

## Call for Proposals

### FY 2025 Laboratory Directed Research and Development (LDRD) Program

#### I. Overview

The purpose of the LDRD program is to encourage innovation, creativity, originality, and quality to keep the Laboratory's research activities and staff at the forefront of science and technology.

The FY2025 LDRD program will have three funding tracks for proposals. Please note that these tracks are not in order of priority and are as follows:

- Multi-Area Topics (Section II)
- Area-Priority (Section III)
- Early Career Development (Section IV)

All proposals, including continuations, must be submitted through the online submission database located at <https://ldrd.lbl.gov/>.

Consistent with FY24, LDRD budgets will be requested, awarded, and referenced at total funded values i.e., inclusive of all overheads.

#### II. FY25 Multi-Area Topics

The Multi-Area track, introduced in FY23, has become an important way to encourage combining the breadth of Berkeley Lab capabilities in new ways to create new science directions serving the missions of the Department of Energy. While proposals associated with these topics may be focused on the early exploration of new fundamental scientific concepts or methods, proposals that seek to develop and demonstrate the value of these Multi-Area capabilities in meeting the needs of DOE programs in more advanced or applied ways are also encouraged.

The continuing topics for innovative cross-Area collaborations are:

- Automation in the Acquisition and Management of Experimental Data (Lab Automation)
- Data Science/Machine Learning to Accelerate Science
- Instrumentation to Advance Fundamental and Applied Science



Please read the descriptions of these topics, as they have been updated.

**Lab Automation:** We seek proposals that investigate, develop, and use technology to automate discovery science, including but not limited to self-driving labs incorporated through the next generation of advanced instrumentation and user facilities/centers at Berkeley Lab. Laboratories are not required to fit the classical definition, i.e., a room within a building, and may be expanded to alternative/non-typical settings, e.g., field observatories. The proposals may approach this from i) the fundamental stage: i.e., building out core level technologies and tools to assist with general lab automation, ii) the applied perspective: i.e., reimagining the application of lab automation tools to research, or iii) a combination of the two.

**Data Science and Machine Learning (DS/ML):** We seek proposals that build on and extend innovative approaches to the management and use of datasets to extend our understanding of underlying science in areas of importance to Berkeley Lab. The proposals may approach this from i) the fundamental stage: i.e., developing core-level algorithms and methods to enhance data science, analysis, and machine learning, ii) the applied perspective: i.e., applying or re-engineering existing DS/ML methods and techniques to solve applied problems in novel ways, or iii) simulation of complex engineered systems (e.g., multi-scale models derived from observations and advanced simulations). Proposals submitted under the DS/ML topic do not require the participation of any particular area.

**Instrumentation to Advance Fundamental and Applied Science:** We seek proposals to develop innovative instrumentation in sensing, measurement, readout and data acquisition, as well as particle sources, drivers and accelerators that will advance fundamental and/or applied scientific opportunities at Berkeley Lab. Multi-Area collaborations are encouraged in pursuit of advanced instrumentation to bring unique capabilities to bear on priority scientific research. Proposals may also include needed investments in technical infrastructure in support of instrumentation R&D.

#### Application to Berkeley Lab's Research Themes

Separately, the Laboratory continues to advance our emerging Research Themes. These are intended to define our enduring broad and collaborative areas of scientific excellence and team science, reflecting unique Berkeley Lab strengths that are the foundation for our work for the Office of Science and the Department of Energy. We have and continue to develop and evolve these capabilities through investments, including in innovative and original research advancing the frontiers of science and technology. Under the shared purpose that Multi-Area projects serve as a vehicle to develop cross-Area teams, proposals in the three topics above can serve as specific pilot investments or avenues that will strengthen our capabilities in one or more of these multi-disciplinary themes:



