WOO FOA Modifications

All modifications to the Funding Opportunity Announcement are [HIGHLIGHTED] in the body of the FOA.

Mod. No.	Date	Description of Modification
0001	3/23/2020	1) Extended the submission deadline on the cover page for full applications to 5:00 pm ET on April 24, 2020. Anticipated dates for subsequent activities were also modified. 2) Added WOO Pilot and Amplify logos to the FOA document. 3) Added the following statement to Section I.B.i (Pilot Topic Area Description) regarding award costs of up to $1 million for well rework costs and up to $250,000 for Plug and Abandonment costs: "Remaining project funds will be used to accomplish activities described in the project phase descriptions below." 4) Deleted the following statement in Section I.B.i (Pilot Topic Area Description) regarding recipient cost share (no cost share is required for any phase of proposed Pilot projects): "No recipient cost share will be required during this phase of the project." 5) Modified the statement in Section I.B.ii (Amplify Topic Area Description) regarding "low permeability wells" to the following: "The awards funded under this FOA will characterize and stimulate existing, low permeability geothermal wells with sub-commercial production or injection capacity in a near-field or in-field environment with the goal of sustainably increasing the output of the existing reservoir by 5MW." 6) Modified the statement in Section I.B.ii (Amplify Topic Area Description) regarding stimulation technologies to the following: "Utilization of readily field-deployable well stimulation techniques that target specific sections of wells (via zonal isolation or combinations of well stimulation techniques) will be highly encouraged to advance the state-of-the-art beyond results from previous projects." 7) Modified the statement in Section I.B.ii (Amplify Topic Area Description) under Phase 1 – Pre-stimulation description: *Objective 1.2: Development of Stimulation Plan*

		The minimum requirements for Objective 1.2 are to create or provide a geologic model in support of a plan for well stimulation. The applicant must describe in detail the proposed stimulation method. The geologic model must include some information on subsurface stresses as related to potential fracturing direction. If critical data gaps exist, well characterization activities may be considered in order to develop a successful stimulation plan. All relevant geological, geomechanical, geochemical, geophysical and seismological data may be considered in the development of the stimulation plan 8) Modified the statement in Section I.B.ii (Amplify Topic Area Description) under Phase 1 – Pre-stimulation description*:* *Objective 1.3: Planning and Permitting, Induced Seismicity Mitigation Plan:* Awardees will be expected to work closely with LBNL and SNL to secure necessary permits for surface and borehole seismic monitoring. Costs for permitting will be included in total project costs, while most other costs associated with seismic monitoring will be borne by LBNL and SNL via directly funded agreements with DOE. Additional details will be provided during award negotiations. 9) Deleted the following Phase 1 Report item in Section I.B.ii, Amplify Topic Area Description: <u>*Objective 1.4: Reporting and Publications*</u> • Estimated volume of rock expected to be stimulated based on use of an accepted stimulation modeling package; 10) Deleted the following item in Section I.C, Applications Specifically Not of Interest: • Applications for Topic Area 2 that include stimulation in sedimentary formations. Well stimulations for Amplify may be conducted in any rock type including igneous, metamorphic, and sedimentary. 11) Added the following item in Section I.C, Applications Specifically Not of Interest: • Applications for Topic Area 2 (Amplify) that propose open hole stimulation with no zonal isolation; i.e. stimulation from the casing shoe. 12) Increased the anticipated Period of Performance for Topic Area 2 (Amplify) in Section II.A.i to the following: • EERE anticipates making awards that will run from 3-4 years in length, comprised of one or more budget periods. 13) Updated Compliance Criteria in Section III.C.i regarding surface/subsurface rights for Full Applications for both topic areas (Pilot and Amplify) to the following:

		• The Applicant or partners provide sufficient legal documentation to demonstrate that they have the legal surface and subsurface rights to operate in the proposed well(s). Legal documentation to demonstrate surface and subsurface rights necessary for stimulation and heat mining could be provided in the form of legal documentation from an applicant/prime recipient directly, or legal documentation could be provided in the form of a binding legal contract between the applicant/prime recipient and proposed subrecipients/partners. Letters of support from partners or subcontractors do not take the place of legal documentation; Subsequent references to legal documentation regarding surface and subsurface rights were also updated within the FOA document. 14) Deleted the following Compliance Criteria in Section III.C.i for Topic Area 2 (Amplify): • The Applicant provides sufficient documentation illustrating that the potential geothermal reservoir is located in igneous or metamorphic rock; Potential geothermal reservoirs for Amplify may be located in any rock type including igneous, metamorphic, and sedimentary. 15) Updated the suggested percentages for content and form of the Pilot (Topic Area 1) Technical Volume in Section IV.B.ii to the following: Project Overview: 10% Technical Description: 40% Workplan: 30% Tech Qualifications and Resources: 20% 16) Updated the costs associated with well work over requirements content and form of the Pilot (Topic Area 1) Technical Volume in Section IV.B.ii to the following: Work Over Requirements (if any): 1. If your proposed well(s) was last logged or drilled MORE THAN three years ago, please provide a general sense of the amount of remediation required to make the identified well(s) accessible using the estimated remediation cost ranges below: a. Low costs to access available well (less than $300,000) b. Moderate costs to remediate well ($300,000 to $600,000) c. High costs for well workover operations ($600,000 to $1,000,000)

		17) Added the following item to Section IV.B.iii in the list of requested information for Appendix A (Site and Well Characterization Data) to the Technical Volume for Amplify (Topic Area 2): • Historic seismic data from the proposed project area. 18) Modified the statement in Section V.A.i (Amplify Topic Area Review Criteria) to the following: **Criterion 1: Technical Merit, Innovation, and Impact (50%)** • Technical merit and feasibility of the proposed work (i.e., is it based on sound scientific/engineering principles and on an understanding of current state of the art technology/methods in the geothermal industry, is it feasible to accomplish and deploy proposed technology within the project time-frame) • Extent that proposed well stimulation methods are field-ready, have demonstrated successful functionality in the field (regardless of industry use) and will advance the state-of-the-art in EGS deployment. • Adequacy of existing site characterization data and geologic/geothermal model including data on rock properties, stratigraphy/lithology, temperature profile, petrologic/mineralogical evaluations of cuttings/core, geophysical/geological logs, stress data to support project objectives • Availability and adequacy of historic seismic data from the proposed project area

Department of Energy (DOE)
Office of Energy Efficiency and Renewable Energy (EERE)

Geothermal Wells of Opportunity (WOO)



Funding Opportunity Announcement (FOA) Number: DE-FOA-0002227
FOA Type: Initial
CFDA Number: 81.087

FOA Issue Date:	February 4, 2020
Informational Webinar:	February 25, 2020
Submission Deadline for Full Applications:	April 24, 2020 5:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	June 1, 2020 5:00pm ET
Expected Date for EERE Selection Notifications:	July 17, 2020
Expected Timeframe for Award Negotiations:	July – September 2020

- To apply to this FOA, applicants must register with and submit application materials through EERE Exchange at https://eere-Exchange.energy.gov, EERE's online application portal.
- Applicants must designate primary and backup points-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. If an application is selected for award negotiations, it is not a commitment to issue an award. It is imperative that the applicant/selectee be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancelation of further award negotiations and rescission of the selection.

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I. Funding Opportunity Description

A. Background and Context

Background and Purpose

Geothermal energy is a renewable and diverse solution for the United States—providing reliable and flexible electricity generation and delivering unique technology solutions to America's heating and cooling demands. Geothermal resources can be found nationwide, are "always on," and represent vast domestic energy potential. Only a fraction of this potential has been realized due to technical and non-technical barriers that constrain industry growth. In fact, the U.S. Department of Energy's (DOE's) Geothermal Technologies Office's (GTO) recent *GeoVision* report concludes that with technology improvements, especially in areas relevant to enhanced geothermal systems (EGS), geothermal power generation could increase 26-fold from today, representing 60 gigawatts-electric (GWe) by 2050[1].

Enhanced Geothermal Systems are engineered geothermal reservoirs, created where there is hot rock (175-300+°C), but little to no natural permeability and/or fluid saturation. During EGS development, subsurface permeability is enhanced via safe, well-engineered stimulation processes that re-open pre-existing fractures, create new ones, or a combination of both. These open conduits increase permeability and allow fluid to circulate throughout the rock. This fluid transports heat to the surface where electricity can be generated with current power generation technologies.

GTO partners with industry, academia, national laboratories, industry experts, etc. to increase the use of domestic geothermal energy across a range of resource types by improving technologies, reducing costs, and mitigating barriers. Within GTO, the EGS Program actively pursues research, development, and demonstration projects to facilitate technology validation and deployment, reduce cost, and improve performance of EGS. Specifically, the economic viability of EGS depends on developing and improving enabling technologies and a detailed understanding of rock fracture behavior and permeability enhancement. While achieving cost-competitive electricity generation from EGS is a long-term goal, in the near-term, research, development, and demonstration projects will move industry along the learning curve toward technological readiness.

GTO's largest initiative, the Frontier Observatory for Research in Geothermal Energy (FORGE), is focused on gaining the required understanding of fracture and permeability evolution and advancing EGS technology readiness. FORGE is a full-scale, dedicated field site

[1] The *GeoVision* Roadmap outlines a compilation of technical, economic, and institutional actions that the entire geothermal community including DOE, other government agencies, industry, and academia must address in order for geothermal technologies to play a larger role in the Nation's energy mix.

near Milford, UT where scientists and engineers will develop, test, and accelerate breakthroughs in EGS technologies and techniques.

Specifically, the objective of the FORGE initiative is to develop a dedicated geothermal field laboratory where the subsurface scientific and engineering community will develop, test and improve new technologies and techniques in order to gain a fundamental understanding of the key mechanisms controlling EGS, in particular how to initiate and sustain fracture networks in the spectrum of basement rock formations using different stimulation technologies and techniques. This critical knowledge will be used to design and test a methodology for developing large-scale, economically sustainable heat exchange systems, thereby paving the way for a rigorous and reproducible approach that will reduce industry development risk.

The FORGE initiative was designed as a multi-phase effort to reduce DOE risk and ensure alignment of vision and operation plans prior to field work. In 2018, DOE selected the Utah FORGE site located in Milford, Utah as the final FORGE site. The Utah FORGE team is currently preparing to move into the full-scale operational phase where annual solicitations will be released and on-site drilling, monitoring, and stimulation will occur.

Through the Wells of Opportunity (referred to as WOO going forward) FOA, GTO is soliciting well owners or operators with "idle" wells that are willing to partner with DOE to advance and test EGS technologies in-situ. Due to the criticality of the technology prototyping and methodology testing phase of research and development in the innovation pipeline, this FOA focuses on active field testing, where the Federal government takes on the associated high cost and risks.

- **Topic Area 1 – Pilot (FORGE Test Wells):** The objective of this initiative is to select, prepare, permit, and repair idle wells for early-stage FORGE technology and methodology testing prior to or in lieu of testing in the FORGE Utah wells. These wells will be closely linked to the FORGE effort, contributing to the overall goals and mission of the FORGE initiative by enabling higher-risk technology testing.

- **Topic Area 2 – Amplify (EGS Near-Field RD&D):** This field validation effort will culminate in new power production, adding to the economic viability of these existing geothermal fields and illustrating that near-field EGS can be successfully deployed now and that low permeability/unproductive wells near existing hydrothermal fields can be turned into valuable assets using EGS techniques.

This FOA is authorized under EPAct 2005, Section 931(a)(2)(C)(ii),(iii),(v), as codified at 42 U.S.C. 16231(a)(2)(C)(ii),(iii),(v) shown below:

(C) Geothermal

The Secretary shall conduct a program of research, development, demonstration, and commercial application for geothermal energy. The program shall focus on developing improved technologies for reducing the costs of geothermal energy installations, including technologies for

(ii) decreasing drilling costs;
(iii) decreasing maintenance costs through improved materials;
(v) increasing the understanding of reservoir life cycle and management.

Technology Space and Strategic Goals

As identified in the *GeoVision* report, improving the tools, technologies, and methodologies used to explore, identify, access, create, and manage geothermal resources will reduce costs and risks associated with geothermal development. These reductions, possible via the development of EGS-enabling technologies, could increase geothermal power generation nearly 26-fold from today, representing 60 gigawatts-electric (GWe) of always-on, flexible electricity-generation capacity by 2050[2]. This capacity would comprise 3.7% of total U.S. installed capacity, and 8.5% of all U.S. electricity generation in 2050. The *GeoVision* analysis demonstrated that EGS resources have the potential to provide extreme growth in the electric sector and can also support significant growth within the non-electric sector for district heating and other direct-use applications.

