U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy

Vehicle Technologies Office
NATIONAL LABORATORY CALL FOR PROPOSALS

VTO Fiscal Year 2024 Lab Call
DE-LC-0000119

National Lab Funding for Fiscal Year 2024

This Lab Call is being issued by the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Vehicle Technologies Office (VTO).

Questions about this Lab Call? Email VTOLabCall@ee.doe.gov.
Problems with EERE eXCHANGE? Email EERE-eXCHANGESupport@hq.doe.gov.
Include Lab Call name and number in subject line.

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Lab Call Modification(s) History

Modification_1 (pgs 18-24): Section II.A.iii Proposal Content was amended to reflect only the required components for a proposal with the addition of the "Statement of Project Objectives (SOPO)". All other sections previously listed here and on eXCHANGE are optional. The 6 required documents include the following:

1. Technical Volume
2. Statement of Project Objectives (SOPO)
3. Resumes
4. Summary/Abstract for Public Release
5. Summary Slide
6. Diversity, Equity, and Inclusion (DEI) Implementation Plan

I. Lab Call Description

A. Background and Context

i. Overview and Purpose

EERE National Laboratory Guiding Principles require all offices to pursue a merit review of direct-funded National Laboratory work. In line with these principles, VTO is issuing this lab call for fiscal year 2024 (FY 2024).

Some labs have continuing multi-year projects that have already gone through the merit review process. These will continue to be reviewed through the annual peer review process. Labs should work with VTO project and program managers to ensure that ongoing projects are included in the annual operating plans (AOP) to meet AOP deadlines. This lab call will only pertain to the new topic areas below.

Building a clean and equitable energy economy and addressing the climate crisis is a top priority of the Biden Administration. This lab call will advance the Biden Administration's goals to achieve carbon pollution-free electricity by 2035 and to "deliver an equitable, clean energy future, and put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050"[1] to the benefit of all Americans. The Department of Energy is committed to pushing the frontiers of science and engineering, catalyzing clean energy jobs through research, development, demonstration, and deployment (RDD&D), and ensuring environmental justice and inclusion of underserved communities.[2]

The research and development (R&D) activities to be funded under this lab call will support the government-wide approach to the climate crisis by driving the innovation that can lead to the deployment of clean energy technologies, which are critical for climate protection. Specifically, this lab call will address the overarching goals of decarbonization via three distinct approaches. The first is through the investigation of next-generation battery technology for electric vehicles (EVs) that further reduce cost and utilization of critical materials (i.e. Li, Co, Ni) by developing sodium-ion battery (NIB)

[1] Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad," January 27, 2021.

[2] The term "underserved communities" refers to populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life, as exemplified by the list in the definition of "equity." E.O. 13985. For purposes of this Lab Call, as applicable to geographic communities, applicants can refer to economically distressed communities identified by the Internal Revenue Service as Qualified Opportunity Zones; communities identified as disadvantaged or underserved communities by their respective States; communities identified on the Index of Deep Disadvantage referenced at https://news.umich.edu/new-index-ranks-americas-100-most-disadvantaged-communities/, and communities that otherwise meet the definition of "underserved communities" stated above.

technology to increase the accessibility of EVs to a wider market. The acceleration of innovation and adoption of electric drive technologies is the second focus of this lab call and the program will incorporate a suite of digital technologies to increase customer confidence in electrified powertrains through the use of virtual design and virtual verification (VDVV), AI-based design optimization, and digital twin diagnostics. Finally, this lab call will build upon the previous two successful Joining Core Program phases to further develop lightweight materials for EVs to reduce overall vehicle weight and improve costs, range, and battery utilization. In addition, this lab call will emphasize increasing diversity of research staff, increasing diversity of voices in research design, and or increasing quantification and emphasis on supporting underserved communities.

ii. Timeline and Process Logistics

Timeline

KEY DATES	
Lab Call Release Date:	5/6/2024 12:00 PM ET
PROPOSAL DEADLINE AND DECISION DATES	
Full Application Submission Deadline(s):	6/12/2024 5:00 PM ET
Decision Date(s):	7/30/2024 12:00 PM ET
Expected Beginning Award Issue Date(s):	10/1/2024 9:00 AM ET

Process Logistics

All communication to VTO regarding this Lab Call must use VTOLabCall@ee.doe.gov.

- **PROPOSAL SUBMISSIONS:** To apply to this Lab Call, lab personnel must register (and sign in) with their lab email address and submit application materials through EERE eXCHANGE. Application materials must be submitted through EERE eXCHANGE at https://eere-eXCHANGE.energy.gov, EERE's online application portal. Frequently asked questions for this Lab Call and the EERE Application process can be found at https://eere-eXCHANGE.energy.gov/FAQ.aspx.

  Applicants are responsible for meeting the submission deadlines. DOE strongly encourages all applicants to submit the required information at least 24 hours in advance of the submission deadline. Applicants should not wait until the last minute—internet and data server traffic can be heavy in the last hours before

the submission deadline, which may affect the applicants' ability to successfully submit the required information before the deadline.

