

**FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT**



**ADVANCED RESEARCH PROJECTS AGENCY – ENERGY (ARPA-E)
U.S. DEPARTMENT OF ENERGY**

***SPURRING PROJECTS TO ADVANCE ENERGY RESEARCH AND
KNOWLEDGE SWIFTLY (SPARKS) – CONCEPT PAPERS***

Announcement Type: **Initial Announcement Modification 01**
Funding Opportunity No. DE-FOA-0003164
CFDA Number 81.135

Funding Opportunity Announcement (FOA) Issue Date:	November 7, 2023
Application Due Date:	Not applicable. This FOA will remain open until closed or replaced by a modified FOA (which is anticipated to occur on an annual basis, subject to the availability of appropriated funds). Applications will be accepted any time while this FOA remains open.
Close Date:	Open continuously until otherwise amended.

- For eligibility criteria, see Section III.A of the FOA.
- For cost share requirements under this FOA, see Section III.B of the FOA.
- To apply to this FOA, Applicants must register with and submit application materials through ARPA-E eXCHANGE (<https://arpa-e-foa.energy.gov/Registration.aspx>). For detailed guidance on using ARPA-E eXCHANGE, see Section IV.F.1 of the FOA.
- For detailed guidance on compliance and responsiveness criteria, see Sections III.C.1 through III.C.3 of the FOA.

MODIFICATIONS

All modifications to the Funding Opportunity Announcement (FOA) are highlighted in yellow in the body of the FOA.

Mod. No.	Date	Description of Modification
01	September 3, 2024	<ul style="list-style-type: none">• Removed information concerning the compliance criteria of submission in ARPA-E eXCHANGE by the deadline stated in the FOA in Section III.C.1.• Updated information concerning ARPA-E contacts and pre-submission inquiries to include the ARPA-E-SPARKS@hq.doe.gov email address in section VII.A.• Included information concerning outreach to ARPA-E-SPARKS@hq.doe.gov email address in section VII.A.3.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

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REQUIRED DOCUMENTS CHECKLIST

For an overview of the application process, see Section IV.A of the FOA.

For guidance regarding the content and form of Concept Papers, see Section IV.B of the FOA and the Concept Paper template available in ARPA-E's online application portal, eXCHANGE (<https://arpa-e-foa.energy.gov/>).

SUBMISSION	COMPONENTS	OPTIONAL/ MANDATORY	FOA SECTION
Concept Paper	<ul style="list-style-type: none">Each Applicant must submit a Concept Paper in Adobe PDF format. The Concept Paper must not exceed 4 pages in length including graphics, figures, and/or tables, and must include all sections described in the Concept Paper Template.	Mandatory	IV.B

PREFACE

This Funding Opportunity Announcement (FOA) provides a continuing opportunity for the rapid support of early-stage applied research to explore innovative new concepts with the potential for transformational and disruptive changes in energy technology. **Spurring Projects to Advance Energy Research and Knowledge Swiftly (SPARKS)** awards are intended to be flexible and may take the form of analyses or exploratory research that provides the agency with useful information for the subsequent development of focused technology programs. SPARKS awards may also support proof-of-concept research to develop a unique technology concept, either in an area not currently supported by the agency or as a potential enhancement to an ongoing focused technology program. Applications must propose concepts that are *not* covered by open ARPA-E focused FOAs and that do not represent incremental improvements over existing technology.¹

SPARKS awards are defined as single-phase efforts of durations of 18 months or less with a total project cost of \$500,000 or less and will be issued through Grants.²

Applicants will submit Concept Papers (4 pages maximum), and selected Applicants will then be invited to submit Full Applications. This FOA addresses only the Concept Paper process. Applicants are encouraged to review current ARPA-E projects, programs, FOAs, and Requests for Information (RFIs) prior to application.³ The following are highlights of the Concept Paper submission process:

¹ Information on current ARPA-E programs can be found at <https://arpa-e.energy.gov/technologies/programs>, projects at <https://arpa-e.energy.gov/technologies/projects>, and FOAs and RFIs at <https://arpa-e-foa.energy.gov/>.

² Except for funding provided to Federally Funded Research and Development Centers (FFRDCs) and other federal laboratories.

³ Information on ARPA-E's projects is available at <http://arpa-e.energy.gov/?q=projects>.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

1. **Prior to Submission.** Prior to submitting a Concept Paper to this FOA, Applicants are encouraged to contact an ARPA-E Program Director or an ARPA-E Fellow to discuss their research concept and its potential responsiveness to this FOA. While initial engagement with an ARPA-E Fellow may be appropriate, engagement with an ARPA-E Program Director is highly encouraged prior to submission. Please see Section VII.A.3 Technical Inquiries for more details. Once a Concept Paper is submitted, any further communications may only be routed through an ARPA-E Contracting Officer as specified in Section VII.A.1.
2. **Concept Paper Submission.** Applicants may submit Concept Papers at any time during the open period of this FOA.
3. **Concept Paper Review.** Concept Papers determined compliant with application procedures and responsive to the FOA (see Section III.C) will be subject to technical review by ARPA-E technical experts under established ARPA-E merit review procedures. Only the most technically meritorious concepts may result in a subsequent invitation from ARPA-E to submit a Full Application.
4. **Full Application Invitation.** Selected Concept Paper Applicants will be invited to submit a Full Application via ARPA-E's online application portal, ARPA-E eXCHANGE.