The technology developments targeted in this FOA are intended ultimately to bring EGS technology closer to market. Strategic goals identified in the *GeoVision* Roadmap, which outlines a compilation of technical, economic, and institutional actions that the entire geothermal community including DOE, Industry, and Academia must address in order for geothermal technologies to play a larger role in the Nation's energy mix. The relevant "Action Areas" identified in the GeoVision Roadmap are highlighted below in Figure 1.

Wells of Opportunity (WOO) FOA Goals and Applicable GTO Goals

	Topic Area 1: Pilot Goal: Facilitate testing of at least 10 new or high-risk technologies or techniques in idle wells demonstrating repeatability of measurement or process at temperature.	**Topic Area 2: Amplify** Goal: Demonstrate the capability of producing >5MWe additional capacity using advanced stimulation techniques in existing geothermal wells. Reduce production costs of geothermal by 25% vs new build via EGS-related capacity additions for stimulation.
GeoVision Roadmap	**Key Action 1.2**: Improve detection of subsurface signals **Key Action 1.3**: Improve geothermal drilling and wellbore integrity	**Key Action 1.2:** Improve detection of subsurface signals **Key Action 1.3:** Improve geothermal drilling and wellbore integrity

[2] *GeoVision*: Harnessing the Heat Beneath Our Feet, 2019.

	Key Action 1.4: Improve geothermal energy resource recovery **Key Action 1.5**: Improve geothermal resource and asset monitoring, modeling, and management.	**Key Action 1.4:** Improve geothermal energy resource recovery **Key Action 1.5:** Improve geothermal resource and asset monitoring, modeling, and management. **Key Action 4.2:** Improve public education and outreach about geothermal energy
FORGE Roadmap	**Critical Research Areas**: • Stimulation Planning and Design • Fracture Control • Reservoir Management **Enabling Research Areas:** • Well Completions	**Critical Research Areas**: • Stimulation Planning and Design • Fracture Control • Reservoir Management **Enabling Research Areas:** • Well Completions • Induced Seismicity Management
EGS Subprogram Goals	• Demonstrate stimulation of at least 5 reservoir zones via a single wellbore and correlate to increased reservoir performance • Demonstrate at least 3 innovative stimulation techniques for initiating or re-opening fractures in subsurface. • Demonstrate sustained functionality of temporary reservoir interrogation tools at 500F for at least 6 months.	• Demonstrate stimulation of at least 5 reservoir zones via a single wellbore and correlate to increased reservoir performance • Demonstrate at least 3 innovative stimulation techniques for initiating or re-opening fractures in subsurface. • Demonstrate validation of reservoir and site models based on ability to predict post-stimulation fracture initiation directions, total reservoir volume, and connectivity. • Reduce the number of wells required per MW produced through the stimulation of existing unproductive wells

Figure 1: Applicable GTO goals addressed by the WOO FOA

On a programmatic level, these initiatives play a critical role in GTO's contribution to advancing EGS technologies toward wide-spread commercialization. Released earlier this year, *Frontier Observatory for Research in Geothermal Energy: A Roadmap*[3] *(the FORGE Roadmap)*, developed by the Science & Technology Policy Institute (STPI) with community input and participation, outlines the key technical challenges necessary for EGS to become a reliable and reproducible energy supplier. These critical research areas include (Figure 2):

- **Stimulation Planning and Design**: research and development that supports efforts to site, orient, and prepare a well for optimal stimulation
- **Fracture Control**: research that supports efforts to develop an optimal fracture network as well as increase understanding of the resulting fracture systems

[3] Frontier Observatory for Research in Geothermal Energy: A Roadmap

- **Reservoir Management**: research that supports efforts to sustain the long-term heat exchange in the EGS reservoir

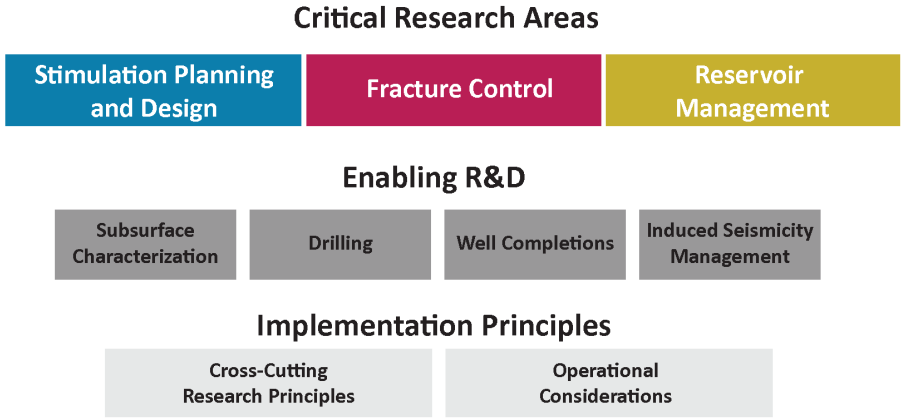


Figure 2: Visual representation of the structure of the FORGE Roadmap with Critical Research Areas highlighted.

Critical Research Areas and Enabling R&D that are related to the goals of this FOA are shown in Figure 2 along with an additional level of technology-focused goals set by GTO's EGS Program that cascade from the higher-level Critical Research Areas. These metrics track more specific success indicators along the EGS technology development spectrum, which will be informed by this FOA and do not supersede the FOA Topic Area Goals (Figure 1):

Topic Area 1: Pilot

- Goal: Facilitate testing of at least 10 new or high-risk technologies or techniques in idle well(s) demonstrating repeatability of measurement or process at temperature.

Topic Area 2: Amplify

- Goal: Demonstrate the capability of producing >5MWe additional capacity using advanced stimulation techniques in an idle geothermal well.

B. Topic Areas



i. Topic Area 1 – Pilot: FORGE Test Wells

Topic Area Overview:

Field testing and validation of new tools, technologies, and methodologies vastly improve the probability of successful commercialization. Under this Topic Area, GTO seeks idle wells in which tool testing and validation can take place. Currently in the U.S., there are idle wells spanning a variety of resource types, states of site infrastructure, and commercial operability. The results of the recent Wells of Opportunity Request for Information (RFI) that closed on October 25, 2019 suggests that there are a significant number of wells that could potentially be made available for the proposed work that span a range of depths and temperatures.

Under this Topic Area, GTO seeks applications to prepare, repair, and host the testing of innovative downhole tools and well stimulation technologies in parallel with or in preparation for deployment at the FORGE site. Awards for this Topic Area will allow for up to $1,000,000 in well work-over costs and require up to $250,000 of funding to be reserved for well plug and abandonment (P&A) expenses. Remaining project funds will be used to accomplish activities described in the project phase descriptions below. Figure 3 represents a sampling of technologies and methods (selected outside of this FOA) that will likely be tested in "Pilot" wells some requiring minimal intervention and others more comprehensive workover and resource development activities.

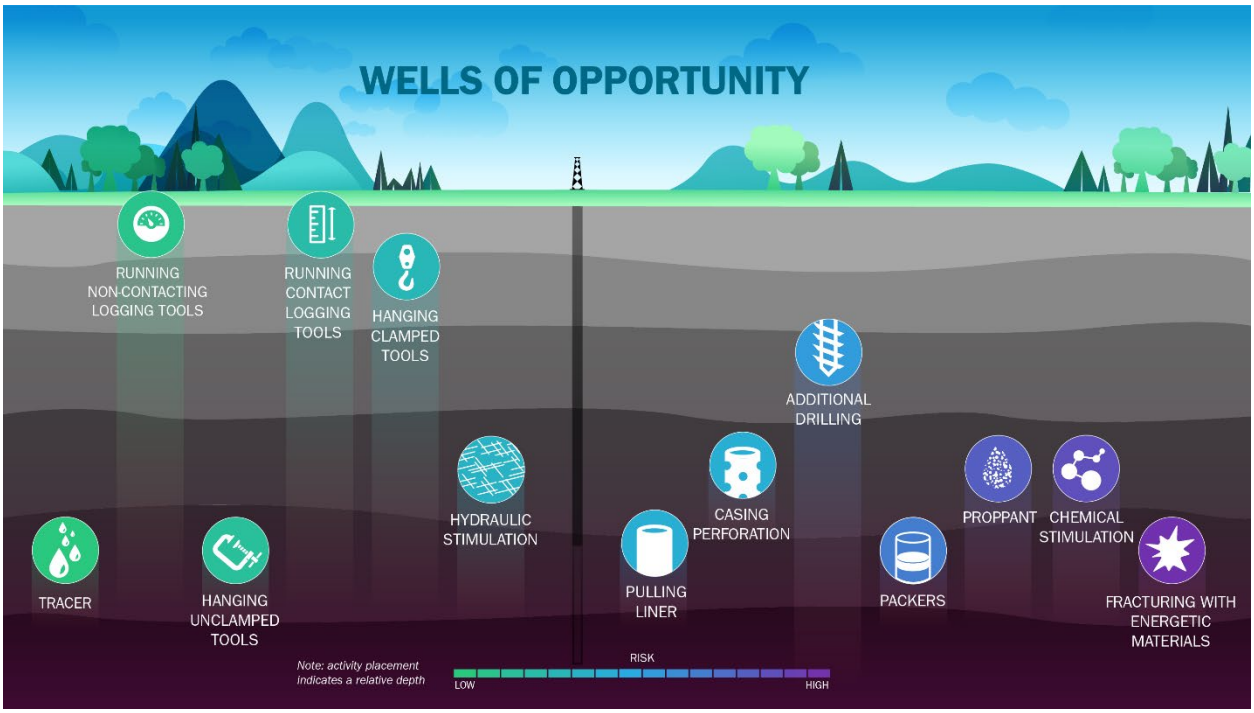


Figure 3 Research and testing activity examples along a qualitative well(s) damage risk spectrum

Applicants may submit multiple wells for consideration under a single application, as long as the project team (same Principal Investigator and partners) remains the same for all wells/sites. If there is a change in the project team between sites, then multiple applications will need to be submitted.

FORGE Background as related to Pilot:

As described above, FORGE is a collaborative and inclusive effort involving geothermal and subsurface stakeholders across industry, DOE National Labs, and academia. GTO envisions that FORGE will result in a rigorous and reproducible methodology that will enable EGS optimization and wide-spread development of electricity generation from EGS.

Research testing at FORGE will occur over the next several years while the Utah team drills two dedicated full-size directional wells for stimulation and testing. Half of the funding for FORGE will be dedicated to competitive R&D solicitations in which the community will be eligible to participate. These competitive solicitations will be issued by the FORGE Utah Team and will likely include a variety of emerging geothermal technology concepts in various stages of development, many of which will require field testing. The FORGE site will have a limited number of wells, some of which will be dedicated to monitoring and others, including the highly deviated main wellbores, will be reserved for testing and deployment of only high technology readiness level (TRL) research projects. Deployment of untested technologies in these first-of-their kind, high cost wells is not economically or technically prudent. As a result, the number of technologies that can be tested at the Utah FORGE site will be limited. Wells at other sites

across the United States will allow for a significantly larger number of field tests and to test technologies and methodologies at much lower risk prior to deployment at FORGE. These additional wells will act as supporting sites associated with the FORGE effort, expanding the breadth of FORGE across the U.S.

Such additional sites, defined as previously drilled wells that are currently under-utilized and which DOE is seeking applications to repair, can enhance FORGE and non-FORGE focused research.

Topic Area Requirements:

Applicants should refer to Section III.C of this announcement to review the Initial Compliance Review requirements.

There are no restrictions on lithology or geologic setting, however, the highest priority for selection will be given to wells in crystalline formations (igneous, metamorphic) for stimulation testing. Other lithologies will be considered for R&D topics that are agnostic to the lithology.

Applications must provide the most up to date data related to the above requirements, as well as a description of the current state of the well(s) and what remediation might be required before field testing can occur. Applications should include detailed well(s)/site data in the Technical Volume (outlined in Section IV.B.ii) in order to provide DOE with the most current state of the proposed well(s) and site.

Additionally, an estimate for wellbore P&A costs and procedures, and a description of the applicant's risk tolerance for operations in the proposed well(s) should be included within the Technical Volume and are described in more detail in Section IV.B.ii.

Project Phase Description

Awards made under this announcement will be cooperative agreements that will include well(s) permitting/planning, re-completion and testing, and close-out. Based on the Substantial Involvement Clause, DOE reserves the right to permanently or temporarily withdraw any well from operations if they no longer serve the goals of the Pilot initiative.