- **QUESTIONS DURING OPEN LAB CALL PERIOD:** Specific questions about this Lab Call should be submitted via e-mail to VTOLabCall@ee.doe.gov VTO will provide answers related to this Lab Call on EERE eXCHANGE at: https://eere-eXCHANGE.energy.gov. Please note that you must first select the specific opportunity number for this Lab Call in order to view the questions and answers specific to this Lab Call. EERE will attempt to respond to a question within 3 business days, unless a similar question and answer have already been posted on the website.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-eXCHANGESupport@hq.doe.gov. To ensure fairness for all lab participants, please do not ask individual VTO staff questions directly.

- **NOTIFICATION OF SELECTION:** When selections are finalized, lab leads will receive an email from VTOLabCall@ee.doe.gov.

B. Key Considerations and Topic Area(s)

i. Key Considerations

- **AVAILABLE FUNDING:** There is approximately **$19.5M in annual funding** available to fund **all** projects solicited in this Lab Call pending appropriations, program direction, and go/no-go decision points.

- **NON-LAB PARTNERS:** Labs partnering with industry, academia or other non-lab entities to perform work under this Lab call must enter into CRADAs with those partners within time parameters set forth by the funding program.

- **ELIGIBILITY:** All DOE/National Nuclear Security Agency (NNSA) Federally Funded Research and Development Centers (FFRDCs), and all National Laboratories, are eligible to submit proposals as prime awardees, unless specified otherwise. Proposals that involve more than one laboratory are also allowed. Only one proposal can be submitted to this Lab Call.

- **DIVERSITY, EQUITY, and INCLUSION:**
  It is the policy of the Biden Administration that:

  > [T]he Federal Government should pursue a comprehensive approach to advancing equity[3] for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Affirmatively advancing equity, civil rights, racial justice, and equal opportunity is the responsibility of the whole of our Government. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies (agencies) must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity.
  >
  > By advancing equity across the Federal Government, we can create opportunities for the improvement of communities that have been historically underserved, which benefits everyone.[4]

[3] The term "equity" means the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality. E.O. 13985.

[4] Executive Order 13985, "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government" (Jan. 20, 2021).

As part of this whole of government approach, this lab call seeks to encourage the participation of underserved communities and underrepresented[5,6] groups. Applicants are highly encouraged to include individuals from groups historically underrepresented, in STEM on their project teams. As part of the application, applicants are required to describe how diversity, equity, and inclusion objectives will be incorporated in the project. Specifically, applicants are required to reference, if available, the existing laboratory Diversity, Equity, and Inclusion Plan and describe within the technical volume the actions the applicant will take to foster a welcoming and inclusive environment, support people from underrepresented groups in STEM, advance equity, and encourage the inclusion of individuals from these groups in the project; and the extent the project activities will be located in or benefit underserved communities.

Because a diverse set of voices at the table in research design and execution has an illustrated impact on innovation, this implementation strategy for the lab-wide plan will be evaluated as part of the technical review process.

[5] According to the National Science Foundation's 2019 report titled, "Women, Minorities and Persons with Disabilities in Science and Engineering", women, persons with disabilities, and underrepresented minority groups—blacks or African Americans, Hispanics or Latinos, and American Indians or Alaska Natives—are vastly underrepresented in the STEM (science, technology, engineering and math) fields that drive the energy sector. That is, their representation in STEM education and STEM employment is smaller than their representation in the U.S. population. https://ncses.nsf.gov/pubs/nsf19304/digest/about-this-report For example, in the U.S., Hispanics, African Americans and American Indians or Alaska Natives make up 24 percent of the overall workforce, yet only account for 9 percent of the country's science and engineering workforce. DOE seeks to inspire underrepresented Americans to pursue careers in energy and support their advancement into leadership positions. https://www.energy.gov/articles/introducing-minorities-energy-initiative

[6] Note that Congress recognized in section 305 of the American Innovation and Competitiveness Act of 2017, Public Law 114-329:

> (1) [I]t is critical to our Nation's economic leadership and global competitiveness that the United States educate, train, and retain more scientists, engineers, and computer scientists; (2) there is currently a disconnect between the availability of and growing demand for STEM-skilled workers; (3) historically, underrepresented populations are the largest untapped STEM talent pools in the United States; and (4) given the shifting demographic landscape, the United States should encourage full participation of individuals from underrepresented populations in STEM fields.

Further, to the extent the proposed project will include external partners, the applicant is encouraged to include Minority Serving Institutions[7], Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, or entities located in an underserved community. The Selection Official may consider the inclusion of these types of entities as part of the selection decision.

- **EERE NATIONAL LABORATORY GUIDING PRINCIPLES:** To ensure continued alignment with EERE lab engagement principles, applicants should consider the following when developing their proposals:
  - VTO strongly encourages projects that bring together multiple labs in a consortia-based approach to meet a high-level strategic goal, leveraging multiple lab capabilities with strong, centralized leadership.
  - To the extent possible and appropriate, VTO seeks lab projects that involve industry engagement or industry partners.

