced Instrumentation, Systems Engineering and Integration.

Each of these core capabilities is comprised of a substantial combination of facilities, teams of people, and equipment that has a unique and often world-leading component and relevance to National needs that includes the education of the next generation of scientists from grades K – 12 through graduate school. These core capabilities enable BNL to deliver transformational S&T that is relevant to specific DOE missions.

The Office of Science (SC) believes that these twelve core capabilities will enable BNL to deliver its mission and customer focus, to perform a complementary role in the DOE laboratory system, and/or to pursue its vision for scientific excellence and pre-eminence. BNL has identified four Critical Outcomes that, when achieved, will realize the BSA vision for Brookhaven:

- Understanding the origins of matter and mass
- Transformational discovery through synchrotron science
- *In operando* and *in situ* energy science leadership
- Leadership in data-driven discovery

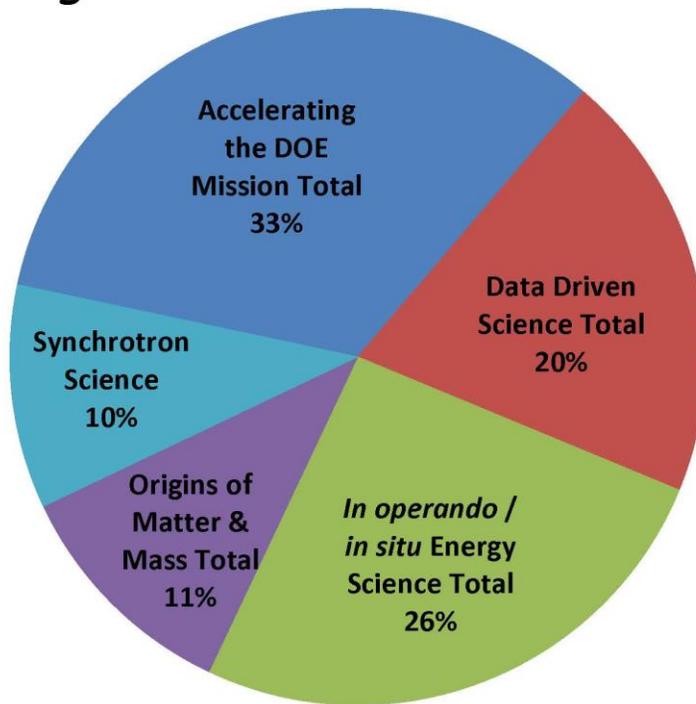
BNL also leverages its unique resources to expand its scientific capability beyond the four scientific Critical Outcomes in order to accelerate the DOE mission in high energy physics, biological and environmental research, nonproliferation, and applied energy.

The Scientific Outcomes are a primary tool by which the Laboratory builds core capabilities in particularly promising areas of S&T and conducts research to meet anticipated National needs. LDRD plays an important role in realizing successful results for the Lab's initiatives by providing resources in key areas of initiative development. Each year, as part of the Laboratory Planning cycle, Laboratory management carefully reviews existing research initiatives and emerging research opportunities, their scientific and technological promise, their match to BNL's core capabilities and mission roles, and their relevance to DOE missions and evolving National

needs. During the review process, management identifies the investment needs for each initiative. These areas are subsequently included in the annual LDRD call for proposals and given high priority for funding. Development of capabilities in these areas is essential to realizing successful outcomes for the Lab's initiatives.

A chart reflecting the allocation of funds by Laboratory Scientific Outcome for projects active in FY 2014 is shown below. A list of projects by scientific outcome is presented as Exhibit F.

Figure 1 - Scientific Outcome



Self-Assessment

BNL supports the concept of continual improvement as part of its management of the Laboratory. To achieve this goal, every year BNL performs self-assessments of various functions at the Laboratory. One of the programs for which the Laboratory conducts a yearly self-assessment is the LDRD program.

In FY 2014, many aspects of the program were reviewed. The following activities contributed to the Laboratory's self-assessment of the LDRD program in FY 2014:

- Review of BNL's selection process for the Open Call for FY 2015 LDRD Proposals
- Other Efforts and Changes

Background on the FY 2014 Selection Process for FY 2015 Proposals

Among the projects in the LDRD portfolio were those in support of basic/applied research underlying breakthroughs in the effective use of renewable energy as well as projects devoted to the S&T of an Electron Ion Collider. After review of the portfolio, Senior Management decided that the optimal investment should address the Laboratory Strategic Plan more broadly and during the spring of FY 2014, BNL issued an open call for FY 2015 LDRD proposals in *all* areas of S&T in support of Brookhaven's mission, vision, and strategy. Areas specifically called out for potential Lab investment were: eRHIC – Technology Challenges: R&D Related to Future Science Experiments at NSLS-II; Grid/Storage – S&T for the Electric Infrastructure; Biological and Environmental Systems; and National Security.

Review of BNL's Selection Process for the Open Call for FY 2015 Proposals

The Selection Process for the FY 2015 Open Call was managed similarly to the FY 2014 Open Call with direct coordination through the Science ALDs.

- This resulted in a set of exceptional proposals that strongly supported the Directorates' strategic directions, although innovative ideas outside of those areas were still encouraged.

The Selection Committee Members agreed that the modified open call process continued to result in a set of superb proposals that were reviewed in a timely manner.

- This process will be used again.

Each ALD was asked to submit a maximum of eight proposals.

- Since this reduced the number of proposals submitted from more than a hundred to forty-two (the DDST submitted two proposals on computation), the peer reviews from the Selection Committee were greatly improved. The length of time needed to discuss and select the proposals was also reduced.

As in previous years, each proposal was assigned to two Committee Members (Readers), who were asked to read them in their entirety, review them against the selection criteria, and provide an oral synopsis.

- This worked well for the selection of FY 2015 proposals. The Committee Members'

preparation sparked a dynamic discussion that included a response from the cognizant ALD about the merits of the proposal and its ranking among the proposals submitted from that Directorate. Each was given an initial coarse numerical score, which enabled the Committee to discriminate among the proposals.