Phase 1 – Pre-Testing

1A- Well assessment and rework planning

Depending on the last date a well was accessed, Phase 1A will follow one of two paths. These operational paths can be outlined in the Statement of Project Objectives (SOPO) described in detail in Section IV.B.vi.

1) If the well was drilled and logged (cement bond log, minimum) or last logged within 3 years of the FOA release date and there is no historical evidence of stability issues in open hole, cement integrity issues, or presence of highly corrosive liquids or gases, or other similar concerns:
    a. The well condition will be reviewed by an independent engineer and will be advanced into the workover stage. Per the substantial involvement clause, if the independent engineer does not find the well in acceptable operating condition, the recipient would be required to complete one or more of the tasks described below in scenario 2.
    b. Well owners must provide at the time of application (as described above):
        i. A detailed assessment of required workover tasks and costs.
2) If the well was drilled or last accessed more than 3 years from the FOA release date:
    a. DOE will require that the well is logged to confirm that the state of the well is still as described in the application materials and that no additional issues are identified. This should include, at minimum, a cement bond log and temperature/pressure log from surface to total depth (TD) or deepest accessible depth in the wellbore.
    b. The condition of the well will be reviewed by an independent engineer, and a determination will be made as to whether the well will be advanced to the workover stage.
    c. If the well is advanced, the well owner will need to provide:
        i. A detailed assessment of required workover tasks and costs.
        ii. An updated list of permitting updates that may apply to the well (including work-over tasks) to allow for the wide range of possible activities noted in Figure 3.

Awardees will be required to reserve up to $250,000 of DOE funding to cover P&A expenses. At the conclusion of this phase DOE will conduct a "Go/No-Go Review" on a well-by-well basis to determine the wells best suited for testing FORGE technologies.

For applications proposing multiple wells, the well assessment and rework planning outline above will need to be completed for each proposed well.

1B- Planning and Permitting

During the Planning and Permitting phase, well owners will work to secure necessary permits and approvals, as well as perform necessary site, archaeological, and other surveys. Well owners will also maintain compliance with all environmental, health, safety, National Environmental Policy Act (NEPA) and legal requirements. Applicants should note that all permits and regulatory approvals relating to the base site, specific wells, and/or proposed work must be submitted to DOE for review and approval. Because of the breadth of technologies that may potentially be tested in the proposed well(s), the recipient will be asked to obtain a permit covering the spectrum of technologies that they identify as acceptable for testing in their

well(s). At the conclusion of this initiative, the well owner may utilize the well(s) for any of these activities in line with the legal requirements from the obtained permit.

At the conclusion of Phase 1 there will be a **Go/no-go decision point**. At this Go/No-go decision point, DOE will make a decision for each award based on the technical progress made relative to the Statement of Project Objectives, actual spending during the project period, and adherence to the proposed project schedule.

After the completion of Phase 1, work may pause depending on the needs and status of FORGE-related testing.

Phase 2- Site Work

Once DOE, in conjunction with FORGE Utah and the FORGE Science Technology and Analysis Team (STAT), has identified and matched competitively selected R&D technologies with available wells, Phase 2 site work will begin. If a well does not require any workover activities, the project will move directly into Phase 2B. There may be a lag in the selection of a well and deployment of FORGE technologies in said well because of the time-frames associated with the FORGE competitive solicitation process. Minimal costs associated with keeping the well(s) in operational condition will be covered by DOE during this idle period.

2A- Well rework (maximum of $1M available for workover activities)

During this phase, any well(s)/sites selected for FORGE R&D testing will be brought up to operational status. The well rework plan that was established in 1A will be updated to include any additional requirements needed for testing of FORGE R&D projects as determined by DOE in conjunction with FORGE Utah and the FORGE STAT. If a well is selected for stimulation activities, additional logging data will be collected at this stage if it is not already available. This may include, but is not limited to, a full suite of geophysical logs, an acoustic televiewer log, and a resistivity based imaging log. Any additional site requirements for FORGE testing (ex. monitoring network) will be directed by and at the cost of DOE, in conjunction with FORGE Utah and the FORGE STAT, with input from the well owner to determine the best options that will work within the permitting status of the site.

Phase 2A Review: If the workover is completed successfully the well(s) will move to Phase 2B.

2B- FORGE Testing

The risk levels associated with all projects selected from the competitive annual FORGE solicitations will be assessed and technologies will be assigned to various Pilot wells based on the infrastructure available at the site, the condition of the well(s), and potentially, the geology.

Once one or more FORGE projects are assigned to the recipients well(s), the well owner will be funded to:

- Facilitate site access and deliveries associated with field testing

- Provide site specific ES&H training
- Supply surface and subsurface project data to R&D team

The well owner can assign a representative to be present on site during any testing. The well owner will be notified of any actions that are planned for work in the well(s) after review by an independent engineer to verify their functionality. DOE will cover personnel costs associated with these activities, which should be included in the budget and outlined in the Budget Justification.

Phase 3- Well Transfer/Remediation/P&A

At the conclusion of well-testing associated with FORGE, full control of the well will revert back to the well owner. During this phase the awardee will develop and execute an updated plan for well P&A, if necessary. If the recipient wishes to keep the well open at the conclusion of FORGE testing they are free to do so, and all rights to funding for P&A will be forfeited.

Non-proprietary data collected during all phases of the projects will be uploaded by award recipients and made available to the public through the National Geothermal Database System (NGDS)/Geothermal Data Repository (GDR).



ii. Topic Area 2 – Amplify: EGS Near-Field RD&D

As identified in the FORGE Roadmap, stimulation activities are central to the success of EGS. Stimulations enhance in situ permeability and increase the permeable surface area within the subsurface, increasing heat exchange between a circulating fluid and the hot rock, and thus increasing reservoir energy output and well productivity. Well stimulation creates a productive geothermal reservoir where only hot rock existed previously. Historically, most EGS stimulations involved activating a single zone or multiple zones of fractures from an open-hole section of the wellbore. In these cases, fluids are pumped downhole, creating or re-opening fractures when the injection pressure reduces the normal/shear stress ratio sufficiently across a fracture surface to cause shearing.

While there are a number of successful historical and active EGS stimulation projects that have been conducted in the United States, several barriers to commercialization remain. These barriers include:

- Sufficient technical understanding of factors that contribute to success or failure of well stimulation methods in a variety of geothermal reservoirs and rock types
- Adequate testing of various well stimulation techniques that utilize various combinations of fluid injection, thermal rock-fluid interaction, chemical stimulation, zonal isolation, and/or other techniques

- Adoption of successful EGS well stimulation techniques by the geothermal industry at a commercial scale[4]

Through this Topic Area, new stimulation techniques and technologies will be validated in the field, culminating in new power production, adding to the economic viability of existing geothermal fields in low permeability/unproductive wells in/near existing hydrothermal fields. GTO seeks to create several EGS well stimulation projects to build upon the knowledge gained from previous EGS well demonstration projects at Desert Peak, The Geysers, Newberry Volcano, Raft River, and Brady's Hot Springs. Results from all of these projects were technically significant, but questions remain regarding reproducible field-scale EGS well stimulation methods, which will be useful to complement upcoming field activities at Utah FORGE site. Since the DOE-funded EGS demonstration projects ended, a number of new technologies or those adopted from the oil and gas sector have shown promise for improving stimulation success in EGS wells. In addition, a shift in the thinking surrounding EGS stimulation strategy – progressing from open hole stimulation (as described above) to isolated stimulation zones - has occurred since the last U.S. EGS demonstrations and provides a near term opportunity to generate power from non-or under-performing wells on the margins of hydrothermal fields. Publically released information regarding previous DOE field projects and technical baseline for well stimulation methods utilized in the past can be found at https://www.osti.gov/ (final technical reports, conference proceedings, journal articles, etc.), and https://www.energy.gov/eere/geothermal (GTO EGS information and GTO Peer Review reports).

The awards funded under this FOA will characterize and stimulate existing, low permeability geothermal wells with sub-commercial production or injection capacity in a near-field or in-field environment with the goal of sustainably increasing the output of the existing reservoir by 5MW. An in-field well is defined as a well located within the boundaries of a known geothermal system, while a near-field well is defined as a well located outside the boundaries of a known geothermal system as depicted by the existing subsurface geologic model. Minimum requirements for the well are described below under Initial Compliance Criteria.

Awardees will develop a plan to enhance the productivity of the system, then stimulate one or more wells and monitor the improvement in productivity or injectivity of the system. The projects will allow testing and validation of advanced and targeted stimulation techniques for improving productivity of wells or increasing inter-well connectivity at existing geothermal fields for purposes of producing additional energy. Use of available or experimental technologies from geothermal, petroleum, or other relevant industries are allowable.

These projects will build on previous DOE EGS demonstration projects in that a larger variety of geologic reservoir environments will be used to test various well stimulation techniques, and usage of targeted stimulation techniques such as zonal isolation, fracture initiation

[4] Frontier Observatory for Research in Geothermal Energy: A Roadmap

technologies, etc. will be required. Most previous EGS demonstration projects did not focus on deploying specific stimulation technologies in/at specific intervals of the target wells. Utilization of readily field-deployable well stimulation techniques that target specific sections of wells (via zonal isolation or combinations of well stimulation techniques) will be highly encouraged to advance the state-of-the-art beyond results from previous projects.

Awards made under this announcement will be cooperative agreements that will include well stimulation and data collection and analysis over three Phases. The projects funded under this announcement will help accelerate EGS technology improvements in order to fully commercialize unproductive or underproductive geothermal resources and transition them into valuable assets.

Applicants should refer to Section III.C of this announcement to review the Initial Compliance Review requirements.

It is a requirement that target well(s) exist at the proposed project site prior to an award being made by DOE under this announcement. In addition, DOE seeks wells that are in good condition and capable of being put into operations relatively quickly and with minimal workover. Any costs incurred prior to the award selection date (such as well drilling, collection of rock/core cuttings, well-field development or power plant construction) are not eligible for consideration as recipient cost share.

However, recipient cost share for wells drilled only **after** December 31, 2008 and prior to the project period start date may be allowable if those costs fall into depreciation covered under an indirect rate agreement or allocation method approved by a governmental agency. Please note that target wells that have been drilled prior to December 31, 2008 are still eligible for stimulation, but will not be allowable for consideration as cost share.

Evidence of compliance with relevant environmental laws and regulations must be provided.

Non-proprietary data provided to DOE during all three phases of the projects will be shared with the United States Geological Survey (USGS) and/or other federal agencies without restriction.

Project Phase Descriptions

Proposed projects should be completed in three distinct phases with go/no-go decision points after Phase 1, after Phase 2, and elsewhere if appropriate.

Via a separate initiative, DOE will support Lawrence Berkeley National Laboratory (LBNL) and Sandia National Laboratories (SNL) for on-site surface and borehole seismic monitoring design, deployment and analysis during the stimulations that take place under this initiative. Therefore, seismic monitoring and costs associated with seismic monitoring will not be required of the recipients under this FOA.

Phase descriptions are as follows:

Phase 1 – Pre-Stimulation

The goal of Phase 1 is to create a detailed well stimulation plan that includes required tasks with a go/no-go decision, a budget, and a schedule. Phase 1 should consist of four objectives as outlined below, with SMART (Specific, Measurable, Achievable, Relevant, and Timely) milestones that demonstrate achievement included at the end of each objective. It is not necessary to complete these objectives in the order listed; some objectives also may be completed in parallel depending on the proposed site.

Objective 1.1: Site/Wellbore Readiness

The minimum requirement for Objective 1 is completion of the candidate well so that it is ready for stimulation work. DOE seeks wells that are in operational condition and/or require minimal workover. Applications should clearly discuss the drilling plan/level of workover anticipated for the proposed well and prepare the budget documents accordingly.

Objective 1.2: Development of Stimulation Plan

The minimum requirements for Objective 1.2 are to create or provide a geologic model in support of a plan for well stimulation. The applicant must describe in detail the proposed stimulation method. The geologic model must include some information on subsurface stresses as related to potential fracturing direction. If critical data gaps exist, well characterization activities may be considered in order to develop a successful stimulation plan. All relevant geological, geomechanical, geochemical, geophysical and seismological data may be considered in the development of the stimulation plan.

Objective 1.3: Planning and Permitting, Induced Seismicity Mitigation Plan

Awardees will be expected to work closely with LBNL and SNL to secure necessary permits for surface and borehole seismic monitoring. Costs for permitting will be included in total project costs, while most other costs associated with seismic monitoring will be borne by LBNL and SNL via directly funded agreements with DOE. Additional details will be provided during award negotiations.