[7] Minority Serving Institutions (MSIs), including Historically Black Colleges and Universities/Other Minority Institutions) as educational entities recognized by the Office of Civil Rights (OCR), U.S. Department of Education, and identified on the OCR's Department of Education U.S. accredited postsecondary minorities' institution list. See https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html.

ii. Topic Area Descriptions

Topic 1: Sodium-Ion Consortium

- Eligibility: No Restrictions – DOE FFRDC-led consortium
- Estimated DOE Funding Available: Up to $10 million per year (total, annually, across all projects selected), pending availability of funds
- Estimated Number of Projects Expected: 1 consortium project
- Estimated Project Duration: 5 years, pending availability of funds

Description:

Of all the proposed "Beyond Lithium-Ion" chemistries, Na-ion batteries (NIBs) are probably the closest to commercial realization. A particular appeal of NIBs is their resemblance to the well-known Li-ion systems, so that engineering knowledge developed over the past twenty-five years for the former can be easily applied to the latter. Another compelling reason to develop NIBs further has to do with supply security issues; the crustal abundance of sodium is far greater than that of lithium, and there is an enormous domestic supply of sodium precursors. The United States is particularly well situated for the adoption of sodium due to producing 14.5% of sodium chloride (salt) globally and 68.8% of natural sodium carbonate (soda ash) globally.[1]

Objective:

VTO Sodium-Ion Consortium seeks to leverage existing and developing U.S. scientific and R&D management capabilities resident at national laboratories and universities by supporting an R&D consortium dedicated to significantly advancing the NIB technology. Recently, NIBs have shown favorable performance metrics and with additional R&D could match the performance of commercialized LFP chemistries. The objective of this AOI is to create a new multi-institution, crossdisciplinary R&D consortium that will not only establish and conduct multi-lab, multidiscipline research but also establish and manage a portfolio of high impact seedling research projects resident at U.S. R&D facilities. The composition of the consortium team and the keystone research projects proposed should have the potential for achieving the VTO Sodium-Ion Strategic Goal (see below) by the end of the period of performance of this award.

The consortium goal is to develop and demonstrate 2 Ah sodium battery cells with a specific energy of 160 Wh/kg and achieve 1000 cycles (see Table 1 for additional requirements). A performance baseline system will be established by the consortium utilizing current state-of-the-art materials employing hard carbon as the anode, an organic liquid electrolyte, and mainly a Mn containing layered oxide

cathode with less than 30% Ni. Future projects would further develop technologies that minimize the use of critical minerals (e.g. Ni, Li) and provide better performance and cost benefits over the baseline. Since sodium has a much lower melting temperature (95 °C) than lithium (180 °C), safety of these battery cells will be evaluated and compared against commercial lithium-ion batteries. The consortium strategic goal at the end of the performance period is to assess whether the technology is ready for prime time, and to identify future areas of further research and development if it is not.

Criteria for a successful consortium are in order of importance:

1. Ability to manage and carry out multi-lab, multidisciplined applied research projects,
2. Breadth and depth of capabilities, evidence of synergies is particularly important.

The organizational structure of the consortium should include (but not limited to) these three elements:

1. A lead national lab, including a dedicated consortium program manager.
2. A management committee consisting of representatives from stakeholder organizations,
3. Three to four keystone multi-PI, multi-organization 3-5 year research projects, and

The VTO Sodium-Ion Consortium is expected to have a thematic element—the keystone projects and the brunt of the seedling projects should reflect a significant opportunity, specific barrier(s), and an approach to rational scientific development. The expectation for the funding distribution is that no more than 20% of the total budget will be used for university and industry partners within the consortium. The consortium is also encouraged to work with any Na-ion seedling projects awarded by VTO.

While the funded organization will be a DOE FFRDC-led consortium comprised of U.S. national laboratories and U.S. academic institutions, corporate involvement may occur through a collaborative R&D agreement and/or advisory panel participation. VTO prefers that participation by non-DOE lab organizations (such as universities and industry stakeholders) be administered through a standard cooperative agreement.

The Vehicle Technologies Office will have substantial involvement in the strategic direction and the development of the research portfolio of the consortium.

Table 1: Performance Targets for Na-ion Cell Deliverables

Initial Cell Capacity	**≥2 Ah**
Cell Specific Energy Density*	≥160 Wh/kg
Cell Cycle Life	≥1,000 cycles with 80% initial capacity
Cathode Specific Capacity	≥200 mAh/g
Cathode Nominal Voltage	≥3.5 V
Anode Specific Capacity	≥300 mAh/g
Anode Nominal Voltage	≤0.2 V
Electrolyte Ionic Conductivity	≥10 mS/cm

*When scaled to automotive sizes (40 Ah or greater)

[1] United States Geological Survey Commodity Statistics and Information. https://www.usgs.gov/centers/nationalminerals-information-center/commodity-statistics-and-information

Topic 2: Electric Drive Technologies – Accelerating Electrification through Improved Asset Utilization