After all proposals were reviewed in this manner, their scoring was revisited. The rankings clearly fell into three groups – those at the top and at the bottom and those clustered in the middle. Those in the middle were reconsidered in light of their broader impact to the Laboratory strategy and the expected amount of LDRD funding still available after the highest ranked proposals were selected for potential funding.

- Since the quality of those in the middle was excellent, a variety of complex factors, including expected impact and probability of follow-on funding were weighed in making the final recommendation for funding.

Other Efforts and Changes

The ALD for PSP attended the Office of Science Annual LDRD Program DOE Review.

- There were no specific action items for BNL.

BNL expects to oversee LDRD spending more tightly in the future. With assistance from the ALDB, tracking and trending of spending is done on a monthly basis. In coordination with the scientific ALDs, the ALD for PSP managed the recruitment of postdoctoral research associates who work on LDRD projects more closely. We have instituted additional project startup budget planning to address the challenges at the beginning of projects. It is our expectation that this will allow us to more effectively utilize our LDRD funds.

- Although it's too early to assess their impact, these changes are intended to enable better out year planning for the LDRD portfolio. It is noteworthy that the monthly tracking and trending of spending is effective in keeping the individual projects well-aligned with their spending plans.

After discussions between the ALD for PSP and the Director of the BHSO Business Management Division, the maximum funding level request to DOE for FY 2015 was reduced to \$13M.

- Considering recent program costs, this level is more realistic.

With the recent transition in leadership of the LDRD Program and the incorporation of the Office of Policy and Strategic Planning into the PPQM Office, there is an opportunity for a fresh look at the overall Program.

- This will take place over the next few months.

The new organizational structure necessitates some changes to the BNL LDRD website and the Standards Based Management LDRD Subject Area.

- The LDRD Subject Matter Expert and Administrative Assistant for the Program made these changes.

Conclusions

In summary, BNL concludes from its self-assessment of the LDRD program that the R&D

conducted is of very high quality. The focus of the call for proposals in the last few years has helped to further the objectives of the BNL Strategic Laboratory Plan specifically in Energy-related R&D, the S&T of an Electron-Ion Collider, and first light NSLS-II experiments.

BNL will maintain its support of any new LDRD requirements and strive to continually improve by:

- Contributing to current and future DOE SC LDRD working groups to develop new work products
- Implementing any changes to the DOE CFO LDRD database
- Ensuring that all projects support the DOE missions and missions of other federal agencies
- Continuing to invite the DOE-BHSD LDRD Program Manager to all LDRD selection and project review meetings
- Conducting an annual Program self-assessment.

Summary of Success Indicators

Statistical data is collected on all projects for the annual report using the Data Collection Form (Exhibit C). Since the LDRD Program is intended to promote high-risk research, the data collected has nominal value on a project-by-project basis. It does provide a general overall picture of the productivity of the LDRD Program.

Some of the more common indicators/measures of success are: 1) the number of proposed, received and approved projects, 2) amount of follow-on funding, 3) the number of patents applied for, and 4) the number of articles published in peer-reviewed journals.

Historically, statistics on the number of projects approved, compared to those rejected, show an overall approval rate of about 30 percent for new starts. For FY 2014, only 8 of 39 openly competed proposals were funded, due to Laboratory budgetary concerns. Essentially all of the scientific departments/divisions are represented in the LDRD portfolio.

An analysis of the FY 2014 projects shows that several of the PIs submitted proposals for grants or follow-on funding (several received funding), a multitude of articles or reports were published or submitted for publication, and the results were communicated broadly through scientific presentations. A summary of success indicators for the FY 2014 projects is shown in the Table below. Only those accomplishments that occurred during FY 2014 are provided and not a complete summary of all the accomplishments from the projects.

SUCCESS INDICATORS FY 2014	QTY
Total number of publications originating in whole or part that were published or submitted this fiscal year	105
Total number of formal presentations originating in whole or in part including those that have been accepted for presentation but not yet presented during this fiscal year	164
Total number of reports originating in whole or in part during this fiscal year.	20
Total number of patents and licenses originating in whole or in part during this fiscal year.	5
Total number of copyrights issued/granted during this fiscal year, including those from follow on funding.	1
Total number of invention disclosures submitted during this fiscal year to the Laboratory's Office of Technology Commercialization and Partnerships that were either directly derived from the LDRD or from any follow-on efforts.	3
Total number of postdoctoral researchers and graduate students supported in full or in part during the fiscal year.	55
Total number of scientific and technical research staff hired during this fiscal year.	4
Total number of requests for follow on funding submitted this fiscal year.	48

<p style="text-align: center;">SUCCESS INDICATORS FY 2014</p>	<p style="text-align: center;">QTY</p>
<p>Total number of national awards or recognitions received this fiscal year that are attributable in whole or in part from the project.*</p>	<p style="text-align: center;">1</p>

In conclusion, the BNL LDRD Program is successful. The LDRD Program has been identified by Laboratory Management to be an important part of its future. It is a key component for developing areas of S&T for the Laboratory that align with its vision for the future and support the missions of the Department of Energy. In FY 2014 the success indicators continue to demonstrate that the Laboratory is benefitting significantly from the achievements of the LDRD Program.

* Our data collection form was clarified in FY 2013 to request only formal recognitions. This number cannot be compared directly to previous years.