I. FUNDING OPPORTUNITY DESCRIPTION

A. AGENCY OVERVIEW

The Advanced Research Projects Agency – Energy (ARPA-E), an organization within the Department of Energy (DOE), is chartered by Congress in the America COMPETES Act of 2007 (P.L. 110-69), as amended by the America COMPETES Reauthorization Act of 2010 (P.L. 111-358), as further amended by the Energy Act of 2020 (P.L. 116-260):

- “(A) to enhance the economic and energy security of the United States through the development of energy technologies that—
- (i) reduce imports of energy from foreign sources;
 - (ii) reduce energy-related emissions, including greenhouse gases;
 - (iii) improve the energy efficiency of all economic sectors;
 - (iv) provide transformative solutions to improve the management, clean-up, and disposal of radioactive waste and spent nuclear fuel; and
 - (v) improve the resilience, reliability, and security of infrastructure to produce, deliver, and store energy; and
- (B) to ensure that the United States maintains a technological lead in developing and deploying advanced energy technologies.”

ARPA-E issues this Funding Opportunity Announcement (FOA) under its authorizing statute codified at 42 U.S.C. § 16538. The FOA and any cooperative agreements or grants made under this FOA are subject to 2 C.F.R. Part 200 as supplemented by 2 C.F.R. Part 910.

ARPA-E funds research on, and the development of, transformative science and technology solutions to address the energy and environmental missions of the Department. The agency focuses on technologies that can be meaningfully advanced with a modest investment over a defined period of time in order to catalyze the translation from scientific discovery to early-stage technology. For the latest news and information about ARPA-E, its programs and the research projects currently supported, see: <http://arpa-e.energy.gov/>.

ARPA-E funds transformational research. Existing energy technologies generally progress on established “learning curves” where refinements to a technology and the economies of scale that accrue as manufacturing and distribution develop drive improvements to the cost/performance metric in a gradual fashion. This continual improvement of a technology is important to its increased commercial deployment and is appropriately the focus of the private sector or the applied technology offices within DOE. In contrast, ARPA-E supports transformative research that has the potential to create fundamentally new learning curves. ARPA-E technology projects typically start with cost/performance estimates well above the level of an incumbent technology. Given the high risk inherent in these projects, many will fail to progress, but some may succeed in generating a new learning curve with a projected cost/performance metric that is significantly better than that of the incumbent technology.

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ARPA-E funds technology with the potential to be disruptive in the marketplace. The mere creation of a new learning curve does not ensure market penetration. Rather, the ultimate value of a technology is determined by the marketplace, and impactful technologies ultimately become disruptive – that is, they are widely adopted and displace existing technologies from the marketplace or create entirely new markets. ARPA-E understands that definitive proof of market disruption takes time, particularly for energy technologies. Therefore, ARPA-E funds the development of technologies that, if technically successful, have clear disruptive potential, e.g., by demonstrating capability for manufacturing at competitive cost and deployment at scale.

ARPA-E funds applied research and development. The Office of Management and Budget defines “applied research” as an “original investigation undertaken in order to acquire new knowledge...directed primarily towards a specific practical aim or objective” and defines “experimental development” as “creative and systematic work, drawing on knowledge gained from research and practical experience, which is directed at producing new products or processes or improving existing products or processes.”⁴ Applicants interested in receiving financial assistance for basic research (defined by the Office of Management and Budget as “experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts”)⁵ should contact the DOE’s Office of Science (<http://science.energy.gov/>). Office of Science national scientific user facilities (<http://science.energy.gov/user-facilities/>) are open to all researchers, including ARPA-E Applicants and awardees. These facilities provide advanced tools of modern science including accelerators, colliders, supercomputers, light sources, and neutron sources, as well as facilities for studying the nanoworld, the environment, and the atmosphere. Projects focused on early-stage research and development (R&D) for the improvement of technology along defined roadmaps may be more appropriate for support through the DOE applied energy offices including: the Office of Energy Efficiency and Renewable Energy (<http://www.eere.energy.gov/>), the Office of Fossil Energy and Carbon Management (<https://www.energy.gov/fecm/office-fossil-energy-and-carbon-management>), the Office of Nuclear Energy (<http://www.energy.gov/ne/office-nuclear-energy>), and the Office of Electricity (<https://www.energy.gov/oe/office-electricity>).

B. PROGRAM OVERVIEW

This announcement is purposely broad in scope to encourage the submission of the most innovative ideas in energy technology to support transformative energy R&D that complements ARPA-E’s primary mechanism, which is through the solicitation of research projects in focused technology programs.

⁴ OMB Circular A-11 (https://www.whitehouse.gov/wp-content/uploads/2018/06/a11_web_toc.pdf), Section 84, pg. 3.

⁵ OMB Circular A-11 (https://www.whitehouse.gov/wp-content/uploads/2018/06/a11_web_toc.pdf), Section 84, pg. 3.

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ARPA-E's focused programs target specific areas of technology that the agency has identified through extensive interaction with the appropriate external stakeholders. The focused programs have significant potential impact on one or more of the statutory goals described in Section I.A of the FOA. Awards made in response to the solicitation for focused programs support the aggressive technical targets established in that solicitation. Taken in total, ARPA-E's focused programs cover a broad swath of energy technologies and applications.

