This is a pre-solicitation for

Pilot-scale Rapid Operational Validation of key Energy Infrastructure Technologies (PROVE IT)

Small Business Innovation Research (SBIR)

Contents

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Executive summary

The Office of Clean Energy Demonstrations (OCED) intends to issue a solicitation titled "Pilot-scale Rapid Operational Validation of key Energy Infrastructure Technologies (PROVE IT)" in the first quarter of the calendar year 2025. This solicitation will be issued under the OCED Small Business Innovation Research (SBIR) program.

The goal of this pre-solicitation is to support the validation of existing pilot projects or subsystems in a relevant industrial environment; to increase their technology readiness to the point of being able to be integrated in a large clean energy infrastructure project; and to increase their adoption readiness level[1] to medium/high.

OCED will prioritize technologies and application use cases that exhibit technological diversity when compared to the existing OCED portfolio of demonstration projects[2] or that have not already been demonstrated at a scale larger than the proposed project.

The PROVE IT solicitation will be issued as a Federal Acquisition Regulation (FAR)-based[3] request for proposals. OCED anticipates awarding milestone-based, firm-fixed priced contracts under this solicitation.

[1] https://www.energy.gov/technologytransitions/adoption-readiness-levels-arl-framework
[2] Information on the current OCED portfolio can be found here: https://www.energy.gov/oced/portfolio
[3] https://www.acquisition.gov/

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Anticipated program scope and characteristics		
Scope	Integrating, operating, and testing existing pilot systems under industrial-relevant conditions	
Total available OCED funding	Approximately $30 million across all topic areas	
Anticipated contract funding	Approximately $4.3 million	
Topic Area (TA)	TA1: Point Source Carbon Capture – Pilot-scale-ready purification, capture, and regeneration	TA2: Long Duration Energy Storage - Non-widely deployed electrochemical systems
Available OCED funding per TA	Approximately $25 million	Approximately $10 million
Anticipated number of contracts	Up to 5 contracts	Up to 2 contracts
Key objectives	• Collect and validate operational performance data of pilot-scale-ready membranes, solvents, and materials for point source carbon capture at power plant or industrial process facilities at a sufficient scale over a representative operating time • Validate technologies under varying CO_2 compositions to provide performance confidence to next stage adopters that the technology can work at target sites • Define engineering improvements to increase uptime, performance, and durability of technology • Narrow margin of error for predicted unit economics for the next stage of investors	• Collect and validate operational performance data at sufficient scale, cycles, power shift time, and over a representative operating period of pilot-scale-ready non-lithium electrochemical long duration energy storage technologies with <100MW of capacity deployed • Validate technologies at test center, industrial or commercial sites, or microgrid site locations to provide performance confidence to next stage site adopters • Define engineering improvements to increase uptime, performance, and durability of technology • Narrow margin of error for predicted unit economics for the next stage of investors

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Eligible applicants	Small, independent U.S. businesses[4]
Cost share requirement	No cost share required

Statutory authority

- Section 9 of the Small Business Act (15 U.S.C. § 638)
- Section 646 of Public Law 95-91, U.S. Department of Energy Organization Act
- Public Law 117-58, Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law (BIL)

Background

OCED was established in December 2021 as part of the Infrastructure Investment and Jobs Act, commonly known as the Bipartisan Infrastructure Law (BIL), to build on DOE's expertise in energy research and development and expand DOE's scope to fill a critical gap in demonstration of first-of-a-kind technologies.

OCED is a multi-technology office with funding for demonstrations that include advanced nuclear, clean hydrogen, carbon management, long-duration energy storage, industrial decarbonization, and more. With a clear role in commercializing critical clean energy technologies, OCED fills the gap between the research, development, and early-stage demonstration projects, including those within DOE technology offices, and initial deployments supported by the private sector and/or other DOE programs, such as the Loan Programs Office. OCED places a specific focus on both technical and adoption risks that may prevent the commercialization and deployment of new technologies such as delivered cost, functional performance, ease of use, market size and market openness, downstream value chain, ability to be integrated in a large infrastructure project, material sourcing, community adoption, and environmental and safety elements.

In June 2023, OCED issued a Request for Information[5] (RFI) asking for input on the need and opportunity of a program targeting pilot-scale operational validation from small businesses, private investors (e.g., venture capitalists, corporate investors, impact funds), incubators and accelerators, and clean energy project developers (e.g., engineering, procurement, construction firms; facility owners and operators) interested in working with small businesses as technology or component suppliers for their projects.