Funding Table of LDRD Projects Approved FY 2010 - FY 2015

Appendix A

LDRD Proj. No.	Project Title	Actual FY10	Actual FY11	Actual FY12	Actual FY13	Actual FY14	Budget FY15	Total
10-040	Development of a Laser System for Driving the Photocathode of the Polarized Electron Source for the EIC	230,599	73,986	100,731		29,813		435,129
11-032	2D Membrane Solution Scattering for Probing the Structures of Membrane Proteins		16,801	217,594	158,361	7,420		400,175
11-033	Exploring the Role of Glue in Hadron Structure by an Electron Ion Collider		153,915	187,511	228,004	5,876		575,306
11-036	CMOS-Pixel Vertex Detector for EIC			90,407	130,961	264,089		485,457
12-007	Complex Modeling: Leveraging Advanced Scattering Data with Computation to Push Back the Materials Complexity Frontier			46,065	290,506	551,909	425,284	1,313,764
12-012	Inter-Individual Variation in Radiation-Induced Epigenetic Modifications and their Potential Impact on Carcinogenesis			417,096	509,201	449,519	156,940	1,532,755
12-015	Developing an Integrated Atmosphere-Ecosystem Model for Investigating Interactions Between Atmospheric System and Ecosystem under a Warming Climate			207,525	260,926	204,618	164,000	837,069
12-018	Conical Slit for Probing Buried Micron or Sub-Micron Volumes for Dynamic Measurements of Heterogeneous			4,901	103,276	153,411	31,368	292,956
12-021	In-Situ Transmission X-Ray Microscopy Studies of Structure and Function in Energy Storage			54,057	127,620	94,350		276,027
12-022	MeV-UED for Ultrafast Science			206,867	175,653	96,148		478,668
12-023	Femto-Second X-ray Pulse Generation by Electron Beam Slicing			118,348	115,302	147,263	49,543	430,456

Funding Table of LDRD Projects Approved FY 2010 - FY 2015

Appendix A

LDRD Proj. No.	Project Title	Actual FY10	Actual FY11	Actual FY12	Actual FY13	Actual FY14	Budget FY15	Total
12-024	Thermochemical Conversion of Biomass to Fuels and Chemicals			236,911	376,949	199,947		813,807
12-025	Flow-Based Battery Architectures for Large-Scale Electrical Energy Storage			297,478	641,916	604,301	565,000	2,108,695
12-032	Laser-Driven Proton Accelerator			119,939	235,554	81,594		437,087
12-033	Water-based Liquid Scintillator Detector for Neutrino and Proton Decay Experiments			80,428	186,023	102,110		368,561
12-034	Quantum Electrodynamics for QCD Precision Studies at the EIC			68,581	135,460	78,964		283,005
13-003	Investigating eRHIC beam-beam effects with CeC linear accelerator				328,916	320,653	34,651	684,221
13-005	Permanent magnet solution of the eRHIC with the Non-Scaling FFAG				199,740	349,358	84,234	633,332
13-006	Time resolved imaging of X-rays and charged particles					283,324	280,500	563,824
13-013	Electrochemical Reduction of Carbon Dioxide on Surface-Modified Metal Electrodes				55,507	212,394	132,200	400,101
13-017	A NSLS-II Workflow Prototype System for Supporting Data Intensive Beamline Experiments				409,636	400,864	417,100	1,227,600
13-020	Synthetic Control of Lipid Biosynthesis in Plant Vegetative Tissue				240,015	278,750	285,400	804,165
13-022	Tracking Lithium Electrochemical Reaction in Individual Nanoparticles at NSLS-II				92,561	192,613	299,000	584,174
13-024	Elucidating the Role of Nanostructured Domains in CIGS PV Device Performance				147,600	401,427	400,000	949,027
13-025	A Probabilistic Approach to Sizing Battery Energy Storage Systems for Improved Grid Inertial Response				336,101	345,201	67,000	748,302

Funding Table of LDRD Projects Approved FY 2010 - FY 2015

LDRD Proj. No.	Project Title	Actual FY10	Actual FY11	Actual FY12	Actual FY13	Actual FY14	Budget FY15	Total
13-027	In situ Studies of Interfaces Under Extreme Environments				231,798	258,098	82,600	572,495
13-031	Modulation Enhanced Diffraction: A New Tool for Powder Diffraction and Total Scattering Studies				67,123	213,396	138,933	419,452
13-032	Development of At-Wavelength Metrology Tools				24,143	228,155	268,033	520,331
13-033	Multidimensional Imaging Data Analysis: From Images to Science				12,600	228,194	283,336	524,131
13-034	Atomic resolution elemental mapping using x-ray assisted STM				18,253	149,555	169,897	337,705
13-036	Segmented Adaptive-Gap Undulator with different period lengths in segments for production of high flux and brightness Hard x-rays at NSLS-II				24,481	4,622		29,102
13-038	Catalysis Program in Sustainable Fuels				143,467	437,125	684,973	1,265,565
14-003	Boron Arsenide (B12As2) Thin Films for Next-Generation Thermal Neutron Detectors					249,095	250,000	499,095
14-011	High Performance Direct Winder Superconducting Magnets					275,085	278,739	553,824
14-021	In-situ investigation of the strain distribution in next-generation 3D transistors using x-ray nanodiffraction					107,320	181,287	288,607
14-024	Enable Early Sciences in NSLS-II with Experiment-Driven Big Data Stream System					741,946	770,000	1,511,946
14-026	Increasing efficiency of nitrogen use by plants: a prerequisite for bioenergy crops on marginal lands					363,894	486,147	850,041
14-028	Tissue-specific metabolic models in plants					332,241	359,717	691,958
14-035	Operando studies of C1 catalytic reactions: Probing model and technical catalysts at high pressures using soft x-rays					153,517	163,942	317,459
14-036	Correlative microscopy, spectroscopy and diffraction with a micro-reactor					18,221	125,724	143,945
						9,616,379	7,635,548	26,189,319



BROOKHAVEN
 NATIONAL LABORATORY

managed by Brookhaven Science Associates
 for the U.S. Department of Energy

Memo

date: March 27, 2014

to: Scientific Staff

from: W.A. Bookless 

subject: Laboratory Directed Research & Development Program (LDRD) Proposals

We are now soliciting proposals for the annual LDRD competition for awards that will begin in Fiscal Year 2015 (FY15). The deadline for receipt of proposals is COB **June 9, 2014**.