- Understanding the universe, from quarks and nuclei to the cosmos
  - We are deepening our understanding of the universe by advancing theory, simulation, and data science and developing state-of-the-art detectors and instrumentation. We explore the fundamental laws of physics by building advanced accelerators and experiments.
- Discovering materials, chemical processes, and biological systems for energy and the environment
  - We are discovering knowledge about energy and the environment by understanding and directing chemical processes and material phenomena on scales from electrons to molecules to extended systems and by characterizing and controlling biological systems. We are harnessing this knowledge in systems engineering and manufacturing by developing a predictive understanding of complex environmental systems (biotic and/or abiotic).
- Driving the future of computing and data science
  - We are driving the future of computing and data science by innovating new mathematical, statistical, and computational methods and realizing the benefits of these novel approaches, such as AI/ML in scientific disciplines. We are innovating methods to optimize and deliver application-ready data for the scientific community and creating models to explore the limits of emergent behavior of physical, chemical, and biological systems. We are co-designing novel computing and network architectures and accelerating the next quantum revolution.
- Accelerating clean energy technologies through a science-to-systems approach
  - We are driving the future of computing and data science by innovating new mathematical, statistical, and computational methods and realizing the benefits of these novel approaches, such as AI/ML in scientific disciplines. We are innovating methods to optimize and deliver application-ready data for the scientific community and creating models to explore the limits of emergent behavior of physical, chemical, and biological systems. We are co-designing novel computing and network architectures and accelerating the next quantum revolution.
- Revolutionizing how we do science
  - We are revolutionizing the way we do science by enhancing multi- and transdisciplinary research environments and accelerating discovery by integrating AI, automation, and data science. We are developing and cultivating the adoption of first-of-a-kind scientific tools as well as building and managing specialized instrumentation and capabilities (including user facilities) in the service of science communities. We are incorporating human factors, policy, and economic analysis in evaluating technical solutions while advancing partnerships and embodying a culture of inclusion.

Additional Labwide communication on specifics within the Themes will be distributed shortly.



### Criteria and Detailed Track Guidance

The intent of this track is to support Laboratory research being pursued across Areas that incorporate one or more of the three topic areas. As such, additional focus for these projects may be called out in the Area-priority descriptions below. The descriptions may differ in approach, scope, or division of work, so please make sure to read through them completely.

Proposals will be submitted by a lead Division/Area, usually the primary PI's Division/Area, with it being identified as Multi-Area via a check box on the coversheet. In addition, co-PIs, other researchers, and their Areas should be explicitly identified in the appropriate coversheet data fields.

Lead and co-PIs are responsible for co-planning work and budgets for each partner Area with the assistance of those Areas' resource analysts. All Area budgets should be added together in a combined full proposal budget sheet. Both Area specific and total budget sheets should be uploaded into the submission database.

Initial funding will come from each of the researchers' home Areas with additional funds contributed by the Directorate reserve to support these projects. There will be two funding options under this track and, in a change from prior years, any funding values listed henceforth should be considered total project values, i.e. inclusive of site support overhead.

1. Proposals that have secured between \$100,000 and \$250,000 from their participating Areas will receive an additional \$75,000 in funding from the Directorate reserve, for a total project budget range of \$175,000 to \$325,000.
2. Proposals that have secured a minimum of \$250,000 from their participating Areas will receive an additional \$125,000 in funding from the Directorate reserve, for a total minimum project budget of \$375,000.

Buy-in, communication, participation, and financial support is required from all Areas involved in any one proposal for it to receive the additional Directorate reserve funding. However, an equal amount of funding support does not have to be provided by each participating Area.

### Review

Initial review and selection of the proposals will be coordinated by the ALDs and/or their designees of the participating Areas after support is determined at the originating Area level. Proposals that are not selected for this track will be returned to the originating Area for consideration at the Area Priority level. Upon selection, PIs will be asked to make a final proposal presentation to the Lab Director and Deputy Lab Director for Research for final award and funding level decisions.