[4] The program is being executed pursuant 13 C.F.R. Part 121 which includes restrictions about (1) the type of firm, (2) its ownership and control structure, and (3) small business concern in terms of the firm's size in terms of the number of employees. Submitters must be domestic entities organized, chartered, or incorporated (or otherwise formed) under the laws of a particular state or territory of the United States or under the laws of the United States; have majority domestic ownership and control; and have a physical place of business in the United States. Additional eligibility details will be included in the solicitation.
[5] DE-FOA-0003123 - https://oced-exchange.energy.gov/#FoaId6130961d-63fe-44ff-887b-0d52d11c2799

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OCED received a robust response and published a summary of the responses received.[6] In short, respondents communicated the need for funding to validate, scale, and de-risk technical and commercial aspects of a new technology before being ready for a large demonstration effort or commercialization in the clean energy infrastructure industry.

The SBIR program was authorized in 1982 to stimulate technological innovation; use small businesses to meet federal Research and Development (R&D) needs; foster and encourage participation in technological innovation by the socially and economically disadvantaged small businesses and those that are 51 percent owned and controlled by women; and increase private sector commercialization of innovations derived from federal R&D, thereby increasing competition, productivity, and economic growth. Currently, OCED contributes to the SBIR program through a specific set-aside from two of its BIL provisions:

- Long-Duration Energy Storage Pilot Program[7]
- Carbon Capture Large-Scale Pilot Projects Program[8]

Due to its unique mission space, OCED has the authority to execute a SBIR program distinct from the program administered by the DOE Office of Science[9] on behalf of other DOE offices. The OCED SBIR program is subject to all applicable statutory language, regulations, and policies issued by the Small Business Administration (SBA).[10] OCED does not intend to issue a Small Business Technology Transfer Research (STTR) solicitation and will not accept applications under the STTR program.

[6] https://www.energy.gov/sites/default/files/2024-02/OCED%20PROVE%20IT%20RFI%20Summary_022324-508.pdf
[7] Section 41001 of the Bipartisan Infrastructure Law of 2021, Public Law 117-58, codified at 42 U.S.C. § 17232(c).
[8] Section 41004(b) of the Bipartisan Infrastructure Law of 2021, Public Law 116-260, codified at 42 U.S.C. § 16292(b).
[9] https://www.energy.gov/science/sbir/small-business-innovation-research-and-small-business-technology-transfer
[10] https://www.sbir.gov/

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Program objectives and structure

The Pilot-scale Rapid Operational Validation of key Energy Infrastructure Technologies (PROVE IT) solicitation will support small businesses conducting research and development efforts aimed at operational validation of a pilot-scale unit before it can be deemed ready for a large-scale demonstration project or its commercialization and deployment. OCED understands that many technology and solution providers need support while their technology is still at the pilot-scale to validate it in relevant operational environments. This pre-solicitation, restricted to small businesses, is closing a gap between the typical fundamental R&D cycle and the technology and adoption readiness needed for a successful demonstration project or to enable technology deployment.

Applicants to this solicitation will have to prove at the time of the application that:

1) The proposed technology has been fully vetted in a laboratory environment, but the component or subsystem still needs testing as part of a fully integrated system – even if not at full scale (pilot-scale) – in an industrial-relevant environment through extensive and rigorous performance data collection and validation.
2) The proposed technology still presents significant adoption challenges across one or more core risk areas of the DOE adoption readiness level.[11]
3) The small business developing this technology has trouble accessing other forms of funding due to risk-tolerance levels, administrative burdens, and strategic gaps of other forms of funding.

An ideal proposal will be submitted by a small business for a technology that has exhausted opportunities for funding from a typical applied technology DOE office or early-stage venture capital, impact fund, or philanthropic funds but is not yet ready for first-of-a-kind demonstration funding from OCED or the private sector.

The program will be designed to de-risk both technology and adoption challenges hindering the liftoff of the given technology. A successful OCED PROVE IT contractor will be able to leverage the outcomes of the operational validation effort funded by OCED to catalyze the additional financing or other partnerships needed to move to the next stage of commercial demonstration by the end of the contract. To accomplish these goals, a successful proposal will show:

- The entity's ability to operate an already existing pilot project, or a pilot project needing minimal upgrades or modifications, in an industrial or commercially relevant environment.
- The entity's ability to partner with all relevant stakeholders to successfully execute the project (including but not limited to access to an industrial facility or a relevant industrial test bed facility; a robust design of experiment to validate the technology and analyze all possible failure modes; the ability to ensure continuous operations of the pilot line and data collection; the ability to identify adverse environmental impacts of the materials or process and devise mitigation strategies for environmental barriers to adoption).
- The entity's ability to identify all other parties (i.e., regulatory partners, financiers, certification bodies, community organizations) needed to minimize adoption risks and ensure fast technology liftoff.

[11] https://www.energy.gov/technologytransitions/adoption-readiness-levels-arl-framework

At the end of a successful PROVE IT contract, the team will be able to show a completed sized-up project, verification of the technology performance at that scale, evidence of ability to operate, and proof of the team's ability to execute – all to provide confidence to investors in their next step.