LDRD Proposal Topics

The primary purposes of LDRD funding are to support laboratory priority programs and programs that might lead to new directions for future support. This includes, but is not limited to, research in the following areas:

- **eRHIC - Technology Challenges (POC: Mueller)**
- **R&D Related to Future Science Experiments at NSLS-II (POC: Dierker)**
- **Grid/Storage - S&T for the Electric Infrastructure (POC: Stokes)**
- **Biological and Environmental Systems (POC: Mann)**
- **National Security (POC: Stokes)**

We strongly encourage you to discuss proposal ideas with the respective POCs for the areas listed above as they may have more specific guidance in their areas of interest. We also ask you to discuss your ideas with Robert Tribble, the Deputy Director for Science and Technology, so that any opportunities for including a strong computational science, modeling and simulation component in your proposal can be addressed appropriately.

Proposal Submission Process

Your Associate Laboratory Director (ALD) must submit proposals to me with a copy to Liz Flynn at lflynn@bnl.gov. Each ALD may submit no more than eight proposals. The set of proposals submitted by each ALD should support the Laboratory's strategic objectives.

It is up to the ALDs, along with their management teams, to determine the best method for screening proposals for ultimate submission. The use of peer review is strongly encouraged.

Further information on BNL's LDRD Program is available on the LDRD website (www.bnl.gov/ldrd).

Proposal Format

For LDRD projects that are requesting less than \$200k/yr, proposals cannot exceed two pages and no abstract is needed. For projects requesting more than \$200k/yr, proposals cannot exceed five pages including a short, one paragraph abstract. If you are considering submitting a proposal for funding in excess of \$500k/yr, please contact your ALD and me for additional information. A one-page CV is required only for the proposal's PI. As in the past, all proposals will need to be submitted electronically in the Proposal Information Questionnaire (PIQ) form, which can be obtained electronically at the following location:

<https://sbms.bnl.gov/sbmsearch/subjarea/99/3c02e011.doc>

Proposal Selection Criteria

The criteria to be used for selection include:

- 1) The intellectual merit of the proposed activity:
 - How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields?
 - What is the specific innovative claim?
 - To what extent does the proposed activity suggest and explore creative and original concepts?
 - Is the proponent qualified to lead the proposed research?
 - How well conceived and organized is the proposed activity?
 - Is the scope of work commensurate with the requested budget?
- 2) The broader impacts of the proposed activity on the Laboratory:
 - How does this project support the strategic directions of the Laboratory?
 - Will the activity lead to new competencies at the Laboratory?
 - Will this project help to ensure the scientific and technical vitality of the Laboratory?
 - Does the proposal foster cross-disciplinary and/or cross-Organizational Unit collaborations?
 - Does the proposal appropriately anticipate DOE or other sponsor needs? How can one tell?
 - Does the proposal enable growth in BNL programs?

The Selection Committee will include the Deputy Director for Science and Technology, the Science ALDs, the Assistant Laboratory Director for Policy and Planning, and members of the Brookhaven Council. The Committee hopes to conclude the selection process by the end of July.

Finally, in conceptualizing your idea, it is important to remember that research conducted under the LDRD Program cannot duplicate or directly augment research presently funded at the Laboratory. The policy and guidelines for the BNL LDRD Program are posted at the following location: https://sbms.bnl.gov/sbmsearch/subjarea/99/99_EXH1.cfm

cc: Level I and II Managers of Science and Technology Organizations
J. DaSilva, BHSO

**BROOKHAVEN NATIONAL LABORATORY
 PROPOSAL INFORMATION QUESTIONNAIRE
 LABORATORY DIRECTED RESEARCH AND DEVELOPMENT PROGRAM**

PRINCIPAL INVESTIGATOR	PHONE
DEPARTMENT/DIVISION	DATE
OTHER INVESTIGATORS	
TITLE OF PROPOSAL	
PROPOSAL TERM (month/year)	From _____ Through _____

SUMMARY OF PROPOSAL

Description of Project:

Expected Results:

INSTRUCTIONS

Under **Description of Project**, provide a summary of the scientific concept of the proposed project including the motivation for the undertaking and the approach that will be used to conduct the investigation. *Briefly explain in a paragraph or less the competitive advantage of your approach.* Also indicate how the project meets the general characteristics of the LDRD Program and how it is tied to the DOE Mission.

Under **Expected Results**, clearly enunciate what are the expected results and how they will impact the science.

These items should not exceed the space remaining on this page, using the given font and size. The content should be understandable by the non-expert. Do not use jargon (defined by Webster as the “technical or secret vocabulary of a science”), as this has no meaning or utility to the non-expert. Submit this Summary of Proposal for review by your ALD. Upon concurrence and possible modification of your summary, follow it with an extended Proposal. In addition, include a one-page Vita of the Principal Investigator; fill out the page with citations to recent pertinent publications. Complete the Questionnaire, obtain the required approvals, and attach a budget in the form referenced. Do not include other attachments, as these will be discarded. Indicate the intent to use collaborators, postdoctoral research associates, and/or students. Go to the LDRD web site (www.bnl.gov/ldr/) for further information. **The Instructions should be removed before proceeding.**

PROPOSAL

VITA (Principal Investigator)

1. HUMAN SUBJECTS (Reference: DOE Order 443.1)

Are human subjects involved from BNL or a collaborating institution? Human Subjects is defined as “A living individual from whom an investigator obtains either (1) data about that individual through intervention or interaction with the individual, or (2) identifiable, private information about that individual”.

If **yes**, attach copy of the current Institutional Review Board Approval and Informed Consent Form from BNL and/or collaborating institution.

Y/N _____

2. VERTEBRATE ANIMALS

Are live, vertebrate animals involved?

Y/N _____

If **yes**, attach copy of approval from BNL’s Institutional Animal Care and Use Committee.

Y/N _____

3. NEPA REVIEW

Are the activities proposed similar to those now carried out in the Department/Division which have been previously reviewed for potential environmental impacts and compliance with federal, state, local rules and regulations, and BNL’s Environment, Safety, and Health Standards? (Therefore, if funded, proposed activities would require no additional environmental evaluation.)