### III. FY25 Area Priorities

Area-priority track proposals will be accepted in each of the scientific Areas of the Lab:

- Biosciences
- Computing Sciences
- Earth and Environmental Sciences
- Energy Sciences
- Energy Technologies
- Physical Sciences

#### Criteria

Area-priority proposals will be evaluated based on their novelty and scientific quality, as well as the ability to introduce new research activities in areas important to one or more of the Scientific Divisions of the Lab. High-risk projects with the potential for significant scientific impact are strongly encouraged.

Proposals in this track can include researchers from more than one Area even if they are not targeting the multi-area topics listed above.

#### Review

The ALD and the Area-specific Division Directors will review the proposals in their Area; they may also include additional reviewers in the process. The PI will be involved in a single round of reviews involving the written proposal and follow-up to Area and Division management. The highly ranked Area Proposals will be presented by the relevant ALD or Division Director to the Lab Director and Deputy Lab Director for Research for final selection and funding level decisions.

The Area-priority LDRDs are encouraged in new “breakthrough” science areas. Within each Area, the particular research topics for which proposals are especially encouraged are:

**Biosciences:** i) Self-Driving Labs: Experimental and computational research and engineering to enable automated experimentation; ii) Computing, analysis, and data acquisition & management: New approaches for biological computing, data analysis, and data management that meet FAIR principles create standardized workflows, enable AI/ML, and organize data for future analysis.; iii) Predictive Biology: Research and development of experimental and computational capabilities to enable accurate predictions of biological processes and phenomena, as well as possible interventions to realize desired phenotypes; iv) Emerging Strategic Research Directions: proposals for hypothesis-driven, emerging and exploratory concepts of potential strategic interest for Biosciences are encouraged. Competitive proposals will focus on new avenues of research



or technology development with broader impacts that may become Area-wide strategic priorities in the future.

Additional guidance provided by Biosciences may be found here:

<https://docs.google.com/document/d/1O9HGQ0ZwjbNZDGEOShsiaqaJwcfFpe8rfh8tV8qcJ6Q/edit#heading=h.rxd6xos03a7z>

**Computing Sciences:** i) New mathematical and statistical methods, including machine learning methods, that enable new capabilities in modeling, simulation, data analysis, or that improve the robustness of control or steering of scientific instruments or energy systems; ii) Techniques, methods, and systems that explore new research in resource, data management, and develop use cases that integrate HPC, networking, storage, and edge devices with experimental and observational facilities; or iii) Architectures, programming frameworks, and system software for resilience, security, productivity, and performance on future architectures, including advanced microelectronics devices, quantum devices, and specialized architectures “at the edge.”

**Earth and Environmental Sciences:** i) Novel experimental and modeling approaches for subsurface properties and processes; ii) Advanced approaches to observe, manipulate, and/or simulate soil-microbe-plant interactions across scales and in response to environmental stresses; and iii) Science, technologies, and machine learning to advance resilience, adaptation, and security of natural resources and the built environment

**Energy Sciences:** i) Projects that advance the development of new transformational connections between research programs and user facilities, or that integrate basic and applied research in novel ways, or that employ data-driven approaches; ii) Projects that motivate long-term research and demonstrate capabilities for the envisioned Charter Hill campus; iii) Projects that have the potential to leverage the brightness and coherence of the upgraded ALS or emerging capabilities at the Molecular Foundry, particularly in electron microscopy; and iv) Proof-of-concept exploratory studies, driven by emerging frontiers in chemistry and materials that are not currently addressed by existing programs. Proposals from single PIs and from multi-PI, cross-Divisional, and cross-Area teams are encouraged. More information can be found at: [go.lbl.gov/fy25-esa-ldrd](http://go.lbl.gov/fy25-esa-ldrd).

**Energy Technologies:** Energy storage, conversion, and decarbonization technologies and strategies for the industrial, building, and transportation sectors; simulation, modeling, and demonstration of decarbonized energy systems and industrial processes; demonstration and development of solutions to manage loads at the distribution grid edge; synthesis and manufacturing of novel materials and devices for energy technologies; critical materials extraction, processing and supply chain analysis; manufacturing R&D for energy storage technologies; measurement, reporting, and verification for carbon removal technologies; sustainable technologies and strategies for climate equitable communities; AI and ML for the energy grid and technologies such as simulation, control, data interoperability and discovery; human behavior and institutional decision making for technology policy and adoption; including contributions within the above priorities aligned with



national and homeland security mission needs. Proposals from single PIs and from multi-PI, cross-Divisional, and cross-Area teams are encouraged.