Consistent with the SBIR statutory objectives,[12] OCED will encourage participation by women-owned and socially and economically disadvantaged small businesses and will strive to improve the return on investment for economic and social benefits to the communities potentially impacted by these technologies and the nation. In addition, this investment supports the Biden-Harris Administration's Justice40 Initiative, which sets a goal that 40% of the overall benefits of certain federal investments in climate, clean energy, and other areas flow to disadvantaged communities that are marginalized by underinvestment and overburdened by pollution. OCED anticipates contractors to commit to certain community benefits uniquely related to the specific technology and aimed at maximizing benefits for all impacted communities and consider labor, diversity, equity, inclusion, and accessibility while minimizing or mitigating any potential or perceived negative impact.

The projects are expected to be structured into three phases. In the initial submission, applicants will submit a single proposal covering work related to all phases. OCED will assess the proposal in its entirety. At the end of each phase, teams will submit deliverables showing they are ready to move to the next option of the contract and that it is in the best interest of OCED to continue supporting the project. Based on these deliverables, OCED will determine whether the project execution is satisfactory according to the pre-specified criteria and whether to approve funding and authorize work for the subsequent phase.

The expected structure for each project is depicted in Figure 1 and described below.

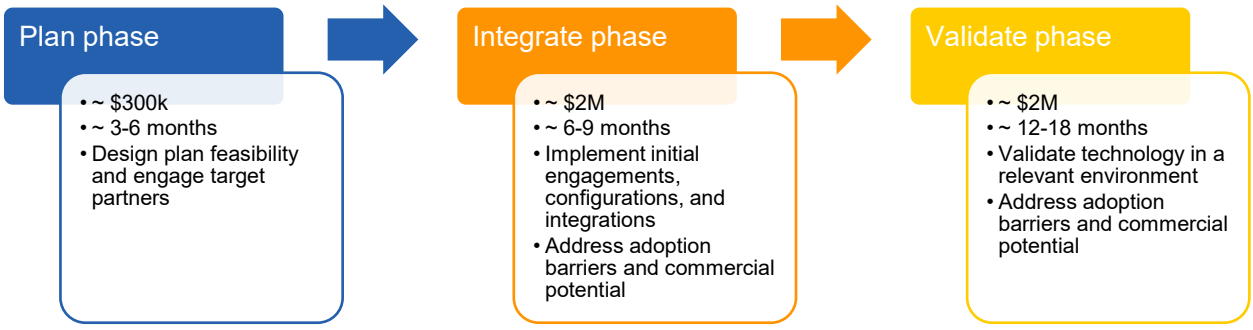

Figure 1 - Project phases

Plan phase

In the Plan phase, teams will finalize the plans to validate the technology under operational conditions and address adoption challenges that might hinder technology commercialization. The plan will include defining system integration engineering designs, size specifications, parts needed and availability, and activity dependency. Teams will engage and secure all necessary

[12] https://www.sbir.gov/about/policies

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partnerships to lock in host-site commitments, supplier quotes, testing services, and other subcontractor support as needed.

Final deliverables will include planning documents of engineering design, comprehensive design of experiment, comprehensive Failure Mode and Effects Analysis (FMEA), and proof of partner commitments. At the end of the Plan phase, teams will be able to start on physical integration activities.

For the Plan phase, OCED expects a maximum total cost of $300,000 and a maximum time of 6 months of work.

Integrate phase

In the Integrate phase, teams will set up their system and equipment and will integrate it in the industrial facility or industry-relevant test bed facility. This work typically includes hiring any workers or contractors, buying needed parts, and performing integrations. Teams will need to coordinate between the host-site, suppliers, and other partners.

Deliverables include certifications from any partners, proof of work completed, data collection and verification plans, and evidence of functioning system within a commercial environment. During or at the end of the Integrate phase, teams will be able to start operating and validating the pilot system.

For the Integrate phase, OCED expects a maximum total cost of $2,000,000 and a maximum time of 9 months of work.

Validate phase

In the Validate phase, teams will operate and validate the pilot system. This work typically includes running the pilot system, collecting operational data, tracking specified metrics, noting and making improvements or upgrades, comparing operating scenarios via comparison tests, and troubleshooting operations and technology. Teams will need to work with the host-site, coordinate with third-party testers, and keep the system staffed appropriately.

Deliverables include performance reports, failure and root-cause-analysis reports, improvement recommendations, comparison test outcomes, next-step-project pro forma financial model, next-step-project investment memo, and summary conclusions. At the end of the Validate phase, teams will have validated sustained operations at the given size and be ready to deploy the technology at the next scale or in a first-of-a-kind demonstration project.

For the Validate phase, OCED expects a maximum total cost of $2,000,000 and a maximum time of 18 months of work – mostly for data collection and analysis.