As part of this objective, the recipients will also be required to develop an Induced Seismicity Mitigation Plan (ISMP) in line with the current version of the "Protocol for Induced Seismicity Associated with Enhanced Geothermal Systems." (https://www.energy.gov/sites/prod/files/2014/02/f7/geothermal_seismicity_protocol_012012.pdf) The ISMP should include a discussion and evaluation of the regional setting, structure, and stratigraphy as related to seismic risk, as well as a

summary of any monitoring data collected prior to initiating this project. Lawrence Berkeley National Laboratory's seismic data collection and analysis effort funded separately by DOE will provide direct input into the development of this plan.

Objective 1.4: Reporting and Publications

The minimum technical requirement for Objective 1.4 is to provide sufficient information to DOE (in the form of a Phase 1 Report) and regulatory entities to receive authorization to proceed to Phase 2 stimulation activities. This information should be documented in a Phase 1 Report.

The Phase 1 Report should include the items listed below. If any of these items were included in the initial application, an updated version must be included as part of the Phase 1 Report.

- Geologic model (including geophysical, geological, geochemical, and geomechanical data and analytical/numerical results);
- Interpretation and representation of the natural fracture system and basic prediction of the direction of fracture growth;
- Historical productivity or injectivity of the candidate well. Results of all flow or injection tests of the well and productivities of neighboring wells. (The data on neighboring wells may be provided in a separate document which may be labeled "Proprietary");
- Estimated or actual pre-stimulation power potential (MWe) of the candidate well;
- A final compilation of the detailed well stimulation plan that includes required tasks with Go/no-go decisions, a budget, and a field operations schedule; and
- All reports, plans, permits, licenses, and other items required by governmental regulatory agencies for the performance of this work, including NEPA determination and documentation.

Following completion of the objectives listed above, the project should include a go/no-go decision point with measureable criteria before implementation of successive activities.

Phase 2 – Reservoir Creation and Characterization

The goal of Phase 2 is to complete well stimulation(s) and establish flow of geothermal fluid between wells. Phase 2 should include execution of well stimulation(s), and near-term post stimulation data collection.

Phase 2 should consist of three Objectives, with SMART milestones that demonstrate achievement included at the end of each objective:

Objective 2.1: Stimulation

The minimum requirement for Objective 2.1 is to complete stimulation of the candidate geothermal well via hydraulic stimulation (or other means) and to establish inter-well connectivity. Work may include mobilization/demobilization of stimulation equipment, execution of well stimulation, running geophysical or production logs, fluid sampling, monitoring of the stimulation through use of tiltmelters or other techniques, flow tests, tracer tests, etc. as long as they are relevant to analyzing stimulation success. Seismic/microseismic monitoring will not be the responsibility of the awardees; seismic arrays and analysis will be provided by DOE via another related project in cooperation with Lawrence Berkeley National Laboratory and Sandia National Laboratories.

Objective 2.2: Communications

Recipients must conduct and promote communications, education, and outreach activities with DOE, outside stakeholders, and the general public to promote awareness of this initiative and increase geothermal science and technology literacy. These activities should be coordinated with other ongoing key communications, education, and outreach efforts supported by DOE outside of the scope of this funding announcement.

Objective 2.3: Reporting and Publications

The minimum technical requirement for Phase 2 is the stimulation of the well and preparation for subsequent Phase 3 monitoring, data collection and validation work. Initial results of the stimulation must be reported within two months of completion of the stimulation as a publicly available DOE report.

At a minimum, the Phase 2 report should include the following data sets:

- Daily stimulation reports;
- Stimulation data;
- Logs run in the well (Pressure Temperature Spinner (PTS), sonic, natural gamma, tool-head temperature, etc.);
- Formation response data for both pre- and post-stimulation; and
- Pumping and related data to evaluate the stimulation.

Following completion of the objectives listed above, the project should include a go/no-go decision point with measureable criteria before implementation of successive activities.

Phase 3 – Validation and Power Generation

The goal of Phase 3 is to assess and validate long-term fluid flow and heat extraction rates following well stimulation.

Phase 3 should consist of two Objectives, with SMART milestones that demonstrate achievement included at the end of each objective:

Objective 3.1: Post Stimulation Data Collection

Applicants must agree to collect data and monitor the stimulation well and other wells within the field, especially those affected by the stimulation for a minimum of one year.

Recipients should collect and provide to the GDR on a quarterly basis, the following data:

- Productivity or injectivity data and analysis;
- Logs run in the well (PTS, sonic, natural gamma, bore hole televiewer etc.);
- Formation response/evolution data;
- Well flow rates, pressures, and well head temperatures;

Not required but relevant and highly encouraged:

- Chemistry of produced fluid and mineral dissolution/precipitation; and
- Tracer data, analysis and results of tracer tests if the well is in communication with other wells in the field or to determine such connection.

DOE may require more data, if necessary based on proposed well readiness/stimulation techniques and specific properties of the target geothermal reservoir, and will work with successful applicants prior to work commencing on Phase 1 to determine the final set of required data. In consultation with the awardee, DOE will determine the type, format, and frequency of data collected over all phases of the project. Non-proprietary data collected during all phases of the projects will be uploaded by award recipients and made available to the public through the Geothermal Data Repository (GDR).

Objective 3.2: Reporting and Publications

The minimum requirement of this Objective is to provide short and long term flow test reports. At the end of Phase 3, the recipient shall submit a final technical report that includes all Phases of the award.

Go/no-go Decision Points

There should be Go/no-go decision points after the end of each phase, and/or else ware if appropriate. At Go/no-go decision points, DOE will make one of three decisions for each award based on the technical progress made relative to the Statement of Project Objectives, actual spending during the project period, and adherence to the proposed project schedule:

- "Go" Forward – the project is on track, minimal or no modifications are required, work is acceptable, the proposed work plan for the next performance phase is acceptable, funding is available and the project continues to be appropriate to the mission and goals of GTO.
- "Hold" – the project is still viewed as having a high likelihood of success; however, additional information is required before a "Go" or "No-Go" decision can be made. It is anticipated that a project would remain in a "Hold" status for a period of weeks to allow awardees to submit additional information for review by GTO.
- "No-Go" – DOE may not provide further funding for the project. This may be due to irresolvable technical difficulties; changes in the GTO mission, goals, or portfolio; lack of appropriated funds; etc. Should the project be terminated, the final annual report will be accepted by GTO to fulfill the final technical report requirement.

All work under EERE funding agreements must be performed in the United States. See Section IV.J.iii. and Appendix B.

C. Applications Specifically Not of Interest

The following types of applications will be deemed nonresponsive and will not be reviewed or considered (See Section III.D. of the FOA):

- Applications that fall outside the technical parameters specified in Section I.A. and I.B. of the FOA
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).
- Applications for Topic Area 2 (Amplify) that propose open hole stimulation with no zonal isolation; i.e. stimulation from the casing shoe.

D. Authorizing Statutes

The programmatic authorizing statute is EPAct 2005, Section 931(a)(2)(C)(ii),(iii),(v), as codified at 42 U.S.C. 16231(a)(2)(C)(ii),(iii),(v) shown below:

(C) Geothermal

The Secretary shall conduct a program of research, development, demonstration, and commercial application for geothermal energy. The program shall focus on developing improved technologies for reducing the costs of geothermal energy installations, including technologies for

(ii) decreasing drilling costs;

(iii) decreasing maintenance costs through improved materials;
(v) increasing the understanding of reservoir life cycle and management.

Awards made under this announcement will fall under the purview of 2 Code of Federal Regulation (CFR) Part 200 as amended by 2 CFR Part 910.

II. Award Information

A. Award Overview

i. Estimated Funding

EERE expects to make a total of up to $25,000,000 of federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making approximately 6-28 awards under this FOA. EERE may issue one, multiple, or no awards. Individual awards may vary between $450,000 and $2,500,000.

EERE may issue awards in one, multiple, or none of the following topic areas:

Topic Area 1 – Pilot
EERE may issue approximately 5-20 awards in this topic area. Individual awards may vary between $450,000 and $2,000,000.

Topic Area 2 - Amplify
EERE may issue approximately 1-8 awards in this topic area. Individual awards may vary between $500,000 and $2,500,000.

EERE may establish more than one budget period for each award and fund only the initial budget period(s). Funding for all budget periods, including the initial budget period, is not guaranteed. Before the expiration of the initial budget period(s), EERE may perform a down-select among different recipients and provide additional funding only to a subset of recipients.

Period of Performance

Topic Area 1 – Pilot
EERE anticipates making awards that will run from 1-5 years in length, comprised of one or more budget periods.

Topic Area 2 - Amplify
EERE anticipates making awards that will run from 3-4 years in length, comprised of one or more budget periods.

New Applications Only

EERE will accept only new applications under this FOA. EERE will not consider applications for renewals of existing EERE-funded awards through this FOA.

B. EERE Funding Agreements

Through cooperative agreements and other similar agreements, EERE provides financial and other support to projects that have the potential to realize the FOA objectives. EERE does not use such agreements to acquire property or services for the direct benefit or use of the United States government.

i. Cooperative Agreements

EERE generally uses cooperative agreements to provide financial and other support to prime recipients.

Through cooperative agreements, EERE provides financial or other support to accomplish a public purpose of support or stimulation authorized by federal statute. Under cooperative agreements, the government and prime recipients share responsibility for the direction of projects.

EERE has substantial involvement in all projects funded via cooperative agreement. See Section VI.B.ix of the FOA for more information on what substantial involvement may involve.

ii. Funding Agreements with Federally Funded Research and Development Center (FFRDCs)

In most cases, FFRDCs are funded independently of the remainder of the project team. The FFRDC then executes an agreement with any non-FFRDC project team members to arrange work structure, project execution, and any other matters. Regardless of these arrangements, the entity that applied as the prime recipient for the project will remain the prime recipient for the project.

iii. Grants

Although EERE has the authority to provide financial support to prime recipients through grants, EERE generally does not fund projects through grants. EERE may fund a limited number of projects through grants, as appropriate.

III. Eligibility Information

To be considered for substantive evaluation, an applicant's submission must meet the criteria set forth below. If the application does not meet these eligibility requirements, it will be considered ineligible and removed from further evaluation.

A. Eligible Applicants

iv. Individuals

U.S. citizens and lawful permanent residents are eligible to apply for funding as a prime recipient or subrecipient.

v. Domestic Entities

For-profit entities, educational institutions, and nonprofits that are incorporated (or otherwise formed) under the laws of a particular state or territory of the United States and have a physical location for business operations in the United States are eligible to apply for funding as a prime recipient or subrecipient. 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.

State, local, and tribal government entities are eligible to apply for funding as a prime recipient or subrecipient.

DOE/NNSA FFRDCs are eligible to apply for funding as a prime recipient or subrecipient.

Non-DOE/NNSA FFRDCs are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

vi. Foreign Entities

Foreign entities, whether for-profit or otherwise, are eligible to apply for funding under this FOA. Other than as provided in the "Individuals" or "Domestic Entities" sections above, all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a state or territory of the United States and have a physical location for business operations in the United States. If a foreign entity applies for funding as a prime recipient, it must designate in the Full Application a subsidiary or affiliate incorporated (or otherwise formed) under the laws of a state or territory of the United States to be the prime recipient. The Full Application must state the nature of the corporate relationship between the foreign entity and domestic subsidiary or affiliate.

Foreign entities may request a waiver of the requirement to designate a subsidiary in the United States as the prime recipient in the Full Application (i.e.,

a foreign entity may request that it remains the prime recipient on an award). To do so, the applicant must submit an explicit written waiver request in the Full Application. Appendix B lists the necessary information that must be included in a request to waive this requirement. The applicant does not have the right to appeal EERE's decision concerning a waiver request.

In the waiver request, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the prime recipient. EERE may require additional information before considering the waiver request.

A foreign entity may receive funding as a subrecipient.

vii. Incorporated Consortia

Incorporated consortia, which may include domestic and/or foreign entities, are eligible to apply for funding as a prime recipient or subrecipient. For consortia incorporated (or otherwise formed) under the laws of a state or territory of the United States, please refer to "Domestic Entities" above. For consortia incorporated in foreign countries, please refer to the requirements in "Foreign Entities" above.