Y/N _____

If **no**, has a NEPA review been completed in accordance with the Subject Area National Environmental Policy Act (NEPA) and Cultural Resources Evaluation and the results documented?

Y/N _____

(Note: If a NEPA review has not been completed, submit a copy of the work proposal to the BNL NEPA Coordinator for review. No work may commence until the review is completed and documented.)

4. ES&H CONSIDERATIONS

Does the proposal provide sufficient funding for appropriate decommissioning of the research space when the experiment is complete?

Y/N _____

Is there an available waste disposal path for project wastes throughout the course of the experiment?

Y/N _____

Is funding available to properly dispose of project wastes throughout the course of the experiment?

Y/N _____

Are biohazards involved in the proposed work? If yes, attach a current copy of approval from the Institutional Biosafety Committee.

Y/N _____

Can the proposed work be carried out within the existing safety envelope of the facility (Facility Use Agreement, Nuclear Facility Authorization Agreement, Accelerator Safety Envelope, etc.) in which it will be performed?

Y/N _____

If **no**, attach a statement indicating what has to be done and how modifications will be funded to prepare the facility to accept the work.

5. TYPE OF WORK

Select Basic, Applied or Development _____

6. LINK TO LABORATORY CRITICAL OUTCOMES

Identify below if the proposal supports one of the scientific Critical Outcomes, which are:

- Understanding the origins of matter and mass
- Transformational discovery through synchrotron science
- *In operando* and *in situ* energy science leadership
- Leadership in data-driven discover

Or if the proposal will expand BNL’s scientific impact beyond the four critical outcomes in the areas of:

- High Energy Physics
- Biological and Environmental Research
- Applied Energy Technology
- National Security, Nuclear Energy, Nuclear Science and Technology, and Isotopes

7. POTENTIAL FUTURE FUNDING

Identify below the Agencies and the specific program/office, which may be interested in supplying future funding. Give some indication of time frame.

APPROVALS

Business Operations Manager

Print Name

Department Chair/Division Manager

Print Name

Cognizant Associate Director

Print Name



Project Type: -
 Initiative: -
 Department: -
 Directorate: -
 Principal Investigator: -

TERM #: mm/dd/yy - mm/dd/yy

LABOR										
TYPE	YEAR 1		YEAR 2		YEAR 3		YEAR 4		TOTAL	
	FTEs	COST	FTEs	COST	FTEs	COST	FTEs	COST		
SCIENTIFIC/SENIOR PERSONNEL	-	-	-	-	-	-	-	-	-	
POST DOCTORAL ASSOCIATES	-	-	-	-	-	-	-	-	-	
OTHER PROFESSIONAL	-	-	-	-	-	-	-	-	-	
OTHER	-	-	-	-	-	-	-	-	-	
TOTAL LABOR	-	\$ -	-	-	-	-	-	\$ -	\$ -	
OTHER LABOR										
TYPE	YEAR 1		YEAR 2		YEAR 3		YEAR 4		TOTAL	
CONSULTANTS/COLLABORATORS	-	-	-	-	-	-	-	-	-	
JOINT APPOINTMENTS	-	-	-	-	-	-	-	-	-	
DISTRIBUTED LABOR	-	-	-	-	-	-	-	-	-	
STUDENT CONTRACT	-	-	-	-	-	-	-	-	-	
RECHARGES	-	-	-	-	-	-	-	-	-	
TOTAL OTHER LABOR	-	-	-	-	-	-	-	\$ -	\$ -	
MATERIALS, SUPPLIES & TRAVEL										
TYPE	CY RATE	YEAR 1		YEAR 2		YEAR 3		YEAR 4		TOTAL
MATERIALS & SUPPLIES	-	-	-	-	-	-	-	-	-	-
TRAVEL	-	-	-	-	-	-	-	-	-	-
EQUIPMENT (LOW/HIGH)	-	-	-	-	-	-	-	-	-	-
PURCHASE HIGH	-	-	-	-	-	-	-	-	-	-
TOTAL MATERIALS, SUPPLIES & TRAVEL	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-
DEPARTMENTAL OVERHEADS										
TYPE	CY RATE	YEAR 1		YEAR 2		YEAR 3		YEAR 4		TOTAL
ELECTRIC	0.00%	-	-	-	-	-	-	-	-	-
SPACE	0.00%	-	-	-	-	-	-	-	-	-
WASTE MGMT	0.00%	-	-	-	-	-	-	-	-	-
ORG. BURDEN	0.00%	-	-	-	-	-	-	-	-	-
OTHER	0.00%	-	-	-	-	-	-	-	-	-
TOTAL DEPARTMENTAL OVERHEADS	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-
GENERAL & ADMINISTRATIVE OVERHEADS										
TYPE	CY RATE	YEAR 1		YEAR 2		YEAR 3		YEAR 4		TOTAL
TRADITIONAL G&A	-	-	-	-	-	-	-	-	-	-
COMMON SUPPORT	-	-	-	-	-	-	-	-	-	-
TOTAL G&A OVERHEADS	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-
TOTAL PROJECT COST		YEAR 1		YEAR 2		YEAR 3		YEAR 4		TOTAL
TOTAL DIRECT COSTS	-	-	-	-	-	-	-	-	-	-
TOTAL INDIRECT COSTS	-	-	-	-	-	-	-	-	-	-
TOTAL PROJECT COST	\$ -	-	\$ -	-	\$ -	-	\$ -	-	\$ -	-
NOTE:	ITEMIZE CAPITAL INDIVIDUALLY (include item and \$ amount)									
Post Doc Rate Exception:	1.									5.
No cost to be incurred on R/C 170 (Relocation Expense)	2.									6.
Funding for Program Development for more than 2 years is unlikely and cannot exceed 3 years.	3.									7.
	4.									8.

LDRD DATA COLLECTION FORM

**Read and then remove the instructions before completing this form; return it electronically to
Liz Flynn (lflynn@bnl.gov)**

LDRD PROJECT NUMBER:

PROJECT TITLE:

PRINCIPAL INVESTIGATOR(S):

PUBLICATIONS **TOTAL** _____

List the citations for all refereed publications originating in whole or in part from this LDRD, during the fiscal year, including those that have been submitted, but do not include any that are in preparation. Provide the total number above.