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Topic areas

Topic Area 1: Point source carbon capture – pilot-scale-ready purification, capture, and regeneration

Background

OCED's carbon management portfolio includes the $937 million Carbon Capture Large-Scale Pilots program, the $2.5 billion Carbon Capture Demonstration Projects Program, and the $3.5 billion Regional Direct Air Capture Hubs program. In particular, the Carbon Capture Large-Scale Pilots program funds projects that further the development of transformational carbon capture technologies "not yet advanced to the point of being tested under real operational conditions at commercial scale."[13]

The Carbon Capture Large-Scale Pilots program released one notice of funding opportunity in February 2023[14] and announced over $304 million to four eligible projects. Additionally, a Notice of Intent (NOI) to issue a second Notice of Funding Opportunity (NOFO) funding up to $1.3 billion across 4 different topic areas was announced in September 2024.[15] This new funding opportunity will focus on point source carbon capture large-scale pilots, commercial demonstrations, and networked demonstration planning and commercialization.

Other DOE offices and programs support early-stage design, engineering, and characterization work, including multiple funding opportunities issued by the Office of Fossil Energy and Carbon Management (FECM)[16] supporting different technology challenges within this space including geologic sequestration (CarbonSafe[17]), transport infrastructure planning and design, point source capture technology development, and small pilots and Front-End Engineering & Design (FEED) studies[18].

Topic area requirements

The PROVE IT Topic Area 1 (Carbon Capture Point Source) expands on the existing DOE programs by supporting operational validation of already built pilot-scale systems of membranes, solvents, and materials for point source carbon capture at power plant or industrial process facilities. OCED will not consider proposals focused on materials or technologies widely represented in the current OCED portfolio of demonstration projects. Sustained and validated operational testing will show potential customers, such as an industrial partner, that the technology can work in their specific site conditions for a sufficient length of time to prove the projected economics of the system and financing requirements for a large-scale pilot or demonstration. This proof point requires performance data at sufficient scale over a long enough operating time to be valuable. Validation under real-world operating conditions will ensure that any impact of corrosion, degradation, or performance is analyzed and controlled.

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[13] 42 U.S.C. § 16292(a)(1)
[14] DE-FOA-0002963 - https://oced-exchange.energy.gov/#FoaIdd3200aa3-9f64-4388-aa2c-c90dfd5f991f
[15] DE-FOA-0003474 - https://oced-exchange.energy.gov/#FoaId9cd8cc7c-6d33-4f51-b5f1-d079d83f4d8d
[16] https://www.energy.gov/fecm/office-fossil-energy-and-carbon-management
[17] https://netl.doe.gov/carbon-management/carbon-storage/carbonsafe
[18] https://www.energy.gov/fecm/point-source-carbon-capture

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Additionally, testing over varying CO_2 compositions can show robustness to unpredictable conditions and applicability to multiple use cases. PROVE IT will support engineering improvements needed to increase uptime and performance as a result of the operational validation campaign.

Applicants are expected to include in the application package proof of having an already built system with a size of 1-3 TPD (tonnes CO_2 per day) / 350 – 1,000 tonnes per year. The system must have an exhaust gas flow rate input of 800-5,500 lb/hr. For a successful application, teams should include proof of having concluded at least 100 hours of non-continuous testing at the laboratory / bench scale.

Applicants will be asked to define a target power plant or industrial process use case, such as refineries, steel, cement, manufacturing, or electricity generation facilities to describe the typical operating conditions and parameters of that specific use case. In particular, the testing and validation exhaust gas composition should match the typical target use case exhaust gas (with respect to CO_2 and O_2 concentrations, as well as presence and levels of any other contaminants). These parameters will then form the basis of the proposed test and validation design of experiment. Testing parameters should at minimum include capture efficiency greater than 80% of input CO_2 and obtain CO_2 purity greater than 90%. Furthermore, the use case will define the specific adoption challenges that need to be addressed or minimized to have a credible path to technology liftoff after the end of the OCED contract.

Applicants are expected to have identified an industrial test center or a commercial or industrial site such as an industrial processing facility or a small power plant. Applicants must show initial commitment for site access for the project period of performance.

Topic area expected outcomes

By the end of the operational validation program, the system will have been integrated into a real-world test environment and shown to operate at the defined conditions and performance.

PROVE IT funding and support should result in the following outcomes:

- Validate operational performance data through the collection of at least 1,000 hours of steady-state data. Continuous data acquisition should be no less than 500 hours.
- Validate technologies under varying CO_2 compositions to the extent able within the use case to provide performance confidence to next stage adopters so that the technology can work at target sites.
- Define engineering improvements to increase uptime, performance, and durability of technology.
- Narrow margin of error for predicted unit economics for the next stage of investors.

