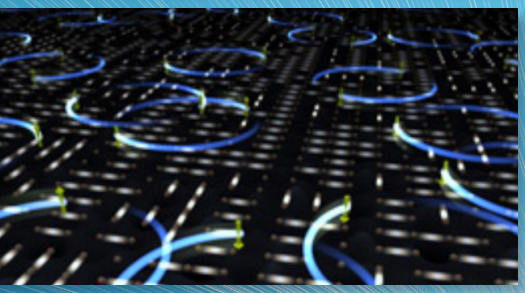
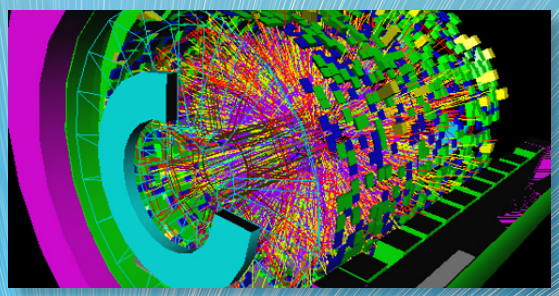
LDRD 2012 Annual Report

Laboratory Directed Research & Development Program Assessment





BROOKHAVEN NATIONAL LABORATORY

BNL-77378-2012

BROOKHAVEN NATIONAL LABORATORY
BROOKHAVEN SCIENCE ASSOCIATES
UPTON, NEW YORK 11973-5000
UNDER CONTRACT NO. DE-AC02-98CH10886
UNITED STATES DEPARTMENT OF ENERGY

March 2013

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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) 2012, there were 3041 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 $727 million ($497M excluding construction), of which $10.1 million 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's Director. Day-to-day responsibilities regarding funding, oversight, proposal evaluation, and report preparation for the LDRD Program reside with the Assistant Laboratory Director (ALD) for Policy and Strategic Planning (PSP). The Office of the Assistant Laboratory Director for Business Operations (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 Associate Laboratory Director (ALD) to the ALD for PSP. An LDRD Selection Committee, comprised of the ALDs, an equal number of scientists from the Brookhaven Council, and the ALD for PSP (or his 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 (e.g. Energy research and development (R&D), the S&T of an Electron Ion Collider (EIC), etc.) 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.

As an example, the strategic call for FY 2010 projects was focused on developing a vision and strategy for an EIC as a potential follow-on facility to the Relativistic Heavy Ion Collider at BNL. There was no focused call for either FY 2011 or FY 2012 LDRD projects.

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. All of these decisions are made by senior-level management.

For each fiscal year, the Laboratory Director, on recommendation from the Deputy Director for Science and Technology (DDST), the ALD for PSP, 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 Program 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 Program Selection Committee. For FY 2012, the Program Committee, which selected the new FY 2013 programs, consisted of eleven members. A delegate, selected by the ALD for PSP, chaired the Committee; the other members were the five scientific ALDs and five members of the Brookhaven Council (BC). The DDST, the ALD for PSP, the Special Assistant to the Director, and the DOE Brookhaven Site Office (BHSO) LDRD Program Manager also attended the meetings.

2012 LDRD PROGRAM SELECTION COMMITTEE

Gerry Stokes	Global and Regional Solutions (ALD)
Steven Vigdor	Nuclear & Particle Physics (ALD)
Steven Dierker	Photon Sciences (ALD)
James Misewich	Basic Energy Sciences (ALD)
Reinhold Mann	Environmental & Life Sciences (ALD)
Elaine Dimasi	Photon Sciences (BC)
Zhangbu Xu	Nuclear & Particle Physics (BC)
Bob Sweet	Environmental & Life Sciences (BC)
Vasilis Fthenakis	Global and Regional Solutions (BC)
Qiang Li	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 2013 call, issued in March 2012, 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 in The Bulletin 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 Budget Administrator, 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 Business 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 ALD for PSP. The Directorate 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 2013 Selection process conducted in FY 2012, 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 the National Environmental Policy Act and Environmental 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.