However, ARPA-E wants to ensure that there are opportunities to support innovative energy R&D in new and emerging fields that either fall outside of the focused technology programs or that develop after those programs have closed. Within this general framework, ARPA-E seeks transformative ideas that enable the most efficient, economical, sustainable, and environmentally benign utilization of energy. Useful energy can take many forms, including radiant energy from lights, electrical energy for appliances, thermal energy to heat homes, mechanical energy for transportation, chemical energy in the form of food, and energy used to manufacture products.

C. PROGRAM OBJECTIVES

The broad objective of this FOA is to identify disruptive concepts in energy-related technologies that challenge the status quo and represent a leap beyond today's technology. An innovative concept alone is not enough; the idea must also have the potential to be impactful. This FOA seeks concepts that, if successful, would represent a fundamentally new paradigm in energy technology with the potential to make a significant impact on ARPA-E's statutory goals (see Section I.A). Concepts of particular interest have the potential to (1) achieve percentage-level reductions in U.S. energy consumption, energy-related imports, or greenhouse gas emissions; (2) improve the resilience, reliability, and security of energy infrastructure; and/or (3) improve the management, clean-up, and disposal of nuclear byproducts.

Awards under this program may take the form of analyses or exploratory research that provide the agency with information useful for the subsequent development of focused technology programs. Alternatively, awards may support proof-of-concept research for a particular new technology, either in an area not currently supported by the agency or as a potential enhancement to an ongoing focused technology program.

D. TECHNICAL CATEGORIES

Applicants may propose any high-risk idea that addresses one or more of ARPA-E's statutory goals through the type of research described in Section I.A of this FOA. Each Applicant must explain how the proposed concept represents a transformative approach to more efficiently, economically, or sustainably utilize energy for useful work. Concepts may span multiple disciplinary boundaries.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

In order to organize the submissions to this FOA for the purposes of merit review, ARPA-E requires that each Concept Paper identify a primary Technical Category for the proposed technology from the list provided below. Applicants may state additional Technical Categories for their proposed technology in the Concept Paper, as appropriate.

The list of Technical Categories is intended to encompass most energy-related technologies. If the proposed technology does not fall within any of the Technical Categories below, the Applicant should select from Category 7, "Other Energy Technologies."

Table 1. SPARKS Program Technical Categories

CATEGORY	DESCRIPTION
<u>CATEGORY 1:</u> GRID	Technologies for (1) the planning, construction, and/or operation of electricity transmission and/or distribution systems, including both AC and DC systems and (2) improving the resilience, reliability, and security of the grid.
<u>CATEGORY 2:</u> TRANSPORTATION	Technologies for (1) improved propulsion and energy storage systems (e.g., electric motors, electrical distribution, power electronics, batteries, fuel cells, and engines) specifically for air, ground, and/or marine transportation applications, (2) yielding energy and/or emissions reductions in the above, and (3) lower-emission fuels that are substitutes for traditionally fossil-derived fuels (e.g., kerosene, diesel, gasoline).
<u>CATEGORY 3:</u> BUILDINGS & CONSTRUCTION	Technologies that reduce the net energy usage and/or emissions associated with the construction and/or operation of buildings or other human-made structures.
<u>CATEGORY 4:</u> ELECTRICITY GENERATION AND STORAGE	Technologies that facilitate (1) the high-efficiency, low-emission, and low-cost generation of electricity (e.g., wind, geothermal, hydro, solar, fission, fusion, biofuels, reduced fossil fuel usage) and/or (2) the storage of intermittent renewable energy.
<u>CATEGORY 5:</u> CARBON CAPTURE, SEQUESTRATION, AND UTILIZATION	Technologies for (1) carbon capture from the ocean and/or atmosphere, (2) utilization of captured carbon, and/or (3) storage of carbon, including agricultural carbon management.
<u>CATEGORY 6:</u> INDUSTRIAL EFFICIENCY & DECARBONIZATION	Technologies that improve the energy efficiency of or reduce emissions from production of industrial materials (e.g., glass, paper, iron, steel, plastics, aluminum, cement).
<u>CATEGORY 7:</u> OTHER ENERGY TECHNOLOGIES	Technologies that are supportive of ARPA-E's mission described in Section I.A of the FOA that do not fit into one of the other categories.

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II. AWARD INFORMATION

A. AWARD OVERVIEW

ARPA-E expects to make approximately \$10 million per fiscal year available for new awards, subject to the availability of appropriated funds. ARPA-E will provide up to \$500,000 in Federal share per award and plans to fully fund the negotiated budget at the time of award. The period of performance for awards may not exceed 18 months.

B. RENEWAL AWARDS

At ARPA-E's sole discretion, awards resulting from this FOA may be renewed by adding one or more budget periods extending the period of performance of the initial award, or a new award. Renewal funding is contingent on: (1) availability of funds appropriated by Congress for the purpose of this program; (2) substantial progress towards meeting the objectives of the approved application; (3) submittal of required reports; (4) compliance with the terms and conditions of the award; and (5) other factors identified by the Agency at the time it solicits a renewal application.

C. FUNDING MECHANISMS

Congress directed ARPA-E to "establish and monitor project milestones, initiate research projects quickly, and just as quickly terminate or restructure projects if such milestones are not achieved."⁶ Accordingly, ARPA-E has involvement in the direction of every project, as described in Section II.D below.

1. GRANTS

ARPA-E expects to award grants⁷ for research funded under this FOA. Cost-reimbursable grants are expected for projects requiring Cost Share (see Section III.B), and fixed-amount grants will be used for all other projects, except in special cases as provided below in Section II.C.2.