Each incorporated consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium must provide a written description of its internal governance structure and its internal rules to the EERE Contracting Officer.

viii. Unincorporated Consortia

Unincorporated Consortia, which may include domestic and foreign entities, must designate one member of the consortium to serve as the prime recipient/consortium representative. The prime recipient/consortium representative must be incorporated (or otherwise formed) under the laws of a state or territory of the United States. The eligibility of the consortium will be determined by the eligibility of the prime recipient/consortium representative under Section III.A. of the FOA.

Upon request, unincorporated consortia must provide the EERE 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 agreement binds the individual consortium members together and should discuss, among other things, 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

Topic Area 1 – Pilot

Cost sharing is not required under this Topic Area. The Assistant Secretary for EERE has issued a Cost Share Waiver determination pursuant to Section 988(b)(3) of the Energy Policy Act of 2005 that is applicable to all entities applying under this Topic Area. Specifically, recipient cost share requirement for applied research and development activities projects under this Topic Area has been reduced to zero (0) percent.

This cost share waiver will maximize competition and the quality of proposed applicants for the Pilot topic area, by encouraging greater participation by any entity that owns or has legal rights to an idle well(s), which could include domestic institutions of higher education, domestic nonprofit entities, national laboratories, FFRDCs, and U.S. State, local, and tribal governments, and industry. The "Pilot" topic area seeks to find and repair idle wells to enable testing of tools and technologies that are not far enough along on the Technology Readiness Scale to be tested at the Utah site of the Frontier Observatory for Research in Geothermal Energy (FORGE).

Topic Area 2 - Amplify

The cost share must be at least 20% of the total allowable costs for research and development projects (i.e., the sum of the government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) and must come from non-federal sources unless otherwise allowed by law. (See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.)

Any costs incurred prior to the award selection date (such as well drilling, collection of rock/core cuttings, well-field development or power plant construction) are not eligible for consideration as recipient cost share. However, recipient cost share for wells drilled only **after** December 31, 2008 and prior to the project period start date may be allowable if those costs fall into depreciation covered under an indirect rate agreement or allocation method approved by a governmental agency.

To assist applicants in calculating proper cost share amounts, EERE has included a cost share information sheet and sample cost share calculation as Appendix A to this FOA.

i. Legal Responsibility

Although the cost share requirement applies to the project as a whole, including work performed by members of the project team other than the prime recipient, the prime recipient is legally responsible for paying the entire cost share. If the funding agreement is terminated prior to the end of the project period, the prime recipient is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination.

The prime recipient is solely responsible for managing cost share contributions by the project team and enforcing cost share obligation assumed by project team members in subawards or related agreements.

ii. Cost Share Types and Allowability

Every cost share contribution must be allowable under the applicable federal cost principles, as described in Section IV.J.i. of the FOA. In addition, cost share must be verifiable upon submission of the Full Application.

Project teams may provide cost share in the form of cash or in-kind contributions. Cost share may be provided by the prime recipient, subrecipients, or third parties (entities that do not have a role in performing the scope of work). Vendors/contractors may not provide cost share. Any partial donation of goods or services is considered a discount and is not allowable.

Cash contributions include, but are not limited to: personnel costs, fringe costs, supply and equipment costs, indirect costs and other direct costs.

In-kind contributions are those where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. Allowable in-kind contributions include, but are not limited to: the donation of volunteer time or the donation of space or use of equipment.

Project teams may use funding or property received from state or local governments to meet the cost share requirement, so long as the funding was not provided to the state or local government by the federal government.

The prime recipient may not use the following sources to meet its cost share obligations including, but not limited to:

- Revenues or royalties from the prospective operation of an activity beyond the project period;
- Proceeds from the prospective sale of an asset of an activity;
- Federal funding or property (e.g., federal grants, equipment owned by the federal government); or
- Expenditures that were reimbursed under a separate federal program.

Project teams may not use the same cash or in-kind contributions to meet cost share requirements for more than one project or program.

Cost share contributions must be specified in the project budget, verifiable from the prime recipient's records, and necessary and reasonable for proper and efficient accomplishment of the project. As all sources of cost share are considered part of total project cost, the cost share dollars will be scrutinized under the same federal regulations as federal dollars to the project. Every cost share contribution must be reviewed and approved in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred.

Applicants are encouraged to refer to 2 CFR 200.306 as amended by 2 CFR 910.130 for additional cost sharing requirements.

iii. Cost Share Contributions by FFRDCs

Because FFRDCs are funded by the federal government, costs incurred by FFRDCs generally may not be used to meet the cost share requirement. FFRDCs may contribute cost share only if the contributions are paid directly from the contractor's Management Fee or another non-federal source.

iv. Cost Share Allocation

Each project team is free to determine how best to allocate the cost share requirement among the team members. The amount contributed by individual project team members may vary, as long as the cost share requirement for the project as a whole is met.

v. Cost Share Verification

Applicants are required to provide written assurance of their proposed cost share contributions in their Full Applications.

Upon selection for award negotiations, applicants are required to provide additional information and documentation regarding their cost share contributions. Please refer to Appendix A of the FOA.

vi. Cost Share Payment

EERE requires prime recipients to contribute the cost share amount incrementally over the life of the award. Specifically, the prime recipient's cost share for each billing period must always reflect the overall cost share ratio negotiated by the parties (i.e., the total amount of cost sharing on each invoice when considered cumulatively with previous invoices must reflect, at a minimum, the cost sharing percentage negotiated). As FFRDC funding will be provided directly to the FFRDC(s) by DOE, prime recipients will be required to provide project cost share at a percentage commensurate with the FFRDC costs, on a budget period basis, resulting in a higher interim invoicing cost share ratio than the total award ratio.

In limited circumstances, and where it is in the government's interest, the EERE Contracting Officer may approve a request by the prime recipient to meet its cost share requirements on a less frequent basis, such as monthly or quarterly. Regardless of the interval requested, the prime recipient must be up-to-date on cost share at each interval. Such requests must be sent to the Contracting Officer during award negotiations and include the following information: (1) a detailed justification for the request; (2) a proposed schedule of payments, including amounts and dates; (3) a written commitment to meet that schedule; and (4) such evidence as necessary to demonstrate that the prime recipient has complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they go into effect.

C. Compliance Criteria

Full Applications and Replies to Reviewer Comments must meet all compliance criteria listed below or they will be considered noncompliant. EERE will not review or consider noncompliant submissions, Full Applications, and Replies to Reviewer Comments that were: submitted through means other than EERE Exchange; submitted after the applicable deadline; and/or submitted incomplete. EERE will not extend the submission deadline for applicants that fail to submit required information by the applicable deadline due to server/connection congestion.

i. Compliance Criteria

1. *Full Applications*
Full Applications are deemed compliant if:

TOPIC AREA 1: PILOT

- The Applicant provides sufficient evidence documenting the maximum recorded well temperature of the target well is ≥ 135°C (275°F);
- The Applicant provides sufficient evidence documenting the maximum recorded temperature of the target well(s) is ≥ 135°C (275°F);
- The Applicant provides sufficient evidence documenting the minimum target well(s) diameter is ≥ 6.25 inches;
- The Applicant or partners provide sufficient legal documentation[5] to demonstrate that they have the legal surface and subsurface rights to operate in the proposed well(s). Legal documentation to demonstrate surface and subsurface rights necessary for stimulation and heat mining could be provided in the form of legal documentation from an applicant/prime recipient directly, or legal documentation could be provided in the form of a binding legal contract between the applicant/prime recipient and proposed subrecipients/partners. Letters of support from partners or subcontractors do not take the place of legal documentation;
- The Full Application complies with the content and form requirements in Section IV.B. of the FOA; and
- The Applicant successfully uploads all required documents and clicks the "Submit" button in EERE Exchange by the deadline stated in the FOA.

TOPIC AREA 2: AMPLIFY

- The Applicant provides sufficient evidence documenting the maximum recorded temperature of the target well is ≥ 135°C (275°F);
- The Applicant or partners provide sufficient legal documentation[5] to demonstrate that they have the legal surface and subsurface rights necessary for stimulation and heat mining. Legal documentation to demonstrate surface and subsurface rights necessary for stimulation and heat mining could be provided in the form of legal documentation from an applicant/prime recipient directly, or legal documentation could be provided in the form of a binding legal contract between the applicant/prime recipient and proposed subrecipients/partners. Letters of support from partners or subcontractors do not take the place of the legal documentation;

[5] For projects on federal land, legal documentation may include a BLM lease, BLM site license, BLM exploration permit, BLM drilling permit, and a BLM utilization permit. For projects on private/state land, legal documentation may include: a deed or lease for the mineral/water/geothermal rights (as defined in that state), a similar document showing surface rights, and drilling & operating permits.

- The Full Application complies with the content and form requirements in Section IV.D. of the FOA; and
- The applicant successfully uploads all required documents and clicks the "Submit" button in EERE Exchange by the deadline stated in the FOA.

2. *Replies to Reviewer Comments*
Replies to Reviewer Comments are deemed compliant if:

- The Reply to Reviewer Comments complies with the content and form requirements in Section IV.E. of the FOA; and
- The applicant successfully uploaded all required documents to EERE Exchange by the deadline stated in the FOA.

D. Responsiveness Criteria

All "Applications Specifically Not of Interest," as described in Section I.C. of the FOA, are deemed nonresponsive and are not reviewed or considered.

E. Other Eligibility Requirements

i. Requirements for DOE/National Nuclear Security Agency (NNSA) Federally Funded Research and Development Centers (FFRDC) Listed as the applicant

A DOE/NNSA FFRDC is eligible to apply for funding under this FOA if its cognizant Contracting Officer provides written authorization and this authorization is submitted with the application.

The following wording is acceptable for the authorization:

> Authorization is granted for the Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

If a DOE/NNSA FFRDC is selected for award negotiation, the proposed work will be authorized under the DOE work authorization process and performed under the laboratory's Management and Operating (M&O) contract.

ii. Requirements for DOE/NNSA and non-DOE/NNSA Federally Funded Research and Development Centers Included as a Subrecipient

DOE/NNSA and non-DOE/NNSA FFRDCs may be proposed as a subrecipient on another entity's application subject to the following guidelines:

1. *Authorization for non-DOE/NNSA FFRDCs*
   The federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with its authority under its award.

2. *Authorization for DOE/NNSA FFRDCs*
   The cognizant Contracting Officer for the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The following wording is acceptable for this authorization:

   > Authorization is granted for the Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

3. *Value/Funding*
   The value of and funding for the FFRDC portion of the work will not normally be included in the award to a successful applicant. Usually, DOE will fund a DOE/NNSA FFRDC contractor through the DOE field work proposal (WP) system and non-DOE/NNSA FFRDC through an interagency agreement with the sponsoring agency.

4. *Cost Share*
   Although the FFRDC portion of the work is usually excluded from the award to a successful applicant, the applicant's cost share requirement will be based on the total cost of the project, including the applicant's, the subrecipient's, and the FFRDC's portions of the project.

5. *Responsibility*
   The prime recipient will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues including, but not limited to disputes and claims arising out of any agreement between the prime recipient and the FFRDC contractor.

F. Limitation on Number of Full Applications Eligible for Review

An entity may submit more than one Full Application to this FOA, provided that each application describes a unique, scientifically distinct project. Applicants should declare which Topic Area(s) they wish to submit their application(s) under. Applicants may designate their application for one or both topic areas. The same project team with multiple target wells can apply with a single application. The same project team could also submit one or more target wells to both topic areas with a single application. If there are changes in the project team between sites, multiple applications are required. DOE reserves the right to designate full applications for selection under either Topic Area based upon the content of the application.

G. Questions Regarding Eligibility

EERE will not make eligibility determinations for potential applicants prior to the date on which applications to this FOA must be submitted. The decision whether to submit an application in response to this FOA lies solely with the applicant.

IV. Application and Submission Information

Upon submission of full applications, EERE performs an initial eligibility review of the applicant submissions to determine whether they meet the eligibility requirements of Section III of the FOA. EERE will not review or consider submissions that do not meet the eligibility requirements of Section III. All submissions must conform to the following form and content requirements, including maximum page lengths (described below) and must be submitted via EERE Exchange at https://eere-exchange.energy.gov/, unless specifically stated otherwise. **EERE will not review or consider submissions submitted through means other than EERE Exchange, submissions submitted after the applicable deadline, or incomplete submissions**. EERE will not extend deadlines for applicants who fail to submit required information and documents due to server/connection congestion.

A **Control Number** will be issued when an applicant begins the EERE Exchange application process. This control number must be included with all application documents, as described below.