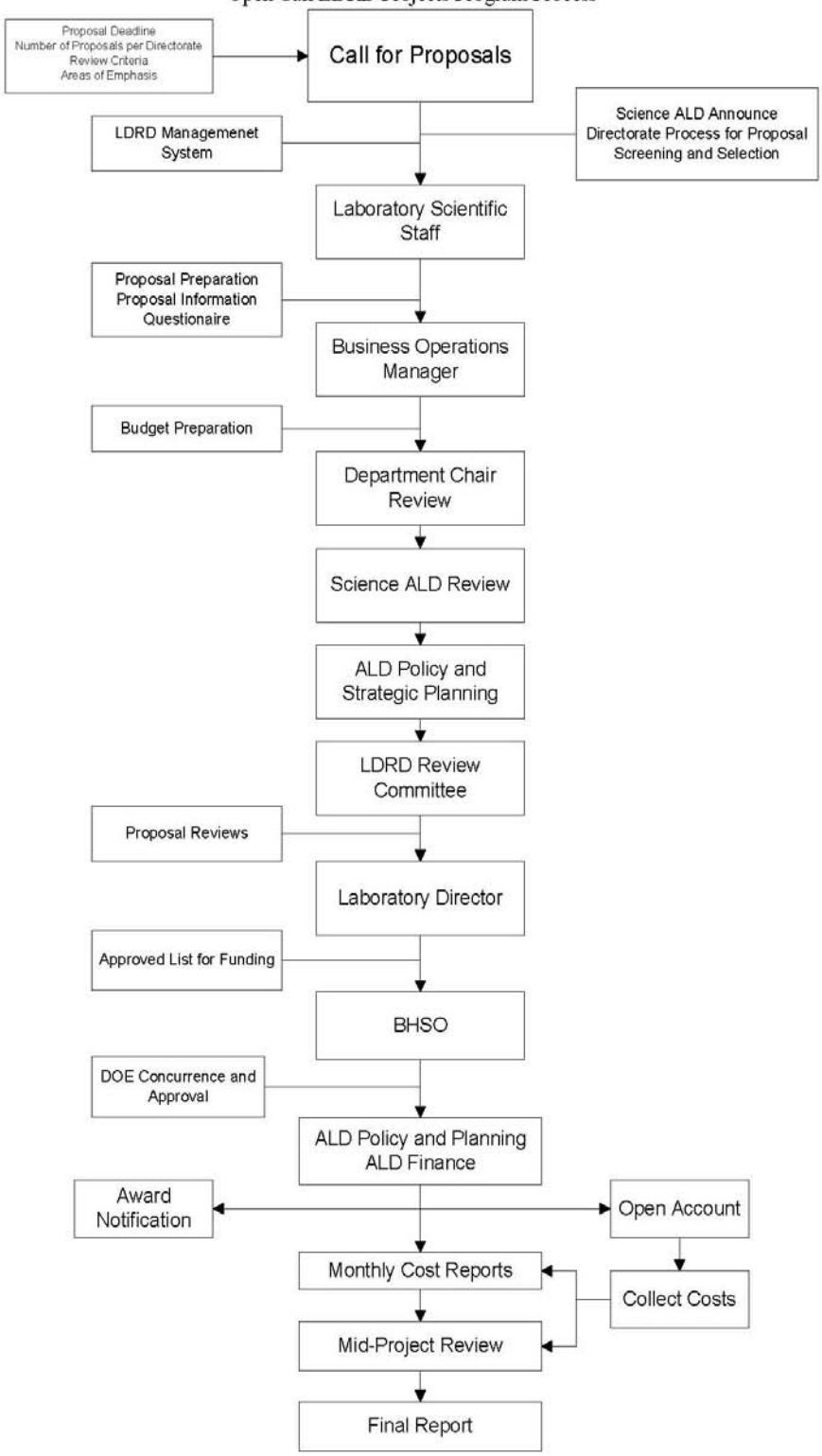
Proposal Review:
Once the ALDs approve the proposals, they are forwarded to the ALD for PSP who transmits a copy of all proposals received to the LDRD Program Selection Committee. The Selection Committee considers all proposals submitted by the ALDs. Each member is assigned a subset of proposals to review 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.

Open Call LDRD Projects Program Process



Open Call Project Selection:
All proposal abstracts are reviewed by 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 the project.

Strategic LDRDs Selection Process:
Responsibility for the allocation of resources and the review and the overall selection of proposals lies with the ALD for PSP, 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:
For cases other than a large focused call that is expected to generate a suite of proposals, the availability of special funds for research under the Strategic LDRD Program is disseminated by the Laboratory Director to the ALDs.

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 Budget Administrator, 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 the National Environmental Policy Act and Environmental Safety and Health.

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

Project Approval:
After completion of the peer review, 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 the project.

Project Supervision:
For all LDRD categories, the ALD for PSP 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 ALD for PSP monitors the project's status, schedule, and progress in coordination with the Chair/Division Head.

The ALD for PSP (or his delegate) organizes a mid-project review of all projects and at his discretion, may conduct others. Each PI presents a progress report on the status of his/her project. In general, in attendance are the ALD for PSP, 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 ALD for PSP 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 ALD for PSP 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. Each project is tracked for two years after its completion so as to

gather a complete set of data on its impact. Also, LDRD data is input to the DOE Chief Financial Officer's Laboratory/Plant/Site Directed Research and Development Web Site (https://ldrdrpt.doe.gov) to support DOE reporting of LDRD to Congress.