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Topic Area 2: Long duration energy storage - non-widely deployed electrochemical systems

Background

Electricity demand is growing significantly from residential and commercial electrification, the rise in data centers, and a growing US manufacturing base, such as semiconductor manufacturing. Additionally, variable renewable solar and wind generation is expected to grow significantly in the coming years and comprise most new capacity additions.[19] Currently deployed 2-6 hour lithium-ion energy storage is already supporting resource adequacy, reliability, and flexibility needs of the grid.[20] Long-duration (greater than 10 hours) technologies that are non-lithium have not yet sufficiently demonstrated the functional performance and delivered cost needed for markets and regulators to integrate them into system planning, and investors lack demonstrated successes to support investing in them. This solicitation attempts to break this chicken-and-egg cycle to progress their deployment.

OCED intends to complement and build on prior and existing DOE programming to target remaining technical and commercial adoption challenges. DOE has a broad range of related programming, including the Duration Addition to electricitY Storage (DAYS)[21] program through ARPA-E, the Critical Facility Energy Resilience (CiFER)[22] opportunity issued by the Office of Electricity, the Energy Storage Pilot Demonstrations opportunity[23] issued by OCED, the projects supporting thermal energy storage through the OCED Industrial Demonstrations program,[24] the Industrial Efficiency and Decarbonization Office (IEDO),[25] the Solar Energy Technologies Office (SETO),[26] and the Grid Resilience and Innovation Partnerships (GRIP) program[27], among others.

Topic area requirements

The PROVE IT long duration energy storage topic area expands on the existing DOE programs by supporting operational validation for already built pilot-scale systems.

For a system that has been shown to operate as a laboratory prototype, sustained and validated operational testing in similar conditions as the target site's conditions is required. This testing needs to show potential customers and regulators that the technology can work at their specific site conditions for a sufficient length of time to prove the projected economics of the system and financing requirements for a large-scale pilot or demonstration.

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[19] https://www.eia.gov/todayinenergy/detail.php?id=61242
[20] https://www.eia.gov/analysis/studies/electricity/batterystorage/pdf/battery_storage_2021.pdf
[21] https://arpa-e.energy.gov/technologies/programs/days
[22] DE-FOA-003384 - https://www.fedconnect.net/FedConnect/default.aspx?ReturnUrl=%2fFedConnect%2f%3fdoc%3dDE-FOA-0003384%26agency%3dDOE&doc=DE-FOA-0003384&agency=DOE
[23] DE-FOA-0003399 - https://oced-exchange.energy.gov/#FoaId22c1262c-80dc-4361-9d06-4a2eda844221
[24] https://www.energy.gov/oced/industrial-demonstrations-program-0
[25] https://www.energy.gov/eere/iedo/industrial-efficiency-decarbonization-office
[26] https://www.energy.gov/eere/solar/solar-energy-technologies-office
[27] https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program

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This proof point requires performance data at appropriate power capacity scales, enough operating cycles, and sufficient power shifting periods over a long enough operating period. Additionally, testing over varying conditions can show robustness to unpredictable conditions and such a program could support making engineering improvements to increase uptime and performance.

OCED expects applicants to have access at the time of application to a completed system sized between approximately 100 and 250 kWdc that can discharge for a minimum of 10 hours. OCED will consider systems that operate on a shorter timeframe (i.e., 8 hours), if the applicant shows a clear path to 10+ hours.

Appropriate scaling pace is important to innovation progression. Upon application, applicants should have an existing, already built system that has been tested for 50-100 hours in a lab environment. Existing Operating Data at the lab/bench scale includes having completed 25+ cycles (not necessarily all at the minimum 8-hour duration). Appropriate sites of interest include test centers, industrial or commercial sites, or microgrid operations. Pilot hosts should be expected to allow site access for the project period of performance for full ability to test. Residential sites and laboratory environments will not be considered acceptable operational hosts sites.

Any other test parameters should match as close as possible to the target use case the applicant would see as the most viable end-use for the technology. Applicants will be asked to define a target use case application and describe that application's conditions and parameters that will then form the basis of the proposed test conditions.

OCED will consider electrochemical technologies that are not lithium-ion chemistries, not widely represented in the current OCED portfolio of demonstration projects (i.e., vanadium-based or zinc bromide technologies), and not already demonstrated at larger scale by the private sector. Within this Topic Area, OCED will only consider proposals that:

- Do not use lithium-based energy storage technologies or other technologies that are deployed currently at >100MW capacity.
- Do not intend to produce a bulk chemical as a storage medium, such as hydrogen or ammonia.
- Have the potential to achieve a 10-hour continuous discharge duration or longer.

Topic area expected outcomes

By the end of the operational validation program, the system will have been integrated into a real-world test environment and shown to operate at the defined conditions and performance.

PROVE IT funding and support should result in the following outcomes:

- Validate operational performance data through the collection of at least 1,000 hours of steady-state data and completing 30 cycles.
- Validate technologies under the necessary conditions and performance requirements to provide confidence to the next stage adopters.
- Define engineering improvements to increase uptime, performance, and durability of technology.
- Reduce margin of error for unit economics estimates for the next stage of investors.