The Full Application and Reply to Reviewer Comments must conform to the following requirements:

- Each must be submitted in Adobe PDF format unless stated otherwise;
- Each must be written in English;
- All pages must be formatted to fit on 8.5 x 11 inch paper with margins not less than one inch on every side. Use Times New Roman typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10

point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement;

- The Control Number 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; and
- Each submission must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

Applicants are responsible for meeting each submission deadline. **Applicants are strongly encouraged to submit their Concept Papers and Full Applications at least 48 hours in advance of the submission deadline**. Under normal conditions (i.e., at least 48 hours in advance of the submission deadline), applicants should allow at least 1 hour to submit a Full Application or Reply to Reviewer Comments. Once the Full Application or Reply to Reviewer Comments is submitted in EERE Exchange, applicants may revise or update that submission until the expiration of the applicable deadline. If changes are made to any of these documents, the applicant must resubmit the Full Application or Reply to Reviewer Comments before the applicable deadline.

EERE urges applicants to carefully review their Full Applications and to allow sufficient time for the submission of required information and documents. All Full Applications that pass the initial eligibility review will undergo comprehensive technical merit review according to the criteria identified in Section V.A.ii. of the FOA.

i. Additional Information on EERE Exchange

EERE Exchange is designed to enforce the deadlines specified in this FOA. The "Apply" and "Submit" buttons will automatically disable at the defined submission deadlines. Should applicants experience problems with EERE Exchange, the following information may be helpful.

Applicants that experience issues with submission PRIOR to the FOA deadline: In the event that an applicant experiences technical difficulties with a submission, the applicant should contact the EERE Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The EERE Exchange helpdesk and/or the EERE Exchange system administrators will assist applicants in resolving issues.

A. Application Forms

The application forms and instructions are available on EERE Exchange. To access these materials, go to https://eere-Exchange.energy.gov and select the appropriate funding opportunity number.

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA, it must be broken into parts and denoted to that effect. For example:
ControlNumber_LeadOrganization_Project_Part_1
ControlNumber_LeadOrganization_Project_Part_2

B. Content and Form of the Full Application

Applicants must submit a Full Application by the specified due date and time to be considered for funding under this FOA. Applicants must complete the following application forms found on the EERE Exchange website at https://eere-Exchange.energy.gov/, in accordance with the instructions.

Applicants will have approximately 30 days from receipt of the Concept Paper Encourage/Discourage notification on EERE Exchange to prepare and submit a Full Application. Regardless of the date the applicant receives the Encourage/Discourage notification, the submission deadline for the Full Application remains the date and time stated on the FOA cover page.

All Full Application documents must be marked with the Control Number issued to the applicant. Applicants will receive a control number upon clicking the "Create Concept Paper" button in EERE Exchange, and should include that control number in the file name of their Full Application submission (i.e., *Control number_Applicant Name_Full Application*).

i. Full Application Content Requirements

EERE will not review or consider ineligible Full Applications (see Section III. of the FOA).

Each Full Application shall be limited to a single concept or technology. Unrelated concepts and technologies shall not be consolidated in a single Full Application. Full Applications must conform to the following requirements:

Submission	Components	File Name
Full Application (PDF, unless stated otherwise)	Technical Volume (PDF format. See Chart in Section IV.D.ii.)	ControlNumber_LeadOrganization_TechnicalVolume
	Resumes (PDF format. 1 page maximum per person)	ControlNumber_LeadOrganization_Resumes
	Letters of Commitment, if applicable (PDF format. 1 page maximum per letter)	ControlNumber_LeadOrganization_LOCs
	Statement of Project Objectives (SOPO) (Microsoft Word format. 10 page limit)	ControlNumber_LeadOrganization_SOPO
	SF-424 Application for Federal Assistance (PDF format)	ControlNumber_LeadOrganization_App424
	Budget Justification (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Budget_Justification
	Summary for Public Release (PDF format. 1 page limit)	ControlNumber_LeadOrganization_Summary
	Summary Slide (Microsoft PowerPoint format. 1 page limit)	ControlNumber_LeadOrganization_Slide
	Subrecipient Budget Justification, if applicable (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
	DOE WP for FFRDC, if applicable (PDF format. See DOE O 412.1A, Attachment 3)	ControlNumber_LeadOrganization_WP
	Authorization from cognizant Contracting Officer for FFRDC, if applicable (PDF format)	ControlNumber_LeadOrganization_FFRDCAuth
	SF-LLL Disclosure of Lobbying Activities (PDF format)	ControlNumber_LeadOrganization_SF-LLL
	Foreign Entity and Foreign Work waiver requests, if applicable (PDF format)	ControlNumber_LeadOrganization_Waiver
	U.S. Manufacturing Plan (PDF format) **(NOT REQUIRED FOR TOPIC AREA 1)**	ControlNumber_LeadOrganization_USMP
	Data Management Plan (Microsoft Word format) **(NOT REQUIRED FOR TOPIC AREA 1)**	ControlNumber_LeadOrganization_DMP

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA it must be broken into parts and denoted to that effect. For example:

ControlNumber_LeadOrganization_TechnicalVolume_Part_1
ControlNumber_LeadOrganization_TechnicalVolume_Part_2

EERE will not accept late submissions that resulted from technical difficulties due to uploading files that exceed 10MB.

EERE provides detailed guidance on the content and form of each component below.

ii. Technical Volume – Topic Area 1 (Pilot)

The Technical Volume must be submitted in Adobe PDF format. The Technical Volume must conform to the following content and form requirements, including maximum page lengths. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages. This volume must address the Merit Review Criteria as discussed in Section V.A.ii. of the FOA. Save the Technical Volume in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_TechnicalVolume".

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

The Technical Volume to the Full Application for Topic Area 1 may not be more than 10 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.ii of the FOA) when preparing the Technical Volume.

The Technical Volume should clearly describe and expand upon information provided in the Concept Paper. The Technical Volume must conform to the following content requirements:

FOR TOPIC AREA 1: PILOT

SECTION/PAGE LIMIT	DESCRIPTION
Cover Page	The cover page should include the project title, the specific FOA Topic Area being addressed, both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.

Project Overview (This section should constitute approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The applicant should discuss the background of their organization. • Project Goal: The applicant should explicitly identify the well(s) that are being proposed and provide a table outlining the well(s) characteristics.
Technical Description(This section should constitute approximately 40% of the Technical Volume)	The Technical Description should contain the following information: **Well(s)/Site Data:** 1. A map and supporting descriptions of the project area with well locations, lease boundaries, right of access to the candidate site, surface and subsurface rights of ownerships, surface infrastructure (Roads, power access, water source, etc.) that could be used to support the project site. a. Description of water availability and any applicable water rights b. Description of existing electrical available on site 2. Description of existing environmental reviews/assessments completed for the proposed well(s) including but not limited to Environmental Impact Statement, Environmental Assessment, Environmental studies performed in the area. 3. Description of any valid or current (local, state, federal) permits for activities in or around the proposed well(s). 4. A simplified geological model of the region around the proposed well(s) that provides a short narrative outlining any available information on rock properties, stress regime (if available), historical regional seismicity, and proximity to local faults and/or other discontinuities if they are known to exist. 5. A stratigraphic/lithologic column for the proposed well(s) including a temperature profile (measured) plotted against depth. 6. Description of the results of all flow or injection tests. 7. Description of well completion including, casing schedule, well completion history, and evidence of casing integrity including integrity logs or previous testing if available. 8. All documentation associated with the above areas should be included as an Appendix to the Technical Volume. **Work Over Requirements (if any)**: 9. **If your proposed well(s) was last logged or drilled MORE THAN three years ago**, please provide a general sense of the amount of remediation required to make the identified well(s) accessible using the estimated remediation cost ranges below: a. Low costs to access available well (less than $300,000) b. Moderate costs to remediate well ($300,000 to $600,000) c. High costs for well workover operations ($600,000 to $1,000,000)

	10. **If your proposed well(s) was last logged or drilled FEWER THAN three years ago**, please provide a detailed assessment of tasks and costs associated with any known workover requirements. **Risk Tolerance**: 11. Referencing the risk scale depicted in Figure 3, please describe the range of acceptable research activities and technologies you would be willing to deploy in the proposed well(s) **Site Remediation**: 12. Please provide an estimate for wellbore Plug & Abandonment (P&A) costs (not to exceed $250,000) and procedures in the event the well is damaged and must be abandoned. If the well(s) remains in operational condition at the end of the lifetime of this effort, P&A will not be required if the owner elects to keep the well(s) open. With DOE Contracting Officer approval, this funding can be utilized for additional testing, or will be recovered by the DOE.
Workplan (This section should constitute approximately 30% of the Technical Volume)	The Workplan should include a summary of the Technical Scope, Milestones, Go/no-go Decision Points, and Project Schedule. A detailed SOPO is separately requested. The Workplan should contain the following information: • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). • Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the tasks described here. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be **S**pecific, **M**easurable, **A**chievable, **R**elevant, and **T**imely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The

	summary provided should be consistent with the Milestone Summary Table in the SOPO. • Go/no-go Decision Points: The applicant should provide a summary of project-wide Go/no-go decision points at appropriate points in the Workplan. A Go/no-go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. At a minimum, each project must have at least one project-wide Go/no-go decision point for each budget period (12 to 18-month period) of the project. See Section VI.B.xiv. The applicant should also provide the specific technical criteria to be used to evaluate the project at the Go/no-go decision point. The summary provided should be consistent with the SOPO. Go/No-Go decision points are considered "SMART" and can fulfill the requirement for an annual SMART milestone. • Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and Go/no-go decision points. • Project Management: The applicant should discuss the team's proposed management plan, including the following: ○ The overall approach to and organization for managing the work ○ The roles of each project team member ○ Any critical handoffs/interdependencies among project team members ○ The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices ○ The approach to project risk management ○ A description of how project changes will be handled How communications will be maintained among project team members
Technical Qualifications and Resources (Approximately 20% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information: • Describe the project team's unique qualifications and expertise, including those of key subrecipients. • Describe the project team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project.

	• Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable.
	• For multi-organizational or multi-investigator projects, describe succinctly:
	  ○ The roles and the work to be performed by each PI and Key Participant
	  ○ Business agreements between the applicant and each PI and Key Participant
	  ○ How the various efforts will be integrated and managed
	  ○ Process for making decisions on scientific/technical direction
	  ○ Publication arrangements
	  ○ Intellectual Property issues
	  ○ Communication plans

Appendix (if Applicable)	Longer documents applicable to the proposed well(s) may be included as an appendix to the Technical Volume. • End of well reports • Any documentation associated with the areas detailed in the Technical Description.

iii. Technical Volume – Topic Area 2 (Amplify)

The Technical Volume must be submitted in Adobe PDF format. The Technical Volume must conform to the following content and form requirements, including maximum page lengths. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages. This volume must address the Merit Review Criteria as discussed in Section V.A.ii. of the FOA. Save the Technical Volume in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_TechnicalVolume".

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

The Technical Volume to the Full Application for Topic Area 2 may not be more than 15 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.ii of the FOA) when preparing the Technical Volume.

The Technical Volume should clearly describe and expand upon information provided in the Concept Paper. The Technical Volume must conform to the following content requirements:

FOR TOPIC AREA 2: AMPLIFY

SECTION/PAGE LIMIT	DESCRIPTION
Cover Page	The cover page should include the project title, the specific FOA Topic Area being addressed, both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Project Overview (This section should constitute approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline well performance and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Technical Description, Innovation, and Impact (This section should constitute approximately 30% of the Technical Volume)	The Technical Description should contain the following information: • Relevance and Outcomes: The applicant should provide a detailed description of the well stimulation methodology to be used, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed methodology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. • Innovation and Impacts: The applicant should describe the current state-of-the-art in the applicable field, the specific innovation of the proposed methodology, the advantages of proposed methodology over previous methods, and the overall impact on advancing the state-of-the-art/technical baseline if the project is successful.