Some of the projects may involve animals or humans. Prior to commencing, those projects will have received approval from the Laboratory's appropriate review committees. All projects selected for approval are reviewed by the BNL Operations Security Working Committee Chair for classification review and operational security considerations, and the Office of Technology Commercialization and Partnerships 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 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 ALD for PSP (or his 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 projects 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 on a rotating basis. Periodic scientific reviews are also conducted by various offices of DOE, where research performed under an LDRD may be assessed.

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 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 significantly increased over the past ten years from $6.0 million in FY 2002 to $16.5 million in FY 2011. During this same period, LDRD spending increased from $6.7M in FY 2002 to $12.2M in FY 2011. Although in FY 2011, the investment rose to $12.2M, it dropped to $10.1M in FY 2012 or about 2% of the Laboratory cost of $497M (excluding construction). See Appendix A for a complete list of FY 2012 projects and the Project Activities Report for more details. This investment funded 52 projects, of which 14 were new starts. The target is to increase the level to about 4%, which would still be less than the DOE maximum ceiling of 8% (Exhibit E).

LDRD investment is vital to the exploration and development of new research directions that will become the hallmarks of the BNL of the future. The BNL LDRD Program will potentially fund 42 projects in FY 2013, Of these, 15 are new starts, although 7 have been delayed, due to budgetary concerns. So far, $9.7M has been authorized and the delayed starts total another $1.8M (also in Appendix A). A summary of the financial history of BNL's LDRD program is shown below.

Historical Growth 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	9,127	11,102	96	28	85
2007	15,500	13,600	10,223	99	36	74
2008	16,000	12,876	12,028	62	10	69
2009	16,500	13,136	11,672	17	6	57
2010	16,500	13,200	11,272	58	28	51
2011	16,500	15,539	12,236	40	21	50
2012	16,500	10,221	10,100	38	14	52
TOTALS	**192,750**	**161,407**	**145048**	**1,664**	**527**	**1,181**

Relatedness of LDRD to Laboratory Programs and Initiatives

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 in the following areas:

- Relativistic heavy ion and spin physics research to understand the essence of nuclear matter.
- Photon sciences for advanced characterization of functional nanomaterials for energy technology applications, and more broadly for tackling grand challenge questions in condensed matter, materials, chemical and nanosciences, as well as in life and environmental sciences, that will lead to breakthroughs needed to address the global energy and climate challenges.
- Energy-related research and development to enable breakthroughs in the effective use of renewable energy through improved conversion, transmission, and storage.
- High energy physics at the energy, intensity, and cosmology frontiers, supported by theory and advanced accelerator R&D.
- Biosystems and climate research to understand climate change and its impact on biological systems, from the molecular to the organism and ecosystem levels.

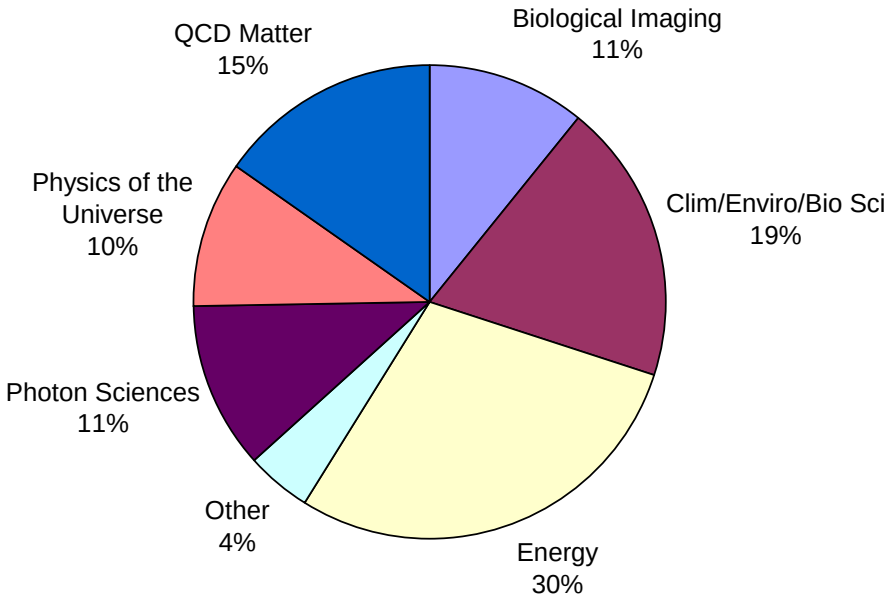
Research initiatives are a primary tool by which the Laboratory builds core capabilities in particularly promising areas of S&T and conducts research to meet anticipated National needs. LDRD plays an important role in realizing successful outcomes for the Lab’s initiatives by providing resources in key 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.