**Physical Sciences:** i) new scientific opportunities in particle physics and cosmology; ii) new opportunities in nuclear science; iii) advanced accelerator systems for colliders, light sources and other applications including high power lasers; iv) novel technical concepts and capabilities especially microelectronics, semiconductor and other radiation detectors, quantum enabled technology, superconducting magnets; v) novel computing capabilities including AI/ML applied to particle physics, cosmology, nuclear science and accelerators; vi) new opportunities in fusion energy sciences; vii) leveraging LBNL capabilities to address national and homeland security mission needs.

An important priority for PSA is to establish the technical and theoretical capabilities for Berkeley Lab leadership roles in the scientific opportunities identified in the Nuclear Physics Long Range Plan, the High Energy Physics P5 report, and the Fusion Energy Sciences Long Range Plan. These opportunities include the Electron-Ion Collider (EIC), as well as the next generations of neutrino detectors, cosmic and dark matter surveys, high power lasers, superconducting magnets, and future high energy hadron and lepton colliders. Novel directions and high risk/high reward ideas are encouraged.

An Area-wide priority for FY25 is to support innovative ideas in instrumentation, with an emphasis on detector and readout R&D that could enable scientific opportunities in more than one discipline, with participation of multiple Divisions to create synergies across and outside the Area. Proposals may also include needed investments in technical infrastructure in support of instrumentation R&D.

#### **IV. FY25 Early Career Development**

The intent of the Early Career Development (ECD) track is to develop the future scientific workforce and prepare early career PIs for a successful scientific career. An ECD LDRD award is intended to be a first opportunity for an early career scientist to develop PI experience and may result in a DOE Early Career Grant application. Considering the future scientific workforce of Berkeley Lab, it is a goal of the laboratory to develop a diverse group of early career scientists and applications from underrepresented and other employee groups are very much encouraged.

A maximum funding amount of \$550,000 per PI will be allocated for the entirety of the project. As mentioned above, any funding values listed in this Call should be considered total project values, i.e. inclusive of site support overhead. This change in funding reference point is not expected to significantly impact the estimated pre-site support award. Applicants may choose either two or three year options as the length of the project. The values for these options equate to \$183,000 per year over three years or \$275,000 per year over two. Any PI who is a



member of the FY24 cohort or earlier should stay consistent with the funding decision that they have previously requested and executed under. The FY25 proposal request should reflect only the amount being requested for that specific fiscal year.

### Criteria

To better align with recent changes to the ECRP program eligibility by DOE, we have in turn extended the eligibility dates for ECD applicants. As such, PIs must have received their Ph.D. no earlier than January 1, 2013. Current postdocs may also submit proposals, but, if successfully funded, they must be on track to a scientific job title (career or career track, research scientist or staff scientist) before the project starts. Candidates are also expected to go through a suitable search prior to the job title change to encourage their long-term growth and stability at the Lab.

An EC LDRD project must include effort for the PI, at no more than 50% of the PI's overall time. While the topic of the proposed project should be consistent with the Area strategy and create a strong basis for a future DOE Early Career grant application or other high value funding opportunities, it is expected that the Early Career LDRD project will be independent from and carried out in parallel to other assigned work from their home division/user facility.

Please direct any further questions or inquiries about eligibility to your Division Director or ALD.

### Review

Applying under this LDRD track invites early career scientists to start thinking strategically about their long-term plans and how these plans fit into the program goals of the Lab and the DOE. Thus, the ALD and the Area-specific Division Directors should encourage and mentor outstanding early career scientists to become ECD PIs in their Area, paying particular attention to diversity and inclusion. Ongoing mentorship by the Area or Division management will be essential for the success of the ECD PIs, thus ALDs/Division Directors should also prepare a mentoring plan for the PIs, which should be submitted with the application.