ARPA-E will only award a fixed-amount grant in instances where it can be assured that the prospective awardee will not realize any increment above the actual cost of performing work. Equal payments will be made, one following grant award, one each upon submission and acceptance by ARPA-E of the quarterly report demonstrating sufficient technical progress, and final payment upon submission and acceptance by ARPA-E of the final technical report. The final payment also requires certification to ARPA-E that all project activity has been completed.

⁶ U.S. Congress, Conference Report to accompany the 21st Century Competitiveness Act of 2007, H. Rpt. 110-289 at 171-172 (Aug. 1, 2007).

⁷ A Grant is an award instrument used by ARPA-E to accomplish research pursuant to ARPA-E's statutory authority. ARPA-E's participation in Grant research is not substantial compared with ARPA-E awards through Cooperative Agreements.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

For additional information about fixed-amount awards refer to 2 C.F.R. § 200.45 and 2 C.F.R. § 200.201.

2. FUNDING AGREEMENTS WITH FFRDCs, GOGOs, AND FEDERAL INSTRUMENTALITIES⁸

Any Federally Funded Research and Development Centers (FFRDC) involved as a member of a Project Team must provide the information requested in the “FFRDC Lab Authorization” and “Field Work Proposal” section of the Business Assurances & Disclosures Form, which is submitted with a Full Application.

When a FFRDC/DOE Lab (including the National Energy Technology Laboratory or NETL) is the *lead organization* for a Project Team, ARPA-E executes a funding agreement directly with the FFRDC/DOE Lab and a single, separate Grant with the rest of the Project Team.

Notwithstanding the use of multiple agreements, the FFRDC/DOE Lab is the lead organization for the entire project, including all work performed by the FFRDC/DOE Lab and the rest of the Project Team.

When a FFRDC/DOE Lab is a *member* of a Project Team, ARPA-E executes a funding agreement directly with the FFRDC/DOE Lab and a single, separate Grant with the rest of the Project Team. Notwithstanding the use of multiple agreements, the Prime Recipient⁹ under the Grant is the lead organization for the entire project, including all work performed by the FFRDC/DOE Lab and the rest of the Project Team.

Funding agreements with DOE/NNSA FFRDCs take the form of Work Authorizations issued to DOE/NNSA FFRDCs through the DOE/NNSA Field Work Proposal system for work performed under Department of Energy Management & Operation Contracts. Funding agreements with non-DOE/NNSA FFRDCs, GOGOs (including NETL), and Federal instrumentalities (e.g., Tennessee Valley Authority) will be consistent with the sponsoring agreement between the U.S. Government and the Laboratory. Any funding agreement with an FFRDC or government-owned, government-operated (GOGO) entity will have similar terms and conditions as ARPA-E’s Model Grant (<https://arpa-e.energy.gov/technologies/project-guidance/pre-award-guidance/funding-agreements>).

Non-DOE GOGOs and Federal agencies may be proposed to provide support to the Project Team members on an applicant’s project, through a Cooperative Research and Development Agreement (CRADA) or similar agreement.

⁸ DOE/NNSA GOGOs are not eligible to apply for funding, as described in Section III.A.

⁹ A Prime Recipient is the signatory to an ARPA-E Grant.

D. STATEMENT OF RESEARCH OVERSIGHT

ARPA-E will conduct oversight of projects from inception to completion. For the purposes of an ARPA-E project funded under this FOA, oversight means:

- ARPA-E may address the conduct or performance of project activities;
- During award negotiations, ARPA-E Program Directors and awardees establish a schedule of milestones and deliverables;
- Prime Recipients document the achievement of these milestones and deliverables in quarterly technical and financial progress reports, which are reviewed and evaluated by ARPA-E Program Directors;
- If applicable, ARPA-E reviews reimbursement requests for compliance with applicable Federal cost principles. Upon request, Prime Recipients are required to provide additional information and documentation to support claimed expenditures; Prime Recipients are required to comply with agency-specific and programmatic requirements;
- ARPA-E works with other government agencies and nonprofits to provide mentoring and networking opportunities for Prime Recipients; and
- ARPA-E organizes and sponsors events to educate Prime Recipients about key barriers to the deployment of their ARPA-E-funded technologies. In addition, ARPA-E establishes collaborations with private and public entities to provide continued support for the development and deployment of ARPA-E-funded technologies.

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III. ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS

1. INDIVIDUALS

U.S. citizens or permanent residents may apply for funding in their individual capacity as a Standalone Applicant,¹⁰ as the lead for a Project Team,¹¹ or as a member of a Project Team. However, ARPA-E will only award funding to an entity formed by the Applicant.

2. DOMESTIC ENTITIES

For-profit entities¹², educational institutions¹³, and nonprofits¹⁴ that are incorporated in the United States, including U.S. territories, are eligible to apply for funding as a Standalone Applicant, as the lead organization for a Project Team, or as a member of a Project Team.

FFRDCs/DOE Labs are eligible to apply for funding as the lead organization for a Project Team or as a member of a Project Team that includes institutions of higher education, companies, research foundations, or trade and industry research collaborations, but not as a Standalone Applicant.

State, local, and tribal government entities are eligible to apply for funding as a member of a Project Team, but not as a Standalone Applicant or as the lead organization for a Project Team.

Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a member of a Project Team, but not as a Standalone Applicant or as the lead organization for a Project Team.

3. FOREIGN ENTITIES

Foreign entities, whether for-profit or otherwise, are eligible to apply for funding as Standalone Applicants, as the lead organization for a Project Team, or as a member of a Project Team. Foreign entities must designate in the Full Application a subsidiary or affiliate incorporated (or otherwise formed or to be formed) under the laws of a State or territory of the United States to

¹⁰ A Standalone Applicant is an Applicant that applies for funding on its own, not as part of a Project Team.

¹¹ A Project Team consists of the Prime Recipient, Subrecipients, and others performing or otherwise supporting work under an ARPA-E funding agreement.

¹² For-Profit Organizations (Other than Small Businesses) (*or large businesses*): Means entities organized for-profit other than small businesses as defined elsewhere in this Glossary.

¹³ Institutions of Higher Education (or educational institutions): Has the meaning set forth at 20 U.S.C. 1001.

¹⁴ Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995, are not eligible to apply for funding as a Prime Recipient or Subrecipient.

receive funding. The Full Application must state the nature of the corporate relationship between the foreign entity and domestic subsidiary or affiliate. All work under the ARPA-E award must be performed in the United States. The Applicant may request a waiver of this requirement in the Business Assurances & Disclosures Form, which is submitted with the Full Application.

4. CONSORTIUM ENTITIES

Consortia, which may include domestic and foreign entities, must designate one member of the consortium as the consortium representative to the Project Team. The consortium representative must be incorporated in the United States. The eligibility of the consortium will be determined by reference to the eligibility of the consortium representative under Section III.A.4 of the FOA. Each consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium entity must provide a written description of its internal governance structure and its internal rules to the Contracting Officer (ARPA-E-CO@hq.doe.gov).

Unincorporated consortia must provide the Contracting Officer with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each consortium member. This collaboration agreement binds the individual consortium members together and shall include the consortium's:

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members' efforts on the project;
- Provisions for members' cost sharing contributions; and
- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

B. COST SHARING

Cost sharing requirements for SPARKS are as follows:

- Cost sharing will not be required for Full Applications submitted by domestic educational institutions, domestic nonprofits, domestic small businesses, and/or FFRDCs submitted as a Standalone Applicant, or a Project Team composed exclusively of these types of entities.
- For-profit entities qualifying as "large businesses" are required to provide 20% of the Total Project Cost as cost share as a Standalone Applicant or member of a Project Team.

If cost sharing is required, the funding agreement makes the Prime Recipient responsible for paying the entire cost share and enforcing cost share obligations assumed by Project Team members in subawards or related agreements.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

C. **OTHER**

1. **COMPLIANT CRITERIA**

Concept Papers are deemed compliant if:

- The Applicant meets the eligibility requirements in Section III.A of the FOA;
- The Concept Paper complies with the content and form requirements in Section IV.B of the FOA; and
- The Applicant entered all required information, successfully uploaded all required documents, and clicked the “Submit” button in ARPA-E eXCHANGE by the deadline stated in the FOA.

Concept Papers found to be noncompliant may not be merit reviewed or considered for award. ARPA-E may not review or consider noncompliant Concept Papers, including Concept Papers submitted through other means, and incomplete Concept Papers. A Concept Paper is incomplete if it does not include required information.

2. **RESPONSIVENESS CRITERIA**

ARPA-E performs a preliminary technical review of Concept Papers. Concept Papers are deemed nonresponsive and may not be reviewed or considered if they:

- Are not scientifically distinct from other projects supported by Federal agencies and/or other sources; and/or
- Present a concept in areas already being explored by current or planned ARPA-E FOAs.
 - Potential Applicants are highly encouraged to review the current ARPA-E FOAs at <https://arpa-e-foa.energy.gov/>.

ARPA-E performs a preliminary technical review of Concept Papers. The following types of submissions will be deemed nonresponsive and will not be reviewed or considered (referred to herein as “Applications Specifically Not of Interest”):

- Applications that have been submitted in response to other currently issued ARPA-E FOAs.
- Applications that are not scientifically distinct from applications submitted in response to other currently issued ARPA-E FOAs.
- Applications for basic research aimed solely at discovery and/or fundamental knowledge generation.
- Applications for large-scale demonstration projects of existing technologies.
- Applications for proposed technologies that represent incremental improvements to existing technologies.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates a law of thermodynamics).
- Applications for proposed technologies that are not transformational, as described in Section I.A of the FOA.
- Applications for proposed technologies that do not have the potential to become disruptive in nature, as described in Section I.A of the FOA. Technologies must be scalable such that they could be disruptive with sufficient technical progress.
- Applications that are not scientifically distinct from existing funded activities supported elsewhere, including within the DOE.
- Applications that describe a technology but do not propose a R&D plan that allows ARPA-E to evaluate the submission under the applicable merit review criteria provided in Section V.A of the FOA.

3. LIMITATION ON NUMBER OF CONCEPT PAPERS

ARPA-E is not limiting the number of Concept Papers that may be submitted by Applicants. Applicants may submit more than one Concept Paper in response to this FOA, provided that each is scientifically distinct.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

IV. CONCEPT PAPER SUBMISSION INFORMATION

A. CONCEPT PAPER SUBMISSION PROCESS OVERVIEW

1. REGISTRATION IN ARPA-E eXCHANGE

The first step in applying to this FOA is registration in ARPA-E eXCHANGE, ARPA-E's online application portal. For detailed guidance on using ARPA-E eXCHANGE, please refer to Section IV.D.1 of the FOA and the "ARPA-E eXCHANGE Applicant Guide" (<https://arpa-e-foa.energy.gov/Manuals.aspx>)

2. CONCEPT PAPERS

Section IV provides instructions on submitting a Concept Paper.