MEETINGS, PROCEEDINGS, ABSTRACTS, AND PROJECT REVIEWS **TOTAL** _____

List all formal presentations originating in whole or in part from this LDRD presented during the fiscal year. Provide the total number above. Do not include the mid-year LDRD program reviews.

REPORTS **TOTAL** _____

List all formal reports originating in whole or in part from this LDRD including those that have been published during the fiscal year. Provide the total number above.

PATENTS AND LICENSES **TOTAL** _____

List all patents and licenses originating in whole or in part from this LDRD during the fiscal year. Provide the total number above.

COPYRIGHTS **TOTAL** _____

List all copyrights (other than publications) originating in whole or in part from this LDRD granted during the fiscal year. Provide the total number above.

INVENTION DISCLOSURES **TOTAL** _____

List all invention disclosures submitted during the fiscal year to the Laboratory's Office of Technology Commercialization and Partnerships that were either directly derived from this LDRD or from any follow-on efforts. Provide the total number above.

STUDENTS**TOTAL _____**

Provide the names of all students supported by this LDRD during the fiscal year and give the number of months that they were supported. Provide the total number as a head count.

POSTDOCTORAL RESEARCH ASSOCIATES**TOTAL _____**

Provide the names of all Postdoctoral Research Associates supported by this LDRD during the fiscal year and give the number of months that they were supported. Provide the total number as a head count.

NEW HIRES**TOTAL _____**

Provide names of any new staff that were hired during the fiscal year as a direct result of this LDRD. Provide the total number above. This number should not include students and postdoctoral research associates.

FOLLOW-ON FUNDING**TOTAL _____**

List all requests for funding submitted during the current and prior fiscal years including any that have been rejected. Give the title of the project, the Principal Investigator, date of submission, the name of the agency, action taken, amount funded or requested per year, and the duration. Provide the total number above.

AWARDS**TOTAL _____**

Provide information on any external awards or recognitions received during the fiscal year that are attributable in whole or in part to the LDRD project. For each award, describe (in 150 words or less) its significance and the role that LDRD played in achieving it. Provide the total number above. Examples include selection as a fellow of a scientific/technical society and receipt of an award from a scientific/technical society. This should not include follow-on funding, such as a grant from a funding agency provided above.

[\[Introduction\]](#) [\[Contents\]](#) [\[Forms/Exhibits\]](#) [\[References\]](#) [\[Definitions\]](#) [\[Instructions\]](#) [\[Keywords\]](#) [\[Changes\]](#)

Management System: [Science and Technology Program Management](#)

Subject Area: Laboratory Directed Research and Development (LDRD) Program

[VIEW/PRINT ALL \(No Exhibits and Forms\)](#)

Effective Date: **Mar 23,**

2015 ([Rev 3.18](#))

Periodic Review Due: **Oct
14, 2019**

Subject Matter

Expert:

[Patricia Giacalone](#)

Management System

Executive:

[Kathleen Barkigia](#)

Management System

Steward:

[Robert Tribble](#)

Introduction

This subject area describes the procedures for preparing, submitting, reviewing, and approving proposals for the Laboratory Directed Research and Development (LDRD) Program. It also describes the procedures for reporting on the status of LDRD projects.

The purpose of the LDRD Program is to encourage and support the development of ideas that could lead to new programs, projects, and directions for the Laboratory. The LDRD program focuses on early exploration and exploitation of creative and innovative concepts, which enhance the ability of the Laboratory to carry out its current and future mission objectives in line with the goals of the Department of Energy (DOE). This discretionary research and development tool is viewed as one important way of maintaining the scientific excellence of the Laboratory. It is a means to stimulate the scientific-technological community (foster new science and technology ideas), which is a factor in achieving and maintaining staff excellence, and is a means to address National needs within the overall mission of the DOE.

The LDRD program includes all discretionary research and development activities other than those provided for in a DOE/NNSA program or by specific designation in the Prime Contract.

Program Structure

The program consists of two categories - open call LDRDs and Strategic LDRDs, which, when combined, meet the overall objectives of the LDRD Program.

Open Call LDRD Proposals

Proposals are solicited annually for review and approval concurrent with the start of the next fiscal year, October 1. An LDRD Selection Committee, comprised of the Associate Laboratory Directors for the Scientific Directorates, an equal number of scientists recommended by the Brookhaven Council and the Director of Planning, Performance, and Quality Management (PPQM) review the proposals submitted in response to the solicitation.

The open call LDRD category emphasizes innovative research concepts to encourage the creativity of individual researchers. The competition is open to all BNL staff in programmatic, scientific, engineering, and technical support areas. Researchers submit their project proposals to the Director for PPQM.

Strategic LDRD Proposals

A portion of the LDRD budget is held for the Strategic LDRD (S-LDRD) category. These funds are used to establish and enhance initiatives that are consistent with Laboratory priorities. Projects in this category focus on innovative R&D activities that are likely to develop new programmatic areas within BNL's mission responsibilities and enhance the Laboratory's science and technology base. The Laboratory Director entertains requests or articulates the need for S-LDRD funds at any time.

These Projects are driven by special opportunities, including:

- Research project(s) in support of a Laboratory strategic hire
- Evolution of Program Development activities into research and development activities
- ALD proposal(s) to the Director to support unique research opportunities
- Research project(s) in support of Laboratory strategic initiatives as defined and articulated by the Director.