In FY 2012, BNL especially welcomed proposals in the areas of smart grid technologies and systems, energy storage, and solar energy; accelerator science and technology; computational science; structural biology and characterization of molecular systems; and R&D related to early science experiments at the National Synchrotron Light Source II (NSLS-II), all of which are high priorities in the Lab's Strategic Plan. However, proposals in all areas of science and technology that support Brookhaven's mission, vision, and strategy were accepted.

A chart reflecting the allocation of funds by Laboratory initiative for FY 2012 is given in Exhibit F. A list of projects by initiative is presented as Exhibit G.

Allocation of LDRD Funds by Lab Initiative



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 2012, many aspects of the program were reviewed. The following activities contributed to the Laboratory's self assessment of the LDRD program in FY 2012:

- Annual Program Review at PNNL in April 2012
- Review of BNL's selection process for the LDRD Projects
- Expected changes and other efforts

LDRD Program Review in April 2012

PNNL hosted the annual DOE SC LDRD program review conducted by John LaBarge and Julie Herward of the SC Office of Laboratory Policy and Evaluation. The review took place on April 18 and 19, 2012 and was attended by representatives from across the DOE complex. The first session of the LDRD Business was mostly focused on the PNNL and INL LDRD Programs.

The second day focused on the other DOE SC Laboratory LDRD programs and additional complex-wide topics.

Background on the FY 2012 Selection Process

Among the programs 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 2012, BNL issued an open call for FY 2013 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 R&D related to early science experiments at NSLS-II; eRHIC technology challenges; grid S&T for the electric infrastructure; and synthetic biology

.

Review of BNL's Selection Process for the FY 2013 Open Call

The Selection Process for the FY 2013 Open Call was managed similarly to the FY 2012 Open Call with direct coordination through the ALD.

- This resulted in a set of exceptional proposals that strongly supported the Directorate's business plan, 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 thirty-nine 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 FY 2013 Selection. 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.

Expected Changes and Other Efforts

BNL expects to oversee LDRD spending more tightly in the future. In coordination with the scientific ALDs, the new ALD for PSP intends to manage the recruitment of postdoctoral research associates who work on LDRD programs more closely. This change will enable better out year planning for the LDRD portfolio.

Conclusions

In summary, BNL concludes from its self assessment of the LDRD program that it is working effectively. The development of the strategic 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 and the S&T of an Electron-Ion Collider.

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 security missions and missions of other federal agencies

- Continuing to invite the DOE-BHSO LDRD Program Manager to all LDRD selection 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 2012, newly funded programs include 14 of 37 openly competed proposals. Essentially all of the scientific departments/divisions are represented in the LDRD portfolio.

An analysis of the FY 2012 projects shows that several of the projects' 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 2012 projects is shown in the Table below. It is noteworthy that only those accomplishments that occurred during FY 2012 are provided and not a complete summary of all the accomplishments from the projects.

SUCCESS INDICATORS FY 2012	QTY
Total number of publications originating in whole or part that were published or submitted this fiscal year	170
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	252
Total number of reports originating in whole or in part during this fiscal year.	12
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.	0
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.	73
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.	30

SUCCESS INDICATORS FY 2012	QTY
Total number of national awards or recognitions received this fiscal year that are attributable in whole or in part from the project.	14

In conclusion, the BNL LDRD Program is successful. In FY 2012, the LDRD Program maximum funding level was approved at $16.5M, the same as the level established in FY 2009 which was the highest in BNL history. This is a consequence of the identification of the LDRD Program by Laboratory Management to be an important part of its future. The LDRD Program is a key component for developing new areas of S&T for the Laboratory. In FY 2012 the success indicators continue to demonstrate that the Laboratory is benefitting significantly from the achievements of the LDRD Program.