ARPA-E performs a preliminary review of Concept Papers to determine whether they are compliant and responsive, as described in Section III.C. ARPA-E makes an independent assessment of each compliant and responsive Concept Paper based on the criteria in Section V.A.

3. FULL APPLICATIONS

Only selected Concept Paper Applicants will be invited to submit Full Applications. Directions for submitting Full Applications will be provided to invited Applicants through ARPA-E's online application portal, ARPA-E eXCHANGE. Non-selected Concept Paper Applicants will receive written notice from ARPA-E.

B. CONTENT AND FORM OF CONCEPT PAPERS

Submission of a Concept Paper is required for initial consideration under this FOA. Concept Papers must conform to the following requirements:

- The Concept Paper must not exceed 4 pages in length including graphics, figures, and/or tables.
- The Concept Paper must be submitted in Adobe PDF format.
- The Concept Paper must be written in English.
- All pages must be formatted to fit on 8-1/2 by 11-inch paper with margins not less than one inch on every side. Single space all text and use Times New Roman typeface, a black font color, and a font size of 12 point or larger (except in figures and tables).
- The ARPA-E assigned Control Number, the Lead Organization Name, and the Principal Investigator's Last Name must be prominently displayed on the upper right corner of the header of every page. Page numbers must be included in the footer of every page.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

- The first section must include the Lead Organization's Name and Location, Principal Investigator's Name, Technical Category, Proposed Funding Requested, Project Duration, and Project Abstract.

ARPA-E strongly encourages Applicants to use the Concept Paper template provided under the header "Required Application Documents" for the SPARKS FOA on ARPA-E's online application portal, ARPA-E eXCHANGE (<https://arpa-e-foa.energy.gov/>). Responding to each question in the template ensures that each Applicant's concept is presented in a manner that can be efficiently evaluated by ARPA-E. Applicants that use alternative Concept Paper formats should ensure that their submission includes responses for all requested information in the Concept Paper template and complies with the requirements listed above.

Concept Papers found to be noncompliant or nonresponsive may not be merit reviewed or considered for award (see Section III.C of the FOA). If Applicants exceed the maximum page length indicated above, ARPA-E will review only the authorized number of pages and disregard any additional pages.

C. INTERGOVERNMENTAL REVIEW

This program is not subject to Executive Order 12372 (Intergovernmental Review of Federal Programs).

D. OTHER SUBMISSION REQUIREMENTS

1. USE OF ARPA-E eXCHANGE

To apply to this FOA, Applicants must register with ARPA-E eXCHANGE (<https://arpa-e-foa.energy.gov/Registration.aspx>). Concept Papers must be submitted through ARPA-E eXCHANGE. ARPA-E will not review or consider applications submitted through other means (e.g., fax, hand delivery, email, postal mail). For detailed guidance on using ARPA-E eXCHANGE, please refer to the "ARPA-E eXCHANGE Applicant Guide" (<https://arpa-e-foa.energy.gov/Manuals.aspx>).

Upon creating an application submission in ARPA-E eXCHANGE, Applicants will be assigned a Control Number. If the Applicant creates more than one application submission, a different Control Number will be assigned for each application.

Once logged in to ARPA-E eXCHANGE (<https://arpa-e-foa.energy.gov/login.aspx>), Applicants may access their submissions by clicking the "My Submissions" link in the navigation on the left side of the page. Every application that the Applicant has submitted to ARPA-E and the corresponding Control Number is displayed on that page. If the Applicant submits more than one application to a particular FOA, a different Control Number is shown for each application.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

ARPA-E may not review or consider incomplete applications. Such applications may be deemed noncompliant (see Section III.C.1 of the FOA). The following errors could cause an application to be deemed “incomplete” and thus noncompliant:

- Failing to comply with the form and content requirements in Section IV of the FOA;
- Failing to enter required information in ARPA-E eXCHANGE;
- Failing to upload required document(s) to ARPA-E eXCHANGE; and
- Uploading the wrong document(s) or application(s) to ARPA-E eXCHANGE.

ARPA-E urges Applicants to carefully review their applications.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

V. CONCEPT PAPER REVIEW INFORMATION

A. CRITERIA

The following merit review criteria are used to evaluate compliant and responsive Concept Papers. Submissions will not be evaluated against each other since they are not submitted in accordance with a common work statement.

1. Impact

- The proposed approach is a transformational (not incremental) advancement over existing solutions;
- The proposed approach has the potential to be disruptive in nature, as described in Section I.A of the FOA; that is technologies that, if developed, could supplant existing technology and/or create entirely new marketplaces; and
- The proposed approach falls within this FOA's *Areas of Interest* (see Section I.D) and could significantly impact one or more of ARPA E's statutory goals (see Section I.A).

2. State of the Art

- The applicant demonstrates an understanding of existing and other emerging solutions.

3. Innovation

- The proposed approach is unique and innovative;
- The proposed approach is technically sound; and
- The proposed approach is aimed at the development of technology, as opposed to basic research aimed at discovery and fundamental knowledge generation.