- Eligibility: Restricted (ORNL, SNL, NREL, and Ames)
- Estimated DOE Funding Available: Up to $4.5 million per year (total, annually, for selected coordinated multi-lab project), pending availability of funds
- Estimated Number of Projects Expected: 1 coordinated, multi-lab project
- Estimated Project Duration: 3 years, pending availability of funds

Description:

The Electric Drive Technologies (EDT) Program is seeking coordinated R&D proposal to overcome the challenges of the market evolution and transition to EVs faced by industry that serve a growing range of vehicle applications and platforms, including commercial medium/heavy-duty trucks and off-road vehicles. These vehicles have unique requirements and challenges, including prolonged high-torque/high-power demands, the need for long hours of operation, and expectations of high-reliability and long lifetimes. Costly, early failures can erode consumer confidence in electrified powertrains in these nascent markets that are poised for rapid growth. To meet national goals for

zero-emission truck adoption, there is a need to accelerate maturation of electric drive technologies for commercial vehicles and accomplish 25 years of development in 5 years. This requires targeted research and development that can significantly reduce development time. As developed through the 21st Century Truck Partnership's Electrification Technologies Sector Team, the Electric Drive Technologies sub-program has the goal of reducing the cost of 530 kW Electric Traction Drive Systems by 20% while increasing volumetric power density by 20%, compared to 2020 baseline, and enabling 1 million miles/25,000 hours operation in a class 8 truck without failure by 2030.

Objective:

Enabling the successful acceleration of technology and vehicle innovations to a wide range of customers is the objective of the EDT Program. To address the barriers to broad market acceptance of on- and off-road commercial vehicles, proposal should address approaches to incorporating the following program thrusts:

- #1 – Multi-physics, high -fidelity models for virtual design and virtual verification (VDVV) to reduce development time and product cost while meeting durability requirements.
- #2 – AI-based design optimization for adaptive and sustainable electrification, including manufacturing
- #3 – Digital twin diagnostics and prognostics to increase uptime and asset utilization (with in-situ monitoring)
- #4 – Enabling technologies to improve EV performance, reliability and range, reduce vehicle cost, and enhance diagnostics and prognostics (includes energy storage options, operation, and grid integration)

A coordinated project is sought to accelerate technology innovation and technology transfer while achieving EDT targets and goals, enabling and accelerating mass market adoption and vehicle electrification. R&D efforts utilizing a comprehensive foundation of expertise, capabilities, and facilities in developing advanced EDT technologies and systems, including plans and opportunities coordination with industry, such as future CRADAs, is required.

Proposed efforts should focus on overcoming vehicle electrification challenges and issues, including total cost of ownership, asset utilization, and the value proposition for customers. Emphasis on the potential to exploit and accelerate the pace of technology development, production, and deployment utilizing

modeling and analysis to reduce time to market should be described in detail, including potential challenges, opportunities, and impacts. Approaches to enable reduced design time while simultaneously reducing costs with improved reliability are a key to meeting challenges identified by industry should be described. Advanced diagnostics and prognostics should be highlighted in the proposal to identify potential to reduce/eliminate device and component failures.

Knowledge of technology gaps and targets should be documented as the basis for proposed efforts and pathways to achieve EDT targets and industry needs. (Targets are documented in DOE/Industry Partnership Technical Team Roadmaps - links/files provided below). Intent to continue coordination with industry and technology transfer, utilizing CRADAs, should be described in detail in the proposal.

Proposal Requirements: Joint, multi-lab proposal with clearly defined tasks, roles, and responsibilities for each lab. Proposals should clearly outline partnerships with vehicle OEMs and suppliers, and potential for opportunities to collaborate with private industry are highly desirable.

21st Century Truck ESTT Roadmap, 2023
https://www.energy.gov/eere/vehicles/reports-and-publications

Topic 3: Joining Core Program 3.0

- Eligibility: No Restrictions
- Estimated DOE Funding Available: Up to $5 million per year (total, annually, across all projects selected), pending availability of funds
- Estimated Number of Projects Expected: 2-4 Projects
- Estimated Project Duration: 3 years

Description:

The Materials Technology Program seeks proposals for a multi-lab effort to build upon knowledge gained during the first two phases of the Joining Core Program. Projects will continue to conduct research and development on joining of dissimilar lightweight materials, including advanced high strength steel, aluminum, polymer matrix composites, and magnesium with the focus on transitioning these methods into a high volume, low cost manufacturing environment. In addition, extending the work on joining dissimilar materials to include the use of sustainable material in researching and developing new

joining methods and addressing the subsequent issue of corrosion when joining dissimilar materials.

Objective:

With the advent of Electric vehicles, the need to research hermetically joining and in-situ monitoring of welds/seals for battery packs and subsequently battery storage solutions and integration into the vehicle. As more manufacturers work to transition their vehicles to EVs, the need for better joining technologies and packaging solutions which aid in both increasing efficiency via light-weighting solutions as well as focus on crash worthiness are critical. The third phase of the Joining Core Program will have four major thrusts, detailed below, that will enable vehicle weight reduction and efficiency improvement by broadening the applicability of individual joining methods, moving lab-scale joining methods towards industry readiness, addressing challenges with adhesion and corrosion, investigate battery pack joining and vehicle integration and providing the automotive industry confidence in the quality of dissimilar material joints.