Funding Table of LDRD Projects Approved FY 2009 - FY 2012

LDRD Proj. No.	Project Title	Actual FY09	Actual FY10	Actual FY11	Actual FY12	Budget FY13	Total
09-001	Nanoscale Anode Materials for Lithium Batteries	553,607	607,487	600,921	14,857		1,776,872
09-003	Organic Photovoltaics: Nanostructure, Solvent Annealing and Performance	442,319	685,258	766,606	215,984		2,110,167
10-006	Solar Energy Source Evaluation for Smart Grid Development		148,525	100,289	215,841		464,655
10-007	High throughput Quantitative Biochemical Phenotyping		484,270	309,050	303,724		1,097,044
10-010	Development of an Ultrafast Electron Diffraction Facility for Condensed Matter Physics Challenges		319,459	174,431	218,891		712,781
10-012	Design of Pt-free Electrocatalysts for Fuel Cell Oxygen Reduction Reactions		80,763	72,814	106,562		260,139
10-014	Charge Generation and Transport in Films of Conjugated Polymers for Organic Photovoltaics BNL Part of a Collaborative NREL, BNL, ANL LDRD		46,122	351,997	326,086		724,205
10-015	Photoelectrochemical Fuel Generation from Water and Carbon Dioxide		63,726	274,215	403,646		741,587
10-016	Structural Basis of Light Perception by Phytochrome		119,015	143,097	116,664		378,776
10-017	New Model Organisms for Analysis of Plant Metabolism		93,435	168,286	69,211		330,932
10-025	Development of Large Liquid Argon Time Projection Chambers (LArTPC) for Future Neutrino Experiments		119,930	342,832	423,491		886,253
10-034	Spin Waves in Artificial Magnonic Crystals: Fabrication, Imaging and Scattering		152,877	150,017	57,431		360,325

Funding Table of LDRD Projects Approved FY 2009 - FY 2012

LDRD Proj. No.	Project Title	Actual FY09	Actual FY10	Actual FY11	Actual FY12	Budget FY13	Total
10-039	EIC Polarized Electron Gun		145,727	214,650	459,429		819,806
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	29,798	435,114
10-041	Simulation, Design, and Prototyping of an FEL for Proof-of-Principal of Coherent Electron Cooling		94,938	61,461	159,434	90,000	405,833
10-042	Realization of an e+A Physics Event Generator for the EIC		155,497	111,158	87,903		354,558
10-043	Exploring Signatures of Saturation and Universality in e+A Collisions at eRHIC		45,761	154,256	190,095		390,112
10-044	Electroweak Physics with an Electron Ion Collider		27,756	138,967	131,771		298,494
10-045	LSST - Astrophysics and Cosmology Initiative		354,165	248,733	131,410	224,000	958,308
11-001	Cloud and Precipitation 4D Radar Science			158,095	190,309	36,000	384,404
11-002	A Novel Approach to Parameterized Sub-Grid Processes in Climate Models			108,302	183,307	83,000	374,609
11-007	Deciphering the Molecular Mechanisms in Lignin Precursor Transportation			170,304	167,747		338,051
11-008	Touchless Micro-Crystallography			104,387	213,665	219,000	537,052
11-012	Multiscale Complexity of Energy and Material Use: Integrated Assessment of Technology and Policy Alternatives			107,632	143,046		250,678

Funding Table of LDRD Projects Approved FY 2009 - FY 2012

LDRD Proj. No.	Project Title	Actual FY09	Actual FY10	Actual FY11	Actual FY12	Budget FY13	Total
11-016	Indium Iodide (InI) - A Potential Next-Generation Room-Temperature Radiation Detector			213,392	252,608		466,000
11-017	Visualization Support Infrastructure for Global Climate Modeling with a Focus on the BNL FASTER Project			61,446	79,069		140,515
11-020	Single Crystal Growth of Novel Energy Materials by High Pressure Method			238,369	220,417		458,786
11-025	Protein Microcrystal Dynamics by Coherent X-Ray Scattering			94,804	181,870	188,000	464,674
11-027	High-Resolution Biological Imaging by X-Ray Diffraction Microscopy			54,131	166,042	153,000	373,173
11-030	Sub-10nm Resolution Soft X-Ray Microscopy of Organic Nano-Materials by Novel Diffraction Methods			61,021	142,421	65,000	268,442
11-032	2D Membrane Solution Scattering for Probing the Structures of Membrane Proteins			16,801	217,594	173,400	407,795
11-033	Exploring the Role of Glue in Hadron Structure by an Electron Ion Collider			153,915	187,511		341,426
11-036	CMOS-Pixel Vertex Detector for EIC			0	90,407	252,000	342,407
11-040	Study of FEL Options for eRHIC			139,481	58,082	166,000	363,563
11-050	Overcoming Electromagnetic Interference in Simultaneous PET and MRI for Biological and Clinical Imaging			513,462	289,565	108,700	911,727
11-051	Estrogen Biosynthesis as a Novel Imaging Target with Multiple Applications			745,473	290,413		1,035,886