4. Risks and Challenges

- The proposal clearly identifies the technical and techno-economic risks and challenges.

5. Project Plan

- The proposal clearly outlines how the key risks and challenges will be addressed; and
- The proposed project objectives, if achieved, validate the proposed concept.

6. Team

- The proposed team has the necessary expertise and resources to carry out the proposed work.

B. REVIEW AND SELECTION PROCESS

ARPA-E intends to promptly review Concept Papers and rapidly notify Applicants whether their Concept Papers have been selected for invitation to submit Full Applications.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

1. ARPA-E REVIEWERS

ARPA-E selects reviewers based on their knowledge and understanding of the relevant field and application, their experience and skills, and their ability to provide constructive feedback on applications.

ARPA-E requires all reviewers to complete a Conflict-of-Interest Certification and Nondisclosure Agreement through which they disclose their knowledge of any actual or apparent conflicts and agree to safeguard confidential information contained in Concept Papers. In addition, ARPA-E trains its reviewers in proper evaluation techniques and procedures.

Applicants are not permitted to nominate reviewers for their applications. Applicants may contact the Contracting Officer by email (ARPA-E-CO@hq.doe.gov) if they have knowledge of a potential conflict of interest or a reasonable belief that a potential conflict exists.

2. ARPA-E SUPPORT CONTRACTORS

ARPA-E utilizes contractors to assist with the evaluation of applications and project management. To avoid actual and apparent conflicts of interest, ARPA-E prohibits its support contractors from submitting or participating in the preparation of applications to ARPA-E.

By submitting an application to ARPA-E, Applicants represent that they are not performing support contractor services for ARPA-E in any capacity and did not obtain the assistance of ARPA-E's support contractor to prepare the application. ARPA-E will not consider any applications that are submitted by or prepared with the assistance of its support contractors.

VI. SELECTION NOTICES

A. REJECTED SUBMISSIONS

Noncompliant and nonresponsive Concept Papers are rejected by the Contracting Officer and are not merit reviewed or considered for award. The Contracting Officer sends a notification letter by email to the technical and administrative points of contact designated by the Applicant in ARPA-E eXCHANGE. The notification letter states the basis upon which the Concept Paper was rejected.

B. CONCEPT PAPER NOTIFICATIONS

ARPA-E promptly notifies Concept Paper Applicants of its determination to invite or not invite submission of a Full Application. ARPA-E sends a notification letter by email to the technical and administrative points of contact designated by the Applicant in ARPA-E eXCHANGE. Selected Concept Paper Applicants will be invited to submit a Full Application via a web portal provided to the selected Applicants.

A notification letter encouraging the submission of a Full Application does not authorize the Applicant to commence performance of the project. Please refer to Section II.C of the FOA for guidance on pre-award costs.

VII. AGENCY CONTACTS

A. COMMUNICATIONS WITH ARPA-E

Communication	ARPA-E Contact	Email
FOA Questions	Contracting Officer	ARPA-E-CO@hq.doe.gov
ARPA-E eXCHANGE Submission Help	eXCHANGE help desk	ExchangeHelp@hq.doe.gov
Technical Inquiries (Pre-Submission Only)	Program Directors, and Fellows, or ARPA-E SPARKS Email Address	Available at: https://arpa-e.energy.gov/about/team-directory/program-directors and https://arpa-e.energy.gov/about/team-directory/fellows SPARKS Email Address: ARPA-E-SPARKS@hq.doe.gov

1. FOA QUESTIONS

Except for contact as provided by Section VII.A.3 below, applicants are required to submit all questions regarding this FOA to ARPA-E-CO@hq.doe.gov.

- ARPA-E will post responses periodically to questions that are received. ARPA-E may re-phrase questions or consolidate similar questions for administrative purposes.
- Responses are posted to “Frequently Asked Questions” on ARPA-E’s website (<https://arpa-e.energy.gov/faqs/current-funding-faqs>).
- For questions that have not already been answered, please send an email with the FOA name and number in the subject line to ARPA-E-CO@hq.doe.gov. Due to the volume of questions received, ARPA-E will only answer pertinent questions that have not yet been answered and posted at the above link.

After a Concept Paper is submitted, only the Contracting Officer may communicate with the Applicant regarding their submission. ARPA-E personnel and its support contractors are then prohibited from communicating (in writing or otherwise) with Applicants regarding the FOA.

2. ONLINE SUBMISSION HELP

Applicants may submit questions regarding ARPA-E eXCHANGE, ARPA-E’s online application portal, to ExchangeHelp@hq.doe.gov. ARPA-E will promptly respond to emails that raise legitimate, technical issues with ARPA-E eXCHANGE. ARPA-E will refer any questions regarding the FOA to ARPA-E-CO@hq.doe.gov.

ARPA-E will not accept or respond to communications received by other means (e.g., fax, telephone, mail, hand delivery). Emails sent to other email addresses will be disregarded.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

3. TECHNICAL INQUIRIES

Prior to submitting a Concept Paper to this FOA, Applicants are encouraged to contact an ARPA-E Program Director or an ARPA-E Fellow to discuss their research concepts and potential responsiveness to this FOA. Program Directors and Fellows will respond to Applicant inquiries as their availability permits. While initial engagement with an ARPA-E Fellow may be appropriate, engagement with an ARPA-E Program Director is highly encouraged prior to submission.