Thrust 1: Improve joining technologies for high performance materials such as advanced-high strength steels, structural materials such as large lightweight castings, and dissimilar material/metals with a focus on producing cost effective light-weight structures with strength and ductility. Proposals should provide a target application, current baseline, and planned methodology to achieve superior results.

Thrust 2: Specialized joining for BEV Systems: Batteries and battery enclosures require good hermetic seals and the ability to automate the joining technologies for them is important to reduce the cost and improve the production rates for BEVs. Technologies need to be developed and validated that can produce automated, repeatable, and verifiable joints in all aspects of the battery and battery enclosure system. Proposals should provide a target application, current materials utilized, current joining technology utilized, existing quality control mechanisms, and the proposed technical approach develop a robust system that addresses industry performance and throughput needs. In addition, proposals should focus on the manufacturability, sustainability, and system durability and reliability.

Thrust 3: Advanced Characterization and Computational Methods: Advanced Characterization is essential to provide the fundamental understanding of the

joining interface and joint performance of technologies developed in thrusts 1 and 2. The proposal should provide a description of the characterization tools and how they will be utilized to accelerate the development of the technologies of the tasks within thrusts 1 and 2. If a need for additional or specialized characterization are needed to complete the objectives to the proposal, they should be identified along with the justification for their acquisition under the proposal. Computational modeling methods and High Performance Computing may be necessary to explain any phenomena observed in the technical tasks or these methods may be utilized to predict potential performance enhancements. The proposal should identify any anticipated computational and modeling tasks that will be utilized in the project and provide a description of the benefits expected from their application on the project.

Thrust 4: Corrosion of joining dissimilar materials: The interface between different materials can represent a significant corrosion risk that must be addressed before a joining technology can be transitioned to a fully commercialized product. Technical tasks in Thrusts 1 and 2 should identify any potential corrosion issues and Thrust 4 should develop tasks to measure, predict, and mitigate any risks that would jeopardize the commercialization of the technologies in the proposal.

The proposal should identify the teaming partners, the management plan, the area of expertise provided, and task leaders responsible for each activity in the proposal. Resumes of key personnel should be included in the proposal. If there are outside industry technical advisors supporting the proposal, letters of support from them should be included in the proposal. The letters of support should identify the task(s) that they are planning to support and the expertise that they expect to bring to the project.

II. Application Submission and Review Information

A. Application and Submission Details

i. Application Process

To apply to this Lab Call, applicants must register with their lab email address and submit application materials through EERE eXCHANGE at https://eere-eXCHANGE.energy.gov, EERE's online application portal. Beginning on July 8, 2022*,

eXCHANGE will be updated to integrate with Login.gov. As of August 5, 2022*, potential applicants will be required to have a Login.gov account to access EERE eXCHANGE. As part of the eXCHANGE registration process, users will be directed to create an account in https://login.gov/. Please note that the email address associated with Login.gov must match the email address associated with the eXCHANGE account. For more information, refer to the Exchange Multi-Factor Authentication (MFA) Quick Guide in the Manuals section of eXCHANGE.

All submissions must conform to the guidelines for format and length, and be submitted at, or prior to, the deadline listed.

Applicants will be required to include project information and details in eXCHANGE that will be used to develop and accelerate negotiations of FY 2024 AOPs if selected. Appendix A provides a worksheet to guide applicants through this process in eXCHANGE. Any information the applicant considers to be of significance for the review process must be included in the proposal, as reviewers will not have access to the AOP development information entered in eXCHANGE.

ii. General Proposal Requirements

Proposals should be formatted for 8.5 x 11 paper, single spaced, and have 1-inch margins on each side. Typeface size should be 12-point font, except tables and figures, which may be in 10-point font.

iii. Proposal Content

Proposal content aligns with content required in the EERE AOP project forms, with additional information to assist reviewers in evaluating technical details. The narrative should build on the information provided as part of the EERE eXCHANGE template. **Applicants must include all content they wish to have reviewed in the proposal (proposal reviewers will not review any information provided in eXCHANGE for AOP development).**

Full Applications

- EERE will not review or consider ineligible Full Applications.
- Each Full Application shall be limited to a single concept or technology. Unrelated concepts and technologies shall not be consolidated in a single Full Application.

* Please note that these dates are tentative and subject to change.