ALDs and Division Directors will review the ECD proposals in their Area; they may also include additional reviewers in the process. The ECD PIs will be involved in a review process involving the written proposal and possibly a presentation to Area and Division management. Each ALD will forward the top ECD proposal from their Area.

The selected ECD proposals from all Areas will then be presented by their PIs to the Lab Director, Deputy Lab Director, and all ALDs.





## V. General Proposal Requirements and Review Process

Proposals must include a:

- Cover Sheet
- Technical proposal (as described below)
- Budget Request form
- NEPA/CEQA form
- Human Subject and Animal Use form
- Intellectual Property forms

The technical proposal uploads for Area-Priority and Early Career Development tracks may not exceed a maximum of three pages of text with one additional page for figures and references. An additional fifth page will be allowed for Multi-Area Topics proposals to account for an extra page of text. Continuing project proposals must include within the page limit a statement of progress to date, detailed scope and deliverables for the current fiscal year, as well as prospects for follow-on funding.

Proposed work cannot supplement existing DOE projects, nor can it contain construction line items or maintenance activities. The typical duration for projects starting in FY25 will be two years, although a third year of funding will be available in outstanding and exemplary circumstances. However, second year funding is not guaranteed and will be based on several factors including progress towards goals and successful stewardship of project funding.

Proposals should be prepared carefully following the given specifications and requirements available online at Detailed Proposal Guidance.

### Budget

Budgets must include payroll burden, procurement burden and support burden, if applicable, along with scientific organization burden. A Site Support overhead estimate should be included as a separate line item if applicable.

## VI. Schedule and Support

The nominal schedule for the FY 2025 cycle is posted - see LDRD Review Schedule below. Final detailed scheduling of the review period and any presentations will be arranged by the ALD and/or Lab Director's offices.

Investigators should work with their Divisional or Area support staff to prepare their LDRD proposals. Administrative questions on LDRD may be addressed to Darren Ho ([dho@lbl.gov](mailto:dho@lbl.gov)).



For additional information about the purpose and implementation of the LDRD program at Berkeley Lab, please click this link: [LDRD Guidelines](#)

Information about the Laboratory LDRD proposal submission and review process can be found at: [Proposal Submission and Review Processes](#)



## **FY 2025 Laboratory Directed R&D (LDRD) Proposal Schedule**

Schedule as of December 11, 2023. For any updates, please go to: [LDRD Proposal Submission and Review Schedule](#)

<b>Before January 1, 2024</b>	Director issues Call for Proposals and guidance for FY 2025 LDRD to ALDs, Division Directors, and research staff via e-mail and Elements.
<b>March 22, 2024</b>	Principal investigators submit and lock FY 2025 LDRD proposals in the web-based submission system for Division processing. Associate Laboratory Directors (ALDs) initiate review processes of all proposals from their Area.
<b>April 12, 2024</b>	ALDs identify proposals selected for Multi-Area Topics track review. Proposals that are not funded by at least two Areas are returned back to their submitting Area for review as an Area Priority track proposal.
<b>April 19, 2024</b>	ALDs identify proposals selected for Early Career Development track review.
<b>May 6<sup>th</sup> &amp; 14<sup>th</sup>, 2024</b>	Presentation and Review Meetings for FY 2025 ECD, Multi-Area, and Area/Divisional Priority proposals.
<b>July 1, 2024</b>	Director or Deputy Director for Research notifies ALDs and Division Directors of preliminary FY 2025 awards.
<b>September 1, 2024</b>	LDRD Office notifies successfully awarded FY 2025 Pls. Project concurrence requests are provided to DOE-Berkeley Site Office (BSO).
<b>October 1, 2024</b>	DOE project concurrence is provided, and LDRD projects begin work.
<b>December 15, 2024</b>	Awards announced in Elements after final allocations are made.