Prior communication with an ARPA-E Program Director or an ARPA-E Fellow is encouraged but not required prior to Concept Paper submission. Furthermore, prior communication with an ARPA-E Program Director or an ARPA-E Fellow, or the lack thereof, is not taken into consideration in the technical review of a submitted Concept Paper.

Program Director's and Fellow's biographies and email contact information can be accessed at <https://arpa-e.energy.gov/about/team-directory/program-directors> and <https://arpa-e.energy.gov/about/team-directory/fellows>. Applicants interested in contacting the ARPA-E personnel referenced above are asked to a) closely review all individual's biographies for their areas of expertise and select the individual(s) best suited to the Concept Paper that is being prepared and b) include a brief summary of the research concept in question. Applicants who are unsure which Program Director or Fellow is best suited to discuss the research concept should contact ARPA-E-SPARKS@hq.doe.gov and a member of the team will address the inquiry.

Once a Concept Paper is submitted to the FOA, any communications regarding that submission must be through the Contracting Officer, as specified in Section VII.A.1.

This FOA and the FOA selection process will control all ARPA-E selection decisions. The Contracting Officer is the **only individual authorized** to make awards on behalf of ARPA-E or obligate ARPA-E to the expenditure of public funds. A commitment or obligation by any individual other than the Contracting Officer, either explicit or implied, is neither valid nor binding.

B. DEBRIEFINGS

ARPA-E does not offer or provide debriefings. ARPA-E provides Applicants with a notification of its determination to invite or not invite submission of a Full Application based on ARPA-E's assessment of the Concept Paper.

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

VIII. OTHER INFORMATION

A. FOAs AND FOA MODIFICATIONS

FOAs are posted on ARPA-E eXCHANGE (<https://arpa-e-foa.energy.gov/>), Grants.gov (<http://www.grants.gov/>), and FedConnect (<https://www.fedconnect.net/FedConnect/>). Any modifications to the FOA are also posted to these websites. You can receive an e-mail when a modification is posted by registering with FedConnect as an interested party for this FOA. It is recommended that you register as soon as possible after release of the FOA to ensure that you receive timely notice of any modifications or other announcements. More information is available at <https://www.fedconnect.net>.

B. OBLIGATION OF PUBLIC FUNDS

The Contracting Officer is the only individual who can make awards on behalf of ARPA-E or obligate ARPA-E to the expenditure of public funds. A commitment or obligation by any individual other than the Contracting Officer, either explicit or implied, is invalid.

ARPA-E awards may not be transferred, assigned, or assumed without the prior written consent of a Contracting Officer.

C. RETENTION OF SUBMISSIONS

ARPA-E expects to retain copies of all Concept Papers. No submissions will be returned. By applying to ARPA-E for funding, Applicants consent to ARPA-E's retention of their submissions.

D. MARKING OF CONFIDENTIAL INFORMATION

ARPA-E will use data and other information contained in Concept Papers strictly for evaluation purposes. Applicants should not include confidential, proprietary, or privileged information in their Concept Papers, unless such information is necessary to convey an understanding of the proposed project.

Concept Papers containing confidential, proprietary, or privileged information should be 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 (FOIA) or otherwise. ARPA-E will notify Applicants if their applications become the subject of a FOIA request. Such requests are extremely rare. The U.S. Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose.

The first page of the Concept Paper must be marked as follows and identify the specific pages containing confidential, proprietary, or privileged information:

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

Notice of Restriction on Disclosure and Use of Data:

Pages [] of this document may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

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." In addition, every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

E. EXPORT CONTROL INFORMATION

Do not include information subject to export controls in Concept Papers – whether marked as subject to US export control laws/regulations or otherwise. Such information may not be accepted by ARPA-E and may result in a determination that the application is non-compliant, and therefore not eligible for selection. This prohibition includes any submission containing a general, non-determinative statement such as "The information on this page [or pages _ to_] may be subject to US export control laws/regulations", or similar. Under the terms of their award, awardees shall be responsible for compliance with all export control laws/regulations.

F. PROTECTED PERSONALLY IDENTIFIABLE INFORMATION

Applicants may not include any Protected Personally Identifiable Information (Protected PII) in their submissions to ARPA-E. Protected PII is defined as data that, if compromised, could cause harm to an individual such as identity theft. Listed below are examples of Protected PII that Applicants must not include in their submissions.

- Social Security Numbers in any form;
- Place of Birth associated with an individual;
- Date of Birth associated with an individual;
- Mother's maiden name associated with an individual;
- Biometric record associated with an individual;
- Fingerprint;
- Iris scan;
- DNA;
- Medical history information associated with an individual;
- Medical conditions, including history of disease;
- Metric information (e.g., weight, height, blood pressure);

Questions about this FOA? Check the Frequently Asked Questions available at <http://arpa-e.energy.gov/faq>. For questions that have not already been answered, email ARPA-E-CO@hq.doe.gov (with FOA name and number in subject line); see FOA Sec. VII.A. Problems with ARPA-E eXCHANGE? Email ExchangeHelp@hq.doe.gov (with FOA name and number in subject line).

- Criminal history associated with an individual;
- Ratings;
- Disciplinary actions;
- Performance elements and standards (or work expectations) are PII when they are so intertwined with performance appraisals that their disclosure would reveal an individual's performance appraisal;
- Financial information associated with an individual;
- Credit card numbers;
- Bank account numbers; and
- Security clearance history or related information (not including actual clearances held).