Contents

Section	Overview of Content (see section for full process)
<u>1. Preparing, Submitting, Reviewing, and Approving Open Call LDRD Proposals</u>	<ul style="list-style-type: none"> • Complete Proposal Information Questionnaire. • Review and approve proposals. • Authorize funding.
<u>2. Preparing, Submitting, Reviewing, and Approving Strategic LDRD Proposals</u>	<ul style="list-style-type: none"> • Complete Proposal Information Questionnaire. • Review and approve proposals. • Authorize funding.
<u>3. Preparing and Submitting Reports on LDRD Projects</u>	<ul style="list-style-type: none"> • Submit status reports.
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<u>Proposal Information Questionnaire</u>	
<u>Strategic LDRD Proposal Review with Instructions</u>	

Training Requirements and Reporting Obligations

This subject area does not contain training requirements.

This subject area contains the following reporting obligations:

- Principal Investigators (PIs) submit an annual status report by November 1 to the Director of PPQM.
- PIs present an Annual LDRD Mid-year Project Review.
- For each year that the program is active and for two years after the completion of the project, PIs submit a LDRD Data Collection Form to the Director of PPQM.
- Director of PPQM submits an Annual Program Plan to the DOE BHSO by August 15
- Director of PPQM submits an Annual Report to the DOE BHSO by March 31
- Director of PPQM annually submits Project Data Sheets to the DOE BHSO by August 31
- Director of PPQM annually submits the required information to OMBE/CFO Database
- Director of PPQM annually submits to DOE Laboratory Policy Division data for Congressional report
- Director of PPQM annually submits performance indicators data to DOE Laboratory Policy Division

See the section [Preparing, Submitting, Reviewing, and Approving Strategic LDRD Proposals](#).

External/Internal Requirements

Requirement Number	Requirement Title
BSA Contract No. DE-SC0012704 - Clause C.4	Statement Of Work
O 413.2B Admin Change 1 (Jan 13, 2011)	Laboratory Directed Research and Development

References

[Laboratory Directed Research and Development \(LDRD\)](#) Web site

Standards of Performance

Provide for strategic growth and investment in the Laboratory's programmatic mission and supporting assets through the following:

- Using Laboratory Directed Research and Development (LDRD);
- Maintaining an Annual Laboratory Plan through a process for formal strategic planning; and
- Maintaining a supportive work environment that fosters innovative scientific and technological research and analysis to serve customers' needs, and staff development to address long-term organizational needs and staff career goals.

All staff shall ensure that the scientific and technical information resulting from BNL research is available to the maximum permissible extent for future use by the scientific community and the public within BNL's and the customer's requirements.

The only official copy of this file is the one on-line in SBMS.
Before using a printed copy, verify that it is the most current version by checking the *effective date*.

| [SBMS Home Page](#) | [Subject Areas](#) | [Instructions](#) | [Changes](#) |

Program Description

The purpose of the Laboratory Directed Research and Development (LDRD) Program is to promote the conduct of highly innovative and exploratory research that supports the mission of the Laboratory including strategic initiatives for the growth of the Laboratory. The Laboratory mission areas include the physical, energy, and life sciences, with additional expertise in environmental sciences, energy technologies, and national security, as well as the design, construction, and operation of large-scale scientific facilities. The following is a list of the general principles that guide the LDRD Program:

- Fund highly innovative and exploratory research that can be of high risk.
- Expect high payoff such as funding prospects, breakthrough science and broadening of the Laboratory's mission.
- Set a fraction of the funds for strategic areas.
- Give some preference to emerging scientists consistent with the quality of their proposals.
- Encourage collaborations across Directorates and Departments/Divisions.
- Do not use the LDRD process as a way to support unfunded investigators.
- Stop support if funding is obtained elsewhere.
- Track the productivity and success of funded proposals.

Program Structure

The program has two categories, the annual open call LDRDs and Strategic LDRDs, which combine to meet the overall objective of the LDRD Program.

Open call LDRD Proposals

Proposals are solicited annually for review and approval concurrent with the next fiscal year, October 1. An LDRD Selection Committee, comprised of the Associate Laboratory Directors (ALDs), an equal number of scientists from the Brookhaven Council, and the Director of Planning, Performance and Quality Management (PPQM) reviews the proposals submitted in response to the solicitation. The ALDs as a group with the benefit of peer reviews from the entire Committee make the final selections for the Laboratory-wide competition. Successful organization and execution of each approved proposal is the responsibility of the cognizant ALD in the area of activity.

The open call LDRD category emphasizes innovative research concepts. The competition is open to all BNL research staff. Researchers submit their project proposals to their respective ALDs, who along with their management teams, determine the best method for screening proposals for ultimate submission to the Director of PPQM.

Strategic LDRD Proposals

A portion of the LDRD budget is held for the Strategic LDRD (S-LDRD) category. These funds are used to establish and enhance initiatives that are consistent with Laboratory priorities. Projects in this category focus on innovative R&D activities that are likely to develop new programmatic areas within BNL's mission focus and enhance the Laboratory's science and technology base. The Laboratory Director entertains requests or articulates the need for S-LDRD funds at any time. The Director of PPQM arranges for the appropriate review in accordance with the Director's guidance.

These projects are driven by special opportunities, including:

- Research project(s) in support of a Laboratory strategic hire,
- Evolution of Program Development activities into research and development activities,
- ALD proposal(s) to the Director to support unique research opportunities,
- Research project(s) in support of Laboratory strategic initiatives as defined and articulated by the Director.

Administration

Further information and assistance can be obtained from Diane Hatton, Director of PPQM, either by email (dhatton@bnl.gov) or telephone (ext. 5073), or Pat Giacalone, Business Manager for the Business Development and Analysis Office, email (pgiacalo@bnl.gov) or telephone (ext. 4628).

Documentation on all approved LDRD projects is maintained by the Office of Policy and Planning to assure that projects have undergone proper review and are in compliance with all applicable requirements.