Funding Table of LDRD Projects Approved FY 2009 - FY 2012

LDRD Proj. No.	Project Title	Actual FY09	Actual FY10	Actual FY11	Actual FY12	Budget FY13	Total
11-053	High Throughput Screening in Biological Systems Using Radiometric Approaches			282,719	496,875		779,594
11-055	Astrophysics and Cosmology Initiative			264,288	371,858		636,146
12-007	Complex Modeling: Leveraging Advanced Scattering Data with Computation to Push Back the Materials Complexity Frontier				46,065	481,700	527,765
12-008	Early Deployment of Flagship Applications on BG-Q				386,700	470,000	856,700
12-012	Inter-Individual Variation in Radiation-Induced Epigenetic Modifications and their Potential Impact on Carcinogenesis				417,096	515,000	932,096
12-015	Developing an Integrated Atmosphere-Ecosystem Model for Investigating Interactions Between Atmospheric System and Ecosystem under a Warming Climate				207,525	269,000	476,525
12-018	Conical Slit for Probing Buried Micron or Sub-Micron Volumes for Dynamic Measurements of Heterogeneous				4,901	142,000	146,901
12-021	In-Situ Transmission X-Ray Microscopy Studies of Structure and Function in Energy Storage				54,057	132,000	186,057
12-022	MeV-UED for Ultrafast Science				206,867	178,000	384,867
12-023	Femto-Second X-ray Pulse Generation by Electron Beam Slicing				118,348	497,000	615,348
12-024	Thermochemical Conversion of Biomass to Fuels and Chemicals				236,911	390,000	626,911

Funding Table of LDRD Projects Approved FY 2009 - FY 2012

LDRD Proj. No.	Project Title	Actual FY09	Actual FY10	Actual FY11	Actual FY12	Budget FY13	Total
12-025	Flow-Based Battery Architectures for Large-Scale Electrical Energy Storage				297,478	630,000	927,478
12-029	Demonstration of a Grid-Wide Measurement and Control Platform for Micro-Grids				140,429	248,000	388,429
12-032	Laser-Driven Proton Accelerator				119,939	235,500	355,439
12-033	Water-based Liquid Scintillator Detector for Neutrino and Proton Decay Experiments				80,428	198,500	278,928
12-034	Quantum Electrodynamics for QCD Precision Studies at the EIC				68,581	142,000	210,581
					10,061,292	**6,316,598**	

Office of Policy & Strategic Planning

BROOKHAVEN NATIONAL LABORATORY

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P.O. Box 5000
Upton, NY 11973-5000
Phone 631 344-5734
Fax 631 344-5803
wbookless@bnl.gov

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

Memo

date: *March 22, 2012*

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 2013 (FY13). The deadline for receipt of proposals is COB ***June 4, 2012***.

LDRD Proposal Topics
The Laboratory is nearing the final phases of construction at NSLS-II and looking forward to the next phase of Nuclear Physics experimental capability, as well as the continued expansion of our work in support of the Nation's energy challenges and in biological research. Since it is our desire to continue to explore the possibilities in these areas, we are soliciting LDRD proposals in the following areas:

1. **R&D Related to Early Science Experiments at NSLS-II**
2. **eRHIC - Technology Challenges**
3. **Grid - S&T for the Electric Infrastructure**
4. **Synthetic Biology**

We especially welcome proposals in these areas. We will also accept proposals in **all areas of science and technology** that support Brookhaven's mission, vision, and strategy.

Proposal Submission Process
Your Associate Laboratory Director (ALD) must submit proposals 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 as stated in the Annual Laboratory Plan:
http://intranet.bnl.gov/planning/docs/AnnualLabPlan2012_1_24_12_5thDraft%20(2).pdf

Each ALD, along with his management team, will determine the best method for screening proposals for ultimate submission. All ALDs will be responsible for developing an internal review process that includes peer review and addresses the selection criteria below.

For FY13, we anticipate that we will be able to fund some projects that are aimed at the development of new core competencies at somewhat higher levels with budgets funded for the full 36 months. The business case, including the potential for follow-on funding, for proposals in

this "competence building" class of proposals will be held to a high standard. 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, proposals cannot exceed two pages and there will be no abstract. For projects requesting more than $200k, proposals cannot exceed five pages including a short, one paragraph abstract. If you are considering submitting a proposal for funding in excess of $500k, 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 **https://sbms.bnl.gov/sbmsearch/subjarea/99/3c02e011.doc.**

Proposal Selection Criteria

The specific criteria to be used for selection are:

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?
- 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?