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Review, selection, and negotiation process

OCED intends to structure the solicitation and selection process into multiple review steps, with an encourage/discourage determination at the end of each review, and to request documents and components of the overall application package only when needed (just-in-time approach). OCED intends to provide notices to interested parties as soon as possible after the completion of each review step – those who are not among the highest rated will be advised that they are unlikely to be viable competitors, along with the general basis for the OCED's advisory recommendation. As this is an advisory notice only, all interested parties who participated in a review step may choose to proceed to the next step. No later than 48 hours after the issuance of the advisory notice, an offeror's notice of intent to participate in the following review step shall be received by OCED. Offerors who do not submit their notice of intent to participate in these steps shall be deemed non-responsive and removed from consideration. The intent is to decrease the burden on potential applicants and encourage only the most promising applicants to move forward in the process.

OCED will evaluate proposal packages that comply with the stated administrative requirements and are technically responsive to the topic areas of this solicitation. Subject matter experts will determine the most promising approaches based on the specified criteria. OCED will meet the SBIR statutory requirements related to the timeline between application submission deadline and selections announcement, and between selections announcement and contract issuance.

The outcome of the review and selection process will result in the selected parties entering negotiations about contract milestones and costs. If satisfactory, OCED will issue a milestone-based firm fixed priced contract.

Step 1: Proof of technology readiness

The first step will focus on backward looking information with the intent to assess whether the interested party meets the technical entry criteria for the specific Topic Area of interest. OCED will determine whether the team has sufficiently de-risked the proposed technology, has access to (or has a credible plan to access) the proper facilities and equipment needed to validate the technology in a pilot-scale under operational conditions. The specific expectations differ for each Topic Area and are discussed above. OCED will request the applicant to submit documents including:

- Company pitch deck, meant to mimic what might be presented to an investor detailing items such as the technology differentiation, IP status, market fit and size, team, and next steps.
- Previous testing data campaign report, meant to demonstrate the technical readiness in the strongest format and detail able.
- Proof (or credible plan) to be able to operate a pilot-scale version of the proposed technology capable of operating under industrially relevant conditions, including evidence that this pilot-scale is representative of a potential full-scale project with a similar use case.
- Short concept paper outlining under one page the approach to the validation testing, the intended testing campaign, and the expected outcomes.

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OCED will assess the merit of each application in step one against the following review criteria:

- Technology Readiness – Assess the maturity of the technology (already proven and validated in a lab environment but not yet demonstrated at scale or in a commercial environment) and its ability to meet the functionality required by the market at a price point that customers are willing to pay, and to meet the market demand:
    - The technology being developed is at an appropriate readiness for operational validation at a pilot-scale.
    - The team has access to a pilot line that can meet the objectives of the program and allows for operational validation of the technology.
    - The team has secured the necessary IP rights and coverage to build and deploy a full system.
    - The technology has the capability to be scaled.
    - The technology has the potential to be cost competitive in relation to current market offerings.
    - The technology has the potential to be deployed in a typical market use case.
    - The technology offers sufficient value potential as compared to competing offerings and to potential customers across all aspects of the customer's concerns.

- Market Opportunity and Economic Viability – Assess the target market(s) demand characteristics and risks posed by existing players — including competitors, customers, and other value chain players:
    - The Total Addressable Market (TAM) and Serviceable Addressable Market (SAM) size estimates are accurate and large enough.
    - Market size estimates are informed and sufficiently accurate.
    - The technology and product fit into the direction and trajectories of the overall relevant industry are considered.
    - The technology presents a minimal risk of environmental or worker hazards and a clear path towards permitting is considered.
    - The business model required for the commercialization of the technology is understood and reasonable to achieve.
    - The timing of the market development matches the deployment timeline of the technology.
    - The technology can offer compelling benefits and a competitive value to its target market segment.

OCED anticipates the evaluation of step 1 to be concluded in approximately 6 weeks. At the end of evaluation of step 1, OCED will encourage a limited number of applicants to move to the next step.

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Step 2: Project plan, commercialization plan, and milestone table

At the second step of the application process, OCED will request submission of details about the future work an applicant intends to take on, and the expected milestones to be accomplished to show success of the validation effort. Items to submit include:

- Project scope, to include project management plan, initial design of experiment, and initial failure mode and effects analysis. The project scope should detail the activities to be performed during the project and by whom as well as detail what will not be in scope.
- The pro forma project financial model shows estimated revenue, expenses, and profits to demonstrate financial understanding even if numbers result in an unfavorable financial performance for this pilot project.
- Milestone table, to include deliverables to show milestones have been met and progress has been made in the operational validation of the technology, and the milestone cost.
- If not already provided in step 1, proof to access a pilot-scale version of your technology capable of operating under industrially relevant conditions.
- Further diligence items, to include verification of claims related to legal business status, IP ownership claims, investors commitments, commercial contracts, partnerships, or any other items related to technology and business/adoption claims made so far as part of the application package.