Exhibits

- [Data Collection Form](#)
- [PIQ Form](#)
- [Sample Interim Status Report](#)

LDRD Program Data

- [FY 02 List of Funded Projects](#) (PDF)
- [FY 03 List of Funded Projects](#) (PDF)
- [FY 04 List of Funded Projects](#) (PDF)
- [FY 05 List of Funded Projects](#) (PDF)
- [FY 06 List of Funded Projects](#) (PDF)
- [FY 07 List of Funded Projects](#) (PDF)
- [FY 08 List of Funded Projects](#) (PDF)
- [FY 09 List of Funded Projects](#) (PDF)
- [FY 10 List of Funded Projects](#) (PDF)
- [FY 11 List of Funded Projects](#) (PDF)
- [FY 12 List of Funded Projects](#) (PDF)
- [FY 13 List of Funded Projects](#) (PDF)
- [FY 14 List of Funded Projects](#) (PDF)
- [FY 15 List of Funded Projects](#) (PDF)

Relationship of FY 2014 LDRD Projects to Laboratory Scientific Outcomes

Project Number Title

Accelerating the DOE Mission

12-012	Inter-Individual Variation in Radiation-Induced Epigenetic Modifications and their Potential Impact on Carcinogenesis
12-015	Developing an Integrated Atmosphere-Ecosystem Model for Investigating Interactions Between Atmospheric System and Ecosystem under a Warming Climate
12-024	Thermochemical Conversion of Biomass to Fuels and Chemicals
12-032	Laser-Driven Proton Accelerator
12-033	Water-based Liquid Scintillator Detector for Neutrino and Proton Decay Experiments
13-020	Synthetic Control of Lipid Biosynthesis in Plant Vegetative Tissue
13-025	A Probabilistic Approach to Sizing Battery Energy Storage Systems for Improved Grid Inertial Response
14-003	Boron Arsenide (B12As2) Thin Films for Next-Generation Thermal Neutron Detectors
14-011	High Performance Direct Winder Superconducting Magnets
14-026	Increasing efficiency of nitrogen use by plants: a prerequisite for bioenergy crops on marginal lands
14-028	Tissue-specific metabolic models in plants

Data Driven Science

12-007	Complex Modeling: Leveraging Advanced Scattering Data with Computation to Push Back the Materials Complexity Frontier
13-017	A NSLS-II Workflow Prototype System for Supporting Data Intensive Beamline Experiments
13-033	Multidimensional Imaging Data Analysis: From Images to Science
14-024	Enable Early Sciences in NSLS-II with Experiment-Driven Big Data Stream System

In operando / In situ Energy Sciences

12-025	Flow-Based Battery Architectures for Large-Scale Electrical Energy Storage
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Although a project may support more than one Laboratory Initiative or Related Opportunity for Growth, each one is assigned to only one category

- 13-013 Electrochemical Reduction of Carbon Dioxide on Surface-Modified Metal Electrodes
- 13-022 Tracking Lithium Electrochemical Reaction in Individual Nanoparticles at NSLS-II
- 13-024 Elucidating the Role of Nanostructured Domains in CIGS PV Device Performance
- 13-027 In situ Studies of Interfaces Under Extreme Environments
- 13-038 Catalysis Program in Sustainable Fuels
- 14-021 In-situ investigation of the strain distribution in next-generation 3D transistors using x-ray nanodiffraction
- 14-035 Operando studies of C1 catalytic reactions: Probing model and technical catalysts at high pressures using soft x-rays
- 14-036 Correlative microscopy, spectroscopy and diffraction with a micro-reactor

Origins of Matter and Mass

- 10-040 Development of a Laser System for Driving the Photocathode of the Polarized Electron Source for the EIC
- 11-033 Exploring the Role of Glue in Hadron Structure by an Electron Ion Collider
- 11-036 CMOS-Pixel Vertex Detector for EIC
- 12-034 Quantum Electrodynamics for QCD Precision Studies at the EIC
- 13-003 Investigating eRHIC beam-beam effects with CeC linear accelerator
- 13-005 Permanent magnet solution of the eRHIC with the Non-Scaling FFAG

Synchrotron Science

- 11-032 2D Membrane Solution Scattering for Probing the Structures of Membrane Proteins
- 12-018 Conical Slit for Probing Buried Micron or Sub-Micron Volumes for Dynamic Measurements of Heterogeneous
- 12-021 In-Situ Transmission X-Ray Microscopy Studies of Structure and Function in Energy Storage
- 12-022 MeV-UED for Ultrafast Science
- 12-023 Femto-Second X-ray Pulse Generation by Electron Beam Slicing
- 13-006 Time Resolved Imaging of X-rays and Charged Particles

Exhibit F

- 13-031 Modulation Enhanced Diffraction: A New Tool for Powder Diffraction and Total Scattering Studies
- 13-032 Development of At-Wavelength Metrology Tools
- 13-034 Atomic resolution elemental mapping using x-ray assisted STM
- 13-036 Segmented Adaptive-Gap Undulator with different period lengths in segments for production of high flux and brightness Hard x-rays at NSLS-II

**Department of Energy**

Washington, DC 20585

September 24, 2014

Dr. Doon Gibbs
Director
Brookhaven National Laboratory
P.O. Box 5000
Upton, New York 11973-5000

THRU: Frank J. Crescenzo
Manager
Brookhaven Site Office

Dear Dr. Gibbs:

Based on the Brookhaven Site Office's recommendation, a review of the Brookhaven National Laboratory's FY 2015 laboratory directed research and development (LDRD) plan, and the Laboratory's ability to effectively manage the LDRD program, this letter provides approval of your FY 2015 LDRD plan and associated maximum funding level of \$13.0 million. Approval of the Brookhaven National Laboratory's funding level is contingent upon the Site Office's concurrence on each proposed LDRD project to ensure compliance with the requirements of DOE Order 413.2B and subsequent Departmental and Office of Science guidance documents.

We recognize how essential the LDRD program is to the health and vitality of the Laboratory, and how this program clearly enhances your ability to support the missions of the Department. As always, the Laboratory needs to continue to conduct its LDRD program in full compliance with Departmental policy.

If you have any questions, please contact John LaBarge at (202) 586-9747.

Sincerely,

A handwritten signature in cursive script, reading "Patricia M. Dehmer".

Patricia M. Dehmer
Acting Director, Office of Science

cc: J. Meadows, Brookhaven Site Office
W. Bookless, BNL