Full Applications must conform to the following requirements:

SECTION	FILE FORMAT	PAGE LIMIT	FILE NAME
Technical Volume	PDF	15 (Topic 1 & 2) 25 (Topic 3)	ControlNumber_LeadOrganization_TechnicalVolume
Statement of Project Objectives (SOPO)	MS word	10	ControlNumber_LeadOrganization_SOPO
Resumes	PDF	No limit	ControlNumber_LeadOrganization_Resumes
Summary/Abstract for Public Release	PDF	1	ControlNumber_LeadOrganization_Summary
Summary Slide	MS PowerPoint	1	ControlNumber_LeadOrganization_Slide
Diversity, Equity, and Inclusion (DEI) Implementation Plan	PDF	No limit	ControlNumber_LeadOrganization_DEIIP

Technical Volume

The Technical Volume must be submitted in PDF format. The Technical Volume must conform to the following content and form requirements, including maximum page lengths. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages. Save the Technical Volume in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_TechnicalVolume".

Applicants must provide sufficient citations and references to the primary research literature to justify the claims and approaches made in the Technical Volume. However, EERE and reviewers are under no obligation to review cited sources.

The Technical Volume to the Full Application may not be more than 15 pages for Topics 1 & 2, and 25 pages for Topic 3, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria when preparing the Technical Volume.

The Technical Volume must conform to the following content requirements:

SECTION / PAGE LIMIT	DESCRIPTION
Cover Page	The cover page should include the project title, the specific Lab Call Topic Area being addressed, both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Project Overview	The Project Overview should contain the following information: • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Technical Description, Innovation, and Impact	The Technical Description should contain the following information: • Relevance and Outcomes: The applicant should provide a detailed description of the technology, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the lab call, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. • Innovation and Impacts: The applicant should describe the current state-of-the-art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies, and the overall impact on advancing the state-of-the-art/technical baseline if the project is successful.

Workplan	The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Milestones, Go/No-Go Decision Points, and Project Schedule. A detailed SOPO is separately requested. The Workplan should contain the following information: • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on Go/No-Go decision points). The applicant should describe the specific expected end result of each performance period. • WBS and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard WBS for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this Lab Call. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the Lab Call, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO. • Go/No-Go Decision Points: The applicant should provide a summary of project-wide Go/No-Go decision points at

	appropriate points in the Workplan. A Go/No-Go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. At a minimum, each project must have at least one project-wide Go/No-Go decision point for each budget period (12 to 18-month period) of the project. The applicant should also provide the specific technical criteria to be used to evaluate the project at the Go/NoGo decision point. The summary provided should be consistent with the SOPO. Go/No-Go decision points are considered "SMART" and can fulfill the requirement for an annual SMART milestone.
	• End of Project Goal: The applicant should provide a summary of the end of project goal(s). At a minimum, each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO.
	• Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and Go/No-Go decision points.
	• Project Management: The applicant should discuss the team's proposed management plan, including the following:
	  ○ The overall approach to and organization for managing the work
	  ○ The roles of each project team member
	  ○ Any critical handoffs/interdependencies among project team members
	  ○ The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices
	  ○ The approach to project risk management
	  ○ A description of how project changes will be handled
	  ○ If applicable, the approach to Quality Assurance/Control
	  ○ How communications will be maintained among project team members

Technical Qualifications and Resources	The Technical Qualifications and Resources should contain the following information:
	• Describe the project team's unique qualifications and expertise, including those of key subrecipients.
	• Describe the project team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project.
	• This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives.
	• Describe the time commitment of the key team members to support the project.
	• Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable.
	• For multi-organizational or multi-investigator projects, describe succinctly:
	  ○ The roles and the work to be performed by each PI and Key Participant;
	  ○ Business agreements between the applicant and each PI and Key Participant;
	  ○ How the various efforts will be integrated and managed;
	  ○ Process for making decisions on scientific/technical direction;
	  ○ Publication arrangements;
	  ○ Intellectual Property issues; and
	  ○ Communication plans

Statement of Project Objectives (SOPO)

Applicants must complete a SOPO. A SOPO template is available on EERE Funding Application and Management Forms on EERE eXCHANGE at https://eere-exchange.energy.gov/

The SOPO, including the Milestone Table, must not exceed 10 pages when printed using standard 8.5" x 11" paper with 1" margins (top, bottom, left, and right) with font not smaller than 12-point (except in figures or tables, which may be 10-point font). Save the SOPO in a single Microsoft Word file using the following convention for the title "ControlNumber_LeadOrganization_SOPO".

Resumes

Applicants are required to submit resumes for key participating team members. Save the resumes in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Resumes".

Summary/Abstract for Public Release

Applicants are required to submit a single page summary/abstract of their project. The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (e.g., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as DOE may make it available to the public after selections are made. The project summary must not exceed a single page when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the Summary for Public Release in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Summary".

Summary Slide

Applicants are required to provide a single MS Powerpoint slide summarizing the proposed project. This slide is used during the evaluation process.

The Summary Slide template requires the following information:

- A technology summary;
- A description of the technology's impact;
- Proposed project goals;
- Any key graphics (illustrations, charts and/or tables);
- The project's key idea/takeaway;
- Project title, prime recipient, Principal Investigator, and Key Participant information; and
- Requested EERE funds and proposed applicant cost share.

Save the Summary Slide in a single page MS Powerpoint file using the following convention for the title "ControlNumber_LeadOrganization_Slide".