As part of this step, applicants will submit a commercialization plan including a full adoption readiness level assessment.[28]

OCED will assess the merit of each application in step two against the following review criteria:

- Project Management and Execution – Assess the details of the project plan, including integrated schedule, work breakdown structure, resource management, risk register and management, governance structure, and communication plan:
    - The project management and execution plans are sufficiently detailed for a project of this size and scope.
    - The project management and execution plans are proven to be feasible and reasonable.
    - The project management and execution plans sufficiently account for preparedness for unforeseen events.

[28] https://www.energy.gov/sites/default/files/2024-10/ARL%20Assessment%2010-10-24.pdf

- License to Operate – Assess non-economic risks that can hinder the project success and plan for the partner and other entities buy-in needed:
    - The project is prepared for the wider context of activities that need to happen to ensure a successful project.
    - The team has shown sufficient support from project partners and entities who are needed to ensure project success, including but not limited to suppliers, advisors, state and local coalitions, workforce organizations, and other related entities.
    - The team is prepared for and ready to meet all the permits, regulations, and approvals required for the project, and to address potential environmental impacts of technology use and deployment.
    - The team has demonstrated and accounted for the community and worker support and buy-in needed to ensure a successful project.

OCED anticipates the evaluation of step 2 to be concluded in approximately 4 weeks. At the end of evaluation of step 2, OCED will encourage a limited number of applicants to move to the next step. It is expected that the number of applicants encouraged to move to step 3 will be essentially equal to the number of available contracts.

Step 3: Team interview

OCED will conduct in-person or virtual interviews with selected teams to verify claims and gauge the team's preparedness. The interview will consist of a discussion of materials submitted and demonstration of the existing system to the extent possible.

OCED anticipates the evaluation of step 3 to be concluded in approximately 2 weeks. At the end, OCED will conclude a holistic review of the entire application package submitted and any information received throughout the three steps against the review and selection criteria as detailed in the upcoming solicitation.

OCED will assess the merit of each application in step three against the following review criterion:

- Team Qualifications and Resource Availability – Assess the capabilities, expertise, and availability of the resources of the applicant and its partners to carry out the project as proposed:
    - The team has personnel with proven experience for executing and completing the proposed project, including specific expertise related to project management and execution, technology demonstration, and design of experiment.
    - The team has experience designing, collecting, and analyzing data from an operational validation campaign.
    - The team has the experience to take the technology and business forward beyond this project period of performance to ensure the technology's long-term success and viability.
    - The team has identified gaps that it plans to address through either hiring or contracting.

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Step 4: Selection and negotiation

Based on the totality of information available, OCED will select a certain number of best-suited parties to negotiate a contract. OCED reserves the right to communicate with only those selected parties to finalize contract(s). During the negotiation phase, OCED will request additional administrative documents to confirm eligibility for a federal contract and to conduct an administrative due diligence of the contractor. In addition, OCED will negotiate the details of the milestone table, the associated payments for their achievements, and the expected deliverables at the end of each phase to ensure success of the contract and define requirements to issue a subsequent option corresponding to a subsequent phase of the project. If the parties cannot successfully address any remaining issues, at OCED's sole discretion, OCED reserves the right to limit exchanges with only the next best rated parties.

Step 5: Contract issued

If a satisfactory agreement is reached between OCED and the selectee, OCED will issue a contract to start work.

Contract information

Type of contract

OCED anticipates awarding Firm Fixed Priced contracts under this solicitation.

Estimated funding

Approximately $4,300,000.00 is expected to be available for each award under this solicitation.

Maximum contract size

Contract ceilings (i.e., the maximum amount for each phase of an individual contract):

- Plan phase: $300,000
- Integrate phase: $2,000,000
- Validate phase: $2,000,000

Expected number of contracts

OCED anticipates issuing approximately 9 contracts under this solicitation. SBIR awards are subject to the availability of appropriated funds and this solicitation does not obligate OCED to make any contract under this solicitation.

Period of performance

OCED anticipates issuing contracts that will have a period of performance of approximately:

- Three to six months for Plan Phase
- Six to nine months for Integrate Phase
- 12 to 18 months for Validate Phase

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Eligibility information

SBIR program eligibility requirements are in place to ensure that the funds go only to small, independent United States (U.S.) businesses. The regulations, 13 C.F.R. § 121, include restrictions about (1) the type of firm, (2) its ownership structure, and (3) the small business' size in terms of the number of employees.[29] These and other requirements can be found in more detail at SBA's program eligibility guide.[30]

Type of firm

A SBIR small business contractor must be a business concern – it must be organized as a for-profit concern and meet all the other requirements for a "business concern" in 13 C.F.R. § 121.105. Non-profit entities are not eligible for the SBIR Program.