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 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 of no more than three (3) pages in length. In addition, include a one-page Vita of the Principal Investigator; fill out the page with citations to recent pertinent publications. Do not include any additional attachments, as these will be discarded. Complete the Questionnaire, obtain the required approvals, and provide a budget in the format on the form supplied. Break down the funding by fiscal year and by the broad categories of labor, materials and supplies, travel (foreign & domestic), services and subcontracts. LDRD funds cannot be used to purchase capital equipment. Indicate the intent to use collaborators, postdoctoral research associates, and/or students. Identify the various burdens applied, i.e., organizational, materials, contracts, and any other charges. Include the Laboratory G&A in the budget statement. Go to the LDRD web site (www.bnl.gov/ldrd/) for further information. **The Instructions should be removed before proceeding.**

PROPOSAL

VITA (Principal Investigator)

1. <u>HUMAN SUBJECTS</u> (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. <u>VERTEBRATE ANIMALS</u>

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. <u>NEPA REVIEW</u>

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. <u>ES&H CONSIDERATIONS</u>

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 STRATEGIC INITIATIVES

Identify below if the proposal is in support of RHIC, the Light Source, or any of the Strategic Initiatives that can be found listed at the LDRD web site, www.bnl.gov/ldrd.

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

Department /Division Administrator _____
Print Name

Department Chair/Division Manager _____
Print Name

Cognizant Associate Director _____
Print Name

Exhibit B

BUDGET REQUEST BY FISCAL YEAR

Department

Title

PI

(Note: Funding for more than 2 years is unlikely and cannot exceed 3 years)

COST ELEMENT	**FISCAL YEAR _____**	**FISCAL YEAR _____**	**FISCAL YEAR _____**	**TOTAL COST**
Labor* Fringe Total Labor Organizational Burden @ ____ %				
DISTRIBUTED TECHNICAL SERVICES				
Materials Supplies Travel Services Total MST Materials Burden @ ____%				
TECHNICAL COLLABORATORS/ CONSULTANTS				
Sub-contracts Contracts Burden @ ____%				
Electric Power Other (specify)				
Traditional G&A @ _____% Common Support G&A @_____%				
TOTAL PROJECT COST				
*Labor (give levels of effort with names, or if unknown indicate TBD) **Scientific & Professional** **Post Doc** **Other**				
Note: The Budget Office covers 20% of the Post Doc's salary/fringe.				
List all Materials Costing Over $5,000				

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] [Revision History]

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: **Nov 2, 2009** (Rev 3.14) Periodic Review Due: **Nov 2, 2014**	Subject Matter Expert: Patricia Giacalone	Management System Executive: Kathleen Barkigia	Management System Steward: Doon Gibbs

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, 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 Assistant Laboratory Director (ALD) for Policy and Strategic Planning (PSP), 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 ALD for PSP.

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)
1. Preparing, Submitting, Reviewing, and Approving Open Call LDRD Proposals	• Complete Proposal Information Questionnaire. • Review and approve proposals. • Authorize funding.

2. Preparing, Submitting, Reviewing, and Approving Strategic LDRD Proposals	• Complete Proposal Information Questionnaire. • Review and approve proposals. • Authorize funding.
3. Preparing and Submitting Reports on LDRD Projects	• Submit status reports.

Definitions

Exhibits

Examples of Projects for LDRD Funding
Restrictions on LDRD Awards
Sample Interim Status Report

Forms
LDRD Data Collection Form
Proposal Information Questionnaire
Strategic LDRD Proposal Review with Instructions

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 ALD for PSP.
- 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 ALD for PSP.
- ALD for PSP submits an Annual Program Plan to the DOE BHSO by August 15
- ALD for PSP submits an Annual Report to the DOE BHSO by March 31
- ALD for PSP annually submits Project Data Sheets to the DOE BHSO by August 31
- ALD for PSP annually submits the required information to OMBE/CFO Database
- ALD for PSP annually submits to DOE Laboratory Policy Division data for Congressional report
- ALD for PSP 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-AC02-98CH10886 - 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.

| SBMS Home Page | Subject Areas | Instructions | Revision History |

Questions/Comments Disclaimer

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 Assistant Laboratory Director for Policy and Planning 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 Assistant Laboratory Director for Policy and Planning.

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 ALD for Policy and Planning 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 Bill Bookless, Assistant Laboratory Director for Policy and Planning, either by email (wbookless@bnl.gov) or telephone (ext. 5734), or Kevin Fox, Special Assistant to the ALD for Finance, email (kjfox@bnl.gov) or telephone (ext. 6185).