Workplan and Market Transformation Plan (This section should constitute approximately 40% of the Technical Volume)	The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Milestones, Go/no-go Decision Points, and Project Schedule. A detailed SOPO is separately requested. The Workplan should contain the following information: • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project and as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on Go/no-go decision points). The applicant should describe the specific expected end result of each performance period. • WBS and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard WBS for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be **S**pecific, **M**easurable, **A**chievable, **R**elevant, and **T**imely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO. • Go/no-go Decision Points: The applicant should provide a summary of project-wide Go/no-go decision points at appropriate points in

	the Workplan. A Go/no-go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. At a minimum, each project must have at least one project-wide Go/no-go decision point for each budget period (12 to 18-month period) of the project. See Section VI.B.xiv. The applicant should also provide the specific technical criteria to be used to evaluate the project at the Go/no-go decision point. The summary provided should be consistent with the SOPO. Go/No-Go decision points are considered "SMART" and can fulfill the requirement for an annual SMART milestone.
	• End of Project Goal: The applicant should provide a summary of the end of project goal(s). At a minimum, each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO.
	• Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and Go/no-go decision points.
	• Project Management: The applicant should discuss the team's proposed management plan, including the following:
	  ○ The overall approach to and organization for managing the work
	  ○ The roles of each project team member
	  ○ Any critical handoffs/interdependencies among project team members
	  ○ The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices
	  ○ The approach to project risk management
	  ○ A description of how project changes will be handled
	  ○ If applicable, the approach to Quality Assurance/Control
	  ○ How communications will be maintained among project team members
	
	• If necessary, Market Transformation Plan: The applicant should provide a market transformation plan, including the following:
	  ○ Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan
	  ○ Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, U.S. Manufacturing Plan, and product distribution

Technical Qualifications and Resources (Approximately 20% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information:
	• Describe the project team's unique qualifications and expertise, including those of key subrecipients.
	• Describe the project team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project.
	• This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives.
	• Describe the time commitment of the key team members to support the project.
	• Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable.
	• For multi-organizational or multi-investigator projects, describe succinctly:
	  ○ The roles and the work to be performed by each PI and Key Participant
	  ○ Business agreements between the applicant and each PI and Key Participant
	  ○ How the various efforts will be integrated and managed
	  ○ Process for making decisions on scientific/technical direction
	  ○ Publication arrangements
	  ○ Intellectual Property issues
	  ○ Communication plans

Appendix A: Site and Well Characterization Data	**Topic Area 2 (Amplify): Applications should include the following items as attachments to the Project Narrative. Failure to include these items will result in a reduced Merit Review score.** • All existing exploration data included well-documented site characterizations and sound justifications as to why the candidate site is suitable for stimulation. • A geological map of the project area with lease boundaries, right of access to the candidate site, and surface and subsurface rights of ownerships. • Relevant geological site data derived from geophysical logs, regional geological logs, surveys, cross sections, etc. • A geological model that demonstrates an understanding of the specific rock mass properties, stress regime (if available), and a petrologic/mineralogical evaluation of cuttings/core • A stratigraphic/lithologic column for the proposed well including a temperature profile plotted against depth. • A baseline flow-rate of the candidate well. • The results and data of all flow or injection tests. • Evidence that the well is open to depth of interest, casing

	schedule, well completion history, and evidence of casing integrity. • Historic seismic data from the proposed project area. • Sufficient legal documentation to demonstrate that the Applicant or partners have the legal surface and subsurface rights necessary for stimulation and heat mining. Legal documentation to demonstrate surface and subsurface rights necessary for stimulation and heat mining could be provided in the form of legal documentation from an applicant/prime recipient directly, or legal documentation could be provided in the form of a binding legal contract between the applicant/prime recipient and proposed subrecipients/partners. Letters of support from partners or subcontractors do not take the place of the legal documentation.

iv. Resumes

Applicants are required to submit one-page resumes for key participating team members. Multi-page resumes are not allowed. Save the resumes in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Resumes".

v. Letters of Commitment

Submit letters of commitment from all subrecipient and third party cost share providers. If applicable, also include any letters of commitment from partners/end users (1 page maximum per letter). Save the letters of commitment in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_LOCs".

vi. Statement of Project Objectives (SOPO)

Applicants are required to complete a SOPO. A SOPO template is available on EERE Exchange at https://eere-Exchange.energy.gov/. The SOPO, including the Milestone Table, must not exceed 10 pages when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the SOPO in a single Microsoft Word file using the following convention for the title "ControlNumber_LeadOrganization_SOPO".

Topic Area 1 (Pilot)

At the conclusion on Phase 1A there will be a Go/no-go decision point. At this Go/No-go decision point, DOE will determine which wells are best suited for moving into the next sub-phase where well rework will begin, based on the detailed assessments of required workover tasks and costs, risk tolerance, and list of permitting updates that may apply to the well.

Another Go/no-go decision point will take place at the end of Phase 2B. At this Go/No-go decision point, DOE will make a decision for each award based on the technical progress made relative to the Statement of Project Objectives, actual spending during the project period, and adherence to the proposed project schedule.

Topic Area 2 (Amplify)

At the conclusion on Phase 1 there will be a Go/no-go decision point. At this Go/No-go decision point, DOE will make a decision for each award based on the technical progress made relative to the Statement of Project Objectives (including site/wellbore readiness, stimulation plan, and permitting/Induced Seismicity Management Plan (ISMP) status), actual spending during the project period, and adherence to the proposed project schedule.

Another Go/no-go decision point will take place at the end of Phase 2. At this Go/No-go decision point, DOE will make a decision for each award based on the technical progress made relative to the Statement of Project Objectives (include execution of the well stimulation plan and communications), actual spending during the project period, and adherence to the proposed project schedule.

vii. SF-424: Application for Federal Assistance

Complete all required fields in accordance with the instructions on the form. The list of certifications and assurances in Field 21 can be found at http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms, under Certifications and Assurances. Note: The dates and dollar amounts on the SF-424 are for the complete project period and not just the first project year, first phase or other subset of the project period. Save the SF-424 in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_App424".

viii. Budget Justification Workbook

Applicants are required to complete the Budget Justification Workbook. This form is available on EERE Exchange at https://eere-Exchange.energy.gov/. Prime recipients must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the prime recipient and its subrecipients and contractors. Applicants should include costs associated with required annual audits and incurred cost proposals in their proposed budget documents. The "Instructions and Summary" included with the Budget Justification Workbook will auto-populate as the applicant enters information into the Workbook. Applicants must carefully read the "Instructions and Summary" tab provided within the Budget Justification Workbook. Save the

Budget Justification Workbook in a single Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Budget_Justification".

ix. Summary/Abstract for Public Release

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

x. Summary Slide

Applicants are required to provide a single PowerPoint slide summarizing the proposed project. The slide must be submitted in Microsoft PowerPoint format. This slide is used during the evaluation process. Save the Summary Slide in a single file using the following convention for the title "ControlNumber_LeadOrganization_Slide".

The Summary Slide template requires the following information:

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

xi. Subrecipient Budget Justification (if applicable)

Applicants must provide a separate budget justification for each subrecipient that is expected to perform work estimated to be more than $250,000 or 25 percent of the total work effort (whichever is less). The budget justification must

include the same justification information described in the "Budget Justification" section above. Save each subrecipient budget justification in a Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Subrecipient_Budget_Justification".

xii. Budget for DOE/NNSA FFRDC (if applicable)

If a DOE/NNSA FFRDC contractor is to perform a portion of the work, the applicant must provide a DOE WP in accordance with the requirements in DOE Order 412.1A, Work Authorization System, Attachment 3, available at: https://www.directives.doe.gov/directives-documents/400-series/0412.1-BOrder-a/@@images/file. Save the WP in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_WP".

xiii. Authorization for non-DOE/NNSA or DOE/NNSA FFRDCs (if applicable)

The federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with the contractor's authority under its award. Save the Authorization in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FFRDCAuth".

xiv. SF-LLL: Disclosure of Lobbying Activities (required)

Prime recipients and subrecipients may not use any federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Prime recipients and subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to ensure that non-federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with the application:

- An officer or employee of any federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

Save the SF-LLL in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_SF-LLL".

xv. Waiver Requests: Foreign Entities and Foreign Work (if applicable)

1. **Foreign Entity Participation:**
   As set forth in Section III.A.iii., all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a state or territory of the United States. To request a waiver of this requirement, the applicant must submit an explicit waiver request in the Full Application. Appendix B lists the necessary information that must be included in a request to waive this requirement.

2. **Performance of Work in the United States (Foreign Work Waiver)**
   As set forth in Section IV.J.iii., all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the prime recipient should make every effort to purchase supplies and equipment within the United States. Appendix B lists the necessary information that must be included in a foreign work waiver request.

Save the Waivers in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Waiver".

xvi. U.S. Manufacturing Commitments

EERE requires subject inventions (i.e., inventions conceived or first actually reduced to practice under EERE awards) to be substantially manufactured in the United States by project teams and their licensees, as described below. The applicant may request a modification or waiver of the U.S. manufacturing requirement.

1. Domestic Small Businesses, Educational Institutions and Nonprofits

Domestic small businesses (including small business concerns), domestic educational institutions, and nonprofits that are recipients or subrecipients under EERE funding agreements must require their exclusive licensees to substantially manufacture the following products in the United States for any use or sale in the United States: (1) articles embodying subject inventions, and (2) articles produced through the use of subject inventions. This requirement does not apply to articles that are manufactured for use or sale overseas.

Domestic small businesses, domestic educational institutions and nonprofits must require their assignees to apply the same U.S. manufacturing requirements to their exclusive licensees.

These U.S. manufacturing requirements do not apply to nonexclusive licensees.

2. **Large Businesses, Foreign Entities, and State and Local Government Entities**

Large businesses and foreign entities that are recipients or subrecipients under EERE funding agreements that take title to subject inventions through a patent waiver are required to substantially manufacture the following products in the United States: (1) products embodying subject inventions, and (2) products produced through the use of subject invention(s). This requirement applies to products that are manufactured for use or sale in the United States or overseas.

Large businesses and foreign entities must apply the same U.S. manufacturing requirements to their assignees, licensees, and entities acquiring a controlling interest in the large business or foreign entity. Large businesses and foreign entities must require their assignees and entities acquiring a controlling interest in the large business or foreign entity to apply the same U.S. manufacturing requirements to their licensees.

3. **FFRDCs**

DOE FFRDCs are subject to the U.S. manufacturing requirements set forth in their M&O Contracts. All other FFRDCs are subject to the U.S. manufacturing requirements as set forth above, based on their size and for-profit status.

Pursuant to the DOE Determination of Exceptional Circumstances (DEC) dated September 9, 2013, each applicant is required to submit a U.S. Manufacturing Plan as part of its application. The U.S. Manufacturing Plan represents the applicant's measurable commitment to support U.S. manufacturing as a result of its award.

Each U.S. Manufacturing Plan must include a commitment that any products embodying any subject invention or produced through the use of any subject invention will be manufactured substantially in the United States, unless the applicant can show to the satisfaction of DOE that it is not commercially feasible to do so (referred to hereinafter as "the U.S. Competitiveness Provision"). The applicant further agrees to make the U.S. Competitiveness Provision binding on any subawardee and any assignee or licensee or any

entity otherwise acquiring rights to any subject invention, including subsequent assignees or licensees. A subject invention is any invention conceived of or first actually reduced to practice under an award.

Due to the lower technology readiness levels of this FOA, DOE does not expect the U.S. Manufacturing Plans to be tied to a specific product or technology. However, in lieu of the U.S. Competitiveness Provision, an applicant may propose a U.S. Manufacturing Plan with more specific commitments that would be beneficial to the U.S. economy and competitiveness. For example, an applicant may commit specific products to be manufactured in the U.S., commit to a specific investment in a new or existing U.S. manufacturing facility, keep certain activities based in the U.S. or support a certain number of jobs in the U.S. related to the technology. An applicant which is likely to license the technology to others, especially universities for which licensing may be the exclusive means of commercialization the technology, the U.S. Manufacturing Plan may indicate the applicant's plan and commitment to use a specific licensing strategy that would likely support U.S. manufacturing.

If DOE determines, at its sole discretion, that the more specific commitments would provide a sufficient benefit to the U.S. economy and industrial competitiveness, the specific commitments will be part of the terms and conditions of the award. For all other awards, the U.S. Competitiveness Provision shall be incorporated as part of the terms and conditions of the award as the U.S. Manufacturing Plan for that award.

The U.S. Competitiveness Provision is also a requirement for the Class Patent Waiver that applies to domestic large business under this FOA (see Section VIII.K. Title to Subject Inventions).

Save the U.S. Manufacturing Plan in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_USMP".

xvii. Data Management Plan (DMP)

The U.S. DOE Geothermal Technologies Office (GTO) requires all data generated as a result of an award to be uploaded to the DOE Geothermal Data Repository (DOE-GDR). Further, GTO requires, to the extent practicable, that data generated under the award be structured according to applicable subject matter templates.

Applicants may use these requirements to explain in their Data Management Plan how data will be shared, preserved and formatted. Additional information pertaining to the DOE-GDR is available at: https://gdr.openei.org/about.