If a contractor is a joint venture, each party to the joint venture must be a concern that satisfies all program eligibility requirements regarding type, size, ownership, and control. The only exception is for an SBA approved Mentor-Protégé small business joint venture formed in accordance with 13 C.F.R. § 125.9.

Business concerns, other than investment companies licensed, or state development companies qualifying under the Small Business Investment Act of 1958, 15 U.S.C. § 661, et seq., are affiliates of one another when either directly or indirectly, (a) one concern controls or has the power to control the other; or (b) a third-party/parties controls or has the power to control both. Control can be exercised through common ownership, common management, and contractual relationships. The term "affiliates" is defined in greater detail in 13 C.F.R. § 121. The term "number of employees" is defined in 13 C.F.R. § 121.

[29] The purpose of the requirement regarding type of firm is to target the contracts to firms with an economic interest in developing the technology into a commercial application. The purpose of the ownership requirement is to limit the program to independent firms controlled by U.S. citizens or permanent resident aliens as a way of maximizing the likelihood that the funding will stimulate innovative activity within the U.S. economy. The purpose of the size restriction (number of employees of the firm and its affiliates) is to limit program funding to small business concerns with a unique capacity for innovation, which are more likely to be constrained by lack of access to such funding.

[30] https://www.sbir.gov/sites/default/files/elig_size_compliance_guide.pdf

Ownership structure

A majority (more than 50%) of your firm's equity (e.g., stock) must be directly owned and controlled by one of the following:

- One or more individuals who are citizens or permanent resident aliens of the U.S. The term "individual" refers only to actual people – it does not refer to companies or other legal entities of any sort. "Permanent resident alien" refers to an alien admitted to the U.S. as a lawful permanent resident by the U.S. Citizenship and Immigration Services;
- Other for-profit small business concerns. Each concern must be more than 50% directly owned and controlled by individuals who are U.S. citizens or permanent resident aliens of the U.S.); or
- A combination of (1) and (2) above.

Small business' size

An SBIR contractor, together with its affiliates, must not have more than 500 employees. Size is determined only by the number of employees. There are no revenue limits. For the SBIR program, an employee includes all individuals employed on a full-time, part-time, or other basis. This includes employees obtained from a temporary employee agency, professional employee organizations or leasing concern. SBA will consider the totality of the circumstances, including criteria used by the IRS for Federal income tax purposes, in determining whether individuals are employees of a concern. Volunteers (i.e., individuals who receive no compensation, including no in-kind compensation, for work performed) are not considered employees.[31]

Other eligibility requirements

All funded activities must be performed in the U.S., except under exceptional circumstances, for which an explanation must be submitted to OCED and an approval, if made, has been conveyed in writing by OCED. "U.S." means the 50 states, the territories, and possessions of the U.S., the Commonwealth of Puerto Rico, the Republic of the Marshall Islands, the Federated States of Micronesia, the Republic of Palau, and the District of Columbia. Non-U.S. citizens are eligible to perform work on SBIR contracts provided they are legally empowered to work in the U.S. at the time that a contract is made and throughout the duration of the project. That is, a foreign national working on an SBIR contract must NOT be an immigrant without legal status and must be an immigrant alien or a foreign national visiting the U.S. on an approved visa.

In exceptional circumstances, where expertise or facilities do not exist in the U.S. to perform the proposed activities, applicants may propose to perform part of the work under the contract outside the U.S. In these situations, the applicant must clearly justify the need for foreign work including details of domestic experts and facilities that were contacted to make this determination. No pre-approval of foreign work will be granted in advance of the application. OCED will decide on whether performance of work outside the U.S. is justified as part of the application review process. Insufficient justification may result in declining the application.

[31] See 13 C.F.R. § 121.106(a) for additional information.

Conflicts of interest

Contractors must be aware of potential conflicts of interest in the event their SBIR contract includes a subcontract to a research institution (e.g., National Laboratory, University) and the contractor's employee(s)/ownership is (are) also an employee(s) of the research institution. The subcontracted work might either be a Strategic Partnership Project (SPP) or a Cooperative Research and Development Agreement (CRADA). Any conflict of interest related to a subcontracted effort with DOE, or its contractors shall be addressed prior to award by providing to DOE a statement from the DOE Contracting Officer at the Laboratory Site Office confirming that the National Laboratory Contractor is aware of the ownership (or dual employment) and that the National Laboratory Contractor has conducted a conflict review in accordance with its approved conflict procedures. A similar statement should be obtained from the Sponsored Program Office or similar business office in the event the subcontract is with a university or other research institution.

In addition, the recipient shall provide to DOE prior to award a document detailing how it will exercise both financial and managerial control over the project and how the awardee will isolate the Research Institution employee(s) from influencing control of the contract.

Data rights

Technical data generated during the execution of a PROVE IT contract, properly recorded, and properly marked will be treated as SBIR Data and will be protected according to the SBIR Data Rights protections established by the Small Business Administration in its SBIR Policy Directive.

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