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)

Relationship of FY 2012 LDRD Projects to Laboratory Initiatives and Related Opportunities for Growth

Project Number	Title
	Climate, Environmental, and Bio-Sciences
10-007	High Throughput Quantitative Biochemical Phenotyping
11-001	Cloud and Precipitation 4D Radar Science
11-002	A Novel Approach to Parameterized Sub-Grid Processes in Climate Models
11-017	Visualization Support Infrastructure for Global Climate Modeling with a Focus on the BNL FASTER Project
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
	EIC
10-039	EIC Polarized Electron Gun
10-040	Development of a Laser System for Driving the Photocathode of the Polarized Electron Source for the EIC
10-041	Simulation, Design, and Prototyping of an FEL, for Proof-of-Principle of Coherent Electron Cooling
10-042	Realization of an e+A Physics Event Generator for the EIC
10-043	Exploring Signatures of Saturation and Universality in e+A Collisions at eRHIC
10-044	Electroweak Physics with an Electron Ion Collider
11-033	Exploring the Role of Glue in Hadron Structure by an Electron Ion Collider
11-036	CMOS-Pixel Vertex Detector for EIC
11-040	Study of FEL Options for eRHIC
12-034	Quantum Electrodynamics for QCD Precision Studies at the EIC

Although a project may support more than one Laboratory Initiative or Related Opportunity for Growth, each one is assigned to only one category

Energy

09-001	Nanoscale Anode Materials for Lithium Batteries
09-003	Organic Photovoltaics: Nanostructure, Solvent Annealing and Performance
10-006	Solar Energy Source Evaluation for Smart Grid Development
10-010	Development of an Ultrafast Electron Diffraction Facility for Condensed Matter Physics Challenges
10-012	Design of Pt-free Electrocatalysts for Fuel Cell Oxygen Reduction Reactions
10-014	Charge Generation and Transport in Films of Conjugated Polymers for Organic Photovoltaics BNL Part of a Collaborative NREL, BNL, ANL LDRD
10-015	Photoelectrochemical Fuel Generation from Water and Carbon Dioxide
10-016	Structural Basis of Light Perception by Phytochrome
10-017	New Model Organisms for Analysis of Plant Metabolism
11-007	Deciphering the Molecular Mechanisms in Lignin Precursor Transportation
11-012	Multiscale Complexity of Energy and Material Use: Integrated Assessment of Technology and Policy Alternatives
11-020	Single Crystal Growth of Novel Energy Materials by High Pressure Method
12-021	In-Situ Transmission X-Ray Microscopy Studies of Structure and Function in Energy Storage
12-024	Thermochemical Conversion of Biomass to Fuels and Chemicals
12-025	Flow-Based Battery Architectures for Large-Scale Electrical Energy Storage
12-029	Demonstration of a Grid-Wide Measurement and Control Platform for Micro-Grids

Photon Sciences

10-034	Spin Waves in Artificial Magnonic Crystals: Fabrication, Imaging and Scattering
11-008	Touchless Micro-Crystallography
11-025	Protein Microcrystal Dynamics by Coherent X-Ray Scattering
11-027	High-Resolution Biological Imaging by X-Ray Diffraction Microscopy

11-030	Sub-10 nm Resolution Soft X-Ray Microscopy of Organic Nano-Materials by Novel Diffraction Methods
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
12-022	MeV-UED for Ultrafast Science
12-023	Femto-Second X-ray Pulse Generation by Electron Beam Slicing

Biological Imaging

11-050	Overcoming Electromagnetic Interference in Simultaneous PET and MRI for Biological and Clinical Imaging
11-051	Estrogen Biosynthesis as a Novel Imaging Target with Multiple Applications
11-053	High Throughput Screening in Biological Systems Using Radiometric Approaches

Physics of the Universe

10-025	Development of Large Liquid Argon Time Projection Chambers (LArTPC) for Future Neutrino Experiments
10-045	LSST - Astrophysics and Cosmology Initiative
11-055	Astrophysics and Cosmology Initiative
12-033	Water-based Liquid Scintillator Detector for Neutrino and Proton Decay Experiments

Homeland and National Security

11-016	Indium Iodide (InI) - A Potential Next-Generation Room-Temperature Radiation Detector

Accelerator Science and Technology

12-032	Laser-Driven Proton Accelerator

Computation

12-007	Complex Modeling: Leveraging Advanced Scattering Data with Computation to Push Back the Materials Complexity Frontier
12-008	Early Deployment of Flagship Applications on BG-Q

Exhibit H

Department of Energy
Office of Science
Washington, DC 20585

September 28, 2012

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

THRU: Frank J. Crescenzo
Acting Manager
Brookhaven Site Office

Dear Dr. Aronson:

Based on the Brookhaven Site Office's recommendation, a review of the Brookhaven National Laboratory's FY 2013 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 2013 LDRD plan and associated maximum funding level of $16.5 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,

W. F. Brinkman
Director, Office of Science

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