Diversity, Equity, and Inclusion (DEI) Implementation Plan

As part of the application, applicants are required to describe how diversity, equity, and inclusion objectives will be incorporated in the project. Specifically, applicants are required to submit a description of how the project will support or implement the labwide Diversity, Equity, and Inclusion Plan and describe the actions the applicant will take to foster a welcoming and inclusive environment, support people from groups underrepresented in STEM, advance equity, and encourage the inclusion of individuals from these groups in the project; and the extent the project activities will be located in

or benefit underserved communities. The plan should include SMART milestones supported by metrics to measure the success of the proposed actions.

The Diversity, Equity, and Inclusion (DEI) Implementation plan should reference the lab DEI plan if available, and contain the following information:

- Equity Impacts: the impacts of the proposed project on underserved communities, including social and environmental impacts.
- Benefits: The overall benefits of the proposed project, if funded, to underserved communities; and
- How diversity, equity, and inclusion objectives will be incorporated in the project.

The following is a non-exhaustive list of actions that can serve as examples of ways the proposed project could incorporate diversity, equity, and inclusion elements. These examples should not be considered either comprehensive or prescriptive. Applicants are encouraged to propose appropriate actions not covered by these examples.

a. Diversity on the research team
    i. Include persons from groups underrepresented in STEM as PI, co-PI, and/or other senior personnel;
    ii. Include persons from groups underrepresented in STEM as student researchers or post-doctoral researchers;
    iii. Implement evidence-based, diversity-focused education programs (such as implicit bias training for staff) in your organization;
    iv. Identify Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses and Veteran Owned Businesses to solicit as vendors and sub-contractors for bids on supplies, services and equipment
    v. Include faculty or students from Minority Serving Institutions as PI/co-PI, senior personnel, and/or student researchers;
    vi. Enhance or collaborate with existing diversity programs at your home organization and/or nearby organizations;
    vii. Collaborate with students, researchers, and staff in Minority Serving Institutions;
b. Explicit diversity in research impact
    i. Illustrated outcome impact in underserved communities
    ii. Disseminate results of research and development in Minority Serving Institutions or other appropriate institutions serving underserved communities;
c. explicit diversity in research design. Inclusion of a broad community, academic, policymaking staff in research design and execution phase

Save the Diversity, Equity, and Inclusion (DEI) Implementation Plan in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_DEIIP".

Treatment of Application Information

Proprietary Information

In general, DOE will use data and other information contained in proposals only for evaluation purposes, unless such information is generally available to the public or is already the property of the government.

Proposals should not include trade secrets or commercial or financial information that is privileged or confidential unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the Lab Call.

Proposals containing confidential, proprietary, or privileged information must be conspicuously marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Federal Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

If a proposal contains confidential, proprietary, or privileged information, it must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

> **1. Notice of Restriction on Disclosure and Use of Data:**
> Pages [List Applicable Pages] of this proposal may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this Lab Call. The government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source. In addition, (1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: "Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure" and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

B. Application Review Details

i. Merit Review and Selection Process

Upon receipt and review for initial compliance with requirements, all proposals received in eXCHANGE by the deadline will undergo a thorough technical review. VTO will use

expert reviewers familiar with the VTO portfolio, goals, and objectives. VTO will collect and collate review scores and comments for use in making final project selections. The VTO Selection Official will consider the merit review results to make the final project selections. For transparency, VTO will provide summaries of the review results to assist labs in understanding how their submission reviewed and aid in improving future work.

ii. Technical Review Criteria

Final Applications

Applications will be evaluated against the merit review criteria shown below:

Criterion 1: Technical Merit, Innovation, and Impact (50%) This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the proposed technology or process is innovative;
- Degree to which the current state of the technology and the proposed advancement are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state-of-the-art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technology Advancement

- How the project supports the topic area objectives and target specifications and metrics; and
- The potential impact of the project on advancing the state-of-the-art.

Criterion 2: Project Research Plan (25%)

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Criterion 3: Team and Resources (15%)

This criterion involves consideration of the following factors:

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

Criterion 4: Diversity, Equity, and Inclusion (10%)

This criterion involves consideration of the following factors:

- The quality and manner in which the measures incorporate diversity, equity and inclusion goals in the project; and
- Extent to which the project benefits underserved communities.

iii. Selection for Award Negotiation

VTO carefully considers all of the information obtained through the proposal process and makes an independent assessment of each compliant and responsive proposal based on the criteria set forth in this Lab Call. VTO may select or not select a proposal for negotiations. VTO may also postpone a final selection determination on one or more proposals until a later date, subject to availability of funds and other factors. VTO will notify applicants if they are, or are not, selected for award negotiation.

iv. Selection Notification

VTO anticipates completing the project selection process and notifying labs of selections during the week of 7/29/2024 **(subject to change)**.

VTO will notify lab leads of selection results from VTOLabCall@ee.doe.gov and will provide lab leads with summaries of anonymized review comments for each proposal submitted.

v. Questions and Agency Contacts

Specific questions about this lab call should be submitted via e-mail to VTOLabCall@ee.doe.gov. To ensure fairness across all labs, individual VTO staff cannot answer questions while the lab call remains open. To keep all labs informed, VTO will post all questions and answers on EERE eXCHANGE.

Appendix A: Lab Call Full Application Worksheet for eXCHANGE

Lab Call Full Application Worksheet

IMPORTANT: This document is provided as a courtesy to allow Lab Call applicants to collaborate offline to develop Full Applications for Lab Calls. All information must be entered into the eXCHANGE system and cannot be submitted with this document.

Please contact ITSIHelp@ee.doe.gov with any questions.

Project General Information

Control Number:

Applicant (Name and Email):

Organization Name:

Project Title:

Topic:

Project Start Date:

Project End Date:

Partner Laboratories:

Partner Laboratory	Email	First Name	Last Name

Is this a continuation of an existing project?

WBS Number:

Fiscal Year Existing Project:

Project Overview (Multi-year):

Project Objectives (Multi-year):

Contact Information

Lab Lead Point of Contact and Business Contact Information Name:

Email:

Title:

Address:

Phone:

Fax:

Financials

Please add a separate table for each partner laboratory.

Lead Laboratory Name:

Year	Planned Project Costs
2021	
2022	
2023	
Subtotal	

Partner Laboratory (If Applicable) Name:

Year	Planned Project Costs
2021	
2022	
2023	
Subtotal	

Total Planned Project Costs:

Performers

Please add a separate table for each partner laboratory.

Lead Laboratory Name:

Subcontractor Name	Sub Type	Start Date	End Date	2021 Planned Costs	2022 Planned Costs	2023 Planned Costs	Total Funding
Subcontractor Subtotal							

Partner Laboratory (If Applicable) Name:

Subcontractor Name	Sub Type	Start Date	End Date	2021 Planned Costs	2022 Planned Costs	2023 Planned Costs	Total Funding
Subcontractor Subtotal							

Total Planned Project Costs:

Project Plan

Project Tasks:

Task Number	Title	Description	Team Members	Planned Costs	Start Date	End Date

Project Milestones:

Item Number	Type	Title	Description	End Date	Team Members	Criteria

Risks

Project Tasks:

Risk Name	Description	Response Plan	Severity	Probability	Response	Source	Classification	Team Members	Target Completion Date

Modalities/TRL

Modalities:

Modality Number	Modaility	FY21 Weight (%)	FY21 Planned Costs ($)
Total:			

Current TRL of the proposed technology (1-9):

Estimated TRL the technology will reach at project end (2-9):

Project Impacts

Deliverable/Product or "Output" Description:

Audience/Customer:

Audience/Customer Use:

Communications/Outreach Strategy:

Does this project involve significant industry engagement?

Description of Engagement:

Associated CRADAs?

CRADA Text

Appendix B: Waiver Requests and Approval Processes:
1. Foreign Entity Participation as the Prime Recipient; and
2. Performance of Work in the United States (Foreign Work Waiver)

1. Waiver for Foreign Entity Participation as the Prime Recipient

All prime recipients receiving funding under this Lab Call must be incorporated (or otherwise formed) under the laws of a state or territory of the United States and have a physical location for business operations in the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

Overall, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this Lab Call and is otherwise in the economic interests of the United States to have a foreign entity serve as the prime recipient. A request to waive the *Foreign Entity Participation as the prime recipient* requirement must include the following:

- Entity name;
    - The rationale for proposing a foreign entity to serve as the prime recipient;
    - Country of incorporation and the extent, if any, the entity is state owned or controlled;
    - A description of the project's anticipated contributions to the US economy;
- How the project will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
- How the project will promote domestic American manufacturing of products and/or services;
- A description of how the foreign entity's participation as the prime recipient is essential to the project;
- A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
- Countries where the work will be performed (Note: if any work is proposed to be conducted outside the U.S., the applicant must also complete a separate request for waiver of the Performance of Work in the United States requirement).

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE's decision concerning a waiver request.

2. Waiver for Performance of Work in the United States (Foreign Work Waiver)

All work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the prime recipient should make every effort to purchase supplies and equipment within the United States. There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

Overall, a waiver request must demonstrate to the satisfaction of EERE that it would further the purposes of this Lab Call and is otherwise in the economic interests of the United States to perform work outside of the United States. A request to waive the *Performance of Work in the United States* requirement must include the following:

- The rationale for performing the work outside the U.S. ("foreign work");
- A description of the work proposed to be performed outside the U.S.;
- An explanation as to how the foreign work is essential to the project;
- A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the U.S. economy;
- The associated benefits to be realized and the contribution to the project from the foreign work;
- How the foreign work will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
- How the foreign work will promote domestic American manufacturing of products and/or services;
- A description of the likelihood of Intellectual Property (IP) being created from the foreign work and the treatment of any such IP;
- The total estimated cost (DOE and recipient cost share) of the proposed foreign work;
- The countries in which the foreign work is proposed to be performed; and
- The name of the entity that would perform the foreign work.

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE's decision concerning a waiver request.