Data submitted to the DOE-GDR will be assigned Digital Object Identifiers (DOIs). As required by the Funding Opportunity Announcement for this Financial Assistance award, the Recipient must provide data to the DOE-GDR. The Recipient must provide data to the DOE-GDR no later than the end of the quarter in which the data is generated. The data must be sufficiently complete, in a format described in the Data Management Plan and acceptable to DOE, and, subject to Intellectual Property Provisions, include sufficient information for an independent analyst to reproduce and verify the results. The data will be submitted to DOE-GDR at https://gdr.openei.org. While most data formats may be uploaded to the DOE-GDR, DOE prefers reusable, structured data that supports conclusions communicated in project quarterly and other reports. Use of National Geothermal Data System (NGDS) data exchange models is highly encouraged. For example, the geothermal "Well Header Observation" content model should be used to associate well records, temperature measurements, chemistry and other information from a particular well. Content models are available at the following website: http://schemas.usgin.org/models/.

The data will be made publicly available via the DOE-GDR once they have been submitted and accepted into the DOE-GDR system. If the data are protected or subject to a moratorium, they will not be made publicly available until the moratorium has expired, and they will be held in a secure section of the DOE-GDR. Protected Data will be treated according to the Intellectual Property Provisions. Please refer to the Provision entitled "DOE GEOTHERMAL DATA REPOSITORY (DOEGDR)" in the award Special Terms and Conditions for specific data submission instructions.

For both topic areas, the following data will be requested:

- Well schematic (pre and post recompletions)
- Geologic logs
- Geophysical logs (including image and/or FMI logs)
- Temperature/Pressure Logs
- Estimated recompletion costs
- Available rock properties (can make exception for reservoir rocks)
- Stress data (magnitude, orientations, and data used in determination)

Applicants are required to submit a DMP with their Full Application.

An applicant may select one of the template Data Management Plans (DMP) listed below. Alternatively, instead of selecting one of the template DPMs below, an applicant may submit another DMP provided that the DMP, at a minimum, (1) describes how data sharing and preservation will enable validation of the results from the proposed work, how the results could be validated if data are not shared or preserved and (2) has a plan for making all research data displayed in

publications resulting from the proposed work digitally accessible at the time of publications. DOE Public Access Plan dated July 24, 2014 provides additional guidance and information on DMPs.

For the deliverables under the award, the recipient does not plan on making the underlying well asset or research data supporting the findings in the deliverables publicly-available for up to five (5) years after the data were first produced because such data will be considered protected under the award. The results from the DOE deliverables can be validated by DOE who will have access, upon request, to the research data. Other than providing deliverables as specified in the award, the recipient does not intend to publish the results from the project. However, in an instance where a publication includes results of the project, the underlying research data will be made available according to the policies of the publishing media. Where no such policy exists, the recipient must indicate on the publication a means for requesting and digitally obtaining the underlying research data. This includes the research data necessary to validate any results, conclusions, charts, figures, images in the publications.

Save the DMP in a single Microsoft Word file using the following convention for the title "ControlNumber_LeadOrganization_DMP".

C. Content and Form of Replies to Reviewer Comments

EERE will provide applicants with reviewer comments following the evaluation of all eligible Full Applications. Applicants will have a brief opportunity to review the comments and to prepare a short Reply to Reviewer Comments responding to the comments however they desire or supplementing their Full Application. The Reply to Reviewer Comments is an optional submission; applicants are not required to submit a Reply to Reviewer Comments. EERE will post the Reviewer Comments in EERE Exchange. The expected submission deadline is on the cover page of the FOA; however, it is the applicant's responsibility to monitor EERE Exchange in the event that the expected date changes. The deadline will not be extended for applicants who are unable to timely submit their reply due to failure to check EERE Exchange or relying on the expected date alone. Applicants should anticipate having approximately three (3) business days to submit Replies to Reviewer Comments.

EERE will not review or consider ineligible Replies to Reviewer Comments (see Section III of the FOA). EERE will review and consider each eligible Full Application, even if no Reply is submitted or if the Reply is found to be ineligible.

Replies to Reviewer Comments must conform to the following content and form requirements, including maximum page lengths, described below. If a Reply to

Reviewer Comments is more than three (3) pages in length, EERE will review only the first three (3) pages and disregard any additional pages.

SECTION	PAGE LIMIT	DESCRIPTION
Text	2 pages max	Applicants may respond to one or more reviewer comments or supplement their Full Application.
Optional	1 page max	Applicants may use this page however they wish; text, graphs, charts, or other data to respond to reviewer comments or supplement their Full Application are acceptable.

D. Post Selection Information Requests

If selected for award, EERE reserves the right to request additional or clarifying information regarding the following (non-exhaustive list):

- Indirect cost information;
- Other budget information;
- Commitment Letters from Third Parties Contributing to Cost Share, if applicable;
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5);
- Representation of Limited Rights Data and Restricted Software, if applicable; and
- Environmental Questionnaire.

E. Dun and Bradstreet Universal Numbering System (DUNS) Number and System for Award Management (SAM)

Each applicant (unless the applicant is an individual or federal awarding agency that is excepted from those requirements under 2 CFR §25.110(b) or (c), or has an exception approved by the federal awarding agency under 2 CFR §25.110(d)) is required to: (1) Be registered in the SAM at https://www.sam.gov before submitting its application; (2) provide a valid DUNS number in its application; and (3) continue to maintain an active SAM registration with current information at all times during which it has an active federal award or an application or plan under consideration by a federal awarding agency. DOE may not make a federal award to an applicant until the applicant has complied with all applicable DUNS and SAM requirements and, if an applicant has not fully complied with the requirements by the time DOE is ready to make a federal award, the DOE will determine that the applicant is not qualified to receive a federal award and use that determination as a basis for making a federal award to another applicant.

F. Submission Dates and Times

Concept Papers, Full Applications, and Replies to Reviewer Comments must be submitted in EERE Exchange no later than 5 p.m. Eastern Time on the dates provided on the cover page of this FOA.

G. Intergovernmental Review

This FOA is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

H. Funding Restrictions

i. Allowable Costs

All expenditures must be allowable, allocable, and reasonable in accordance with the applicable federal cost principles.

Refer to the following applicable federal cost principles for more information:

- Federal Acquisition Regulation (FAR) Part 31 for For-Profit entities; and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

ii. Pre-Award Costs

Selectees must request prior written approval to charge pre-award costs. Pre-award costs are those incurred prior to the effective date of the federal award directly pursuant to the negotiation and in anticipation of the federal award where such costs are necessary for efficient and timely performance of the scope of work. Such costs are allowable only to the extent that they would have been allowable if incurred after the date of the federal award and **only** with the written approval of the federal awarding agency, through the Contracting Officer assigned to the award.

Pre-award costs cannot be incurred prior to the Selection Official signing the Selection Statement and Analysis.

Pre-award expenditures are made at the selectee's risk. EERE is not obligated to reimburse costs: (1) in the absence of appropriations; (2) if an award is not made; or (3) if an award is made for a lesser amount than the selectee anticipated.

1. National Environmental Policy Act (NEPA) Requirements Related to Pre-Award Costs

EERE's decision whether and how to distribute federal funds under this FOA is subject to NEPA. Applicants should carefully consider and should seek legal counsel or other expert advice before taking any action related to the proposed project that would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to EERE completing the NEPA review process.

EERE does not guarantee or assume any obligation to reimburse pre-award costs incurred prior to receiving written authorization from the Contracting Officer. If the applicant elects to undertake activities that DOE determines may have an adverse effect on the environment or limit the choice of reasonable alternatives prior to receiving such written authorization from the Contracting Officer, the applicant is doing so at risk of not receiving federal funding for their project and such costs may not be recognized as allowable cost share. Nothing contained in the pre-award cost reimbursement regulations or any pre-award costs approval letter from the Contracting Officer override these NEPA requirements to obtain the written authorization from the Contracting Officer prior to taking any action that may have an adverse effect on the environment or limit the choice of reasonable alternatives. Likewise, if an application is selected for negotiation of award, and the prime recipient elects to undertake activities that are not authorized for federal funding by the Contracting Officer in advance of EERE completing a NEPA review, the prime recipient is doing so at risk of not receiving federal funding and such costs may not be recognized as allowable cost share.

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

1. Requirement

All work performed under EERE awards must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment; however, the prime recipient should make every effort to purchase supplies and equipment within the United States. The prime recipient must flow down this requirement to its subrecipients.

2. Failure to Comply

If the prime recipient fails to comply with the Performance of Work in the United States requirement, EERE may deny reimbursement for the work conducted outside the United States and such costs may not be recognized as allowable recipient cost share. The prime recipient is responsible should any work under this award be performed outside the United States, absent a waiver, regardless of whether the work is performed by the prime recipient, subrecipients, contractors or other project partners.

3. Waiver

There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a foreign work waiver, the applicant must submit a written waiver request to EERE. Appendix B lists the necessary information that must be included in a request for a foreign work waiver.

The applicant must demonstrate to the satisfaction of EERE that a waiver would further the purposes of the FOA and is in the economic interests of the United States. EERE may require additional information before considering a waiver request. Save the waiver request(s) in a single PDF file titled "ControlNumber_LeadOrganization_Waiver". The applicant does not have the right to appeal EERE's decision concerning a waiver request.

iv. Construction

Recipients are required to obtain written authorization from the Contracting Officer before incurring any major construction costs.

v. Foreign Travel

Topic Area 1 – Pilot

Foreign travel costs are not allowable under this Topic Area.

Topic Area 2 - Amplify

It is critical for those in the domestic EGS community, including those likely to be funded under this Topic Area, to interact and maintain relationships with the international EGS community. Knowledgeable and well-funded sectors in Switzerland, Germany, France, Iceland, Australia, New Zealand, Japan, and China have complementary goals and strengths to those of the domestic EGS community. These interactions and relationships may require foreign travel, and will enable both the spread of domestic ideas as well as taking advantage of best practices, lessons learned, and cutting edge technologies from the international geothermal community efforts in the past decade.

If international travel is included in the proposed project, please note that your organization must comply with the International Air Transportation Fair Competitive Practices Act of 1974 (49 USC 40118), commonly referred to as the "Fly America Act," and implementing regulations at 41 CFR 301-10.131 through 301-10.143. The law and regulations require air transport of people or property to, from, between, or within a country other than the United States, the cost of which is supported under this award, to be performed by or under a cost-sharing arrangement with a U.S. flag carrier, if service is available. Foreign travel costs

are allowable only with the written prior approval of the Contracting Officer assigned to the award.

vi. Equipment and Supplies

To the greatest extent practicable, all equipment and products purchased with funds made available under this FOA should be American-made. This requirement does not apply to used or leased equipment.

Property disposition will be required at the end of a project if the current fair market value of property exceeds $5,000. For-profit entity disposition requirements are set forth at 2 CFR 910.360. Property disposition requirements for other non-federal entities are set forth in 2 CFR 200.310 – 200.316.

vii. Domestic Preference – Infrastructure Projects

As appropriate and to the extent consistent with law, Applicants shall ensure that, to the greatest extent practicable, iron and aluminum as well as steel, cement, and other manufactured products (items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber) used in the proposed project shall be produced in the United States. This requirement shall flow down to all sub-awards including all contracts, subcontracts and purchase orders for work performed under the proposed project.

viii. Lobbying

Recipients and subrecipients may not use any federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Recipients and subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to ensure that non-federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with the application:

- An officer or employee of any federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

ix. Risk Assessment

Prior to making a federal award, the DOE is required by 31 U.S.C. 3321 and 41 U.S.C. 2313 to review information available through any Office of Management and Budget (OMB)-designated repositories of government-wide eligibility qualification or financial integrity information, such as SAM Exclusions and "Do Not Pay."

In addition, DOE evaluates the risk(s) posed by applicants before they receive federal awards. This evaluation may consider: results of the evaluation of the applicant's eligibility; the quality of the application; financial stability; quality of management systems and ability to meet the management standards prescribed in this part; history of performance; reports and findings from audits; and the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-federal entities.

In addition to this review, DOE must comply with the guidelines on government-wide suspension and debarment in 2 CFR 180, and must require non-federal entities to comply with these provisions. These provisions restrict federal awards, subawards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in federal programs or activities.

x. Invoice Review and Approval

DOE employs a risk-based approach to determine the level of supporting documentation required for approving invoice payments. Recipients may be required to provide some or all of the following items with their requests for reimbursement:

- Summary of costs by cost categories;
- Timesheets or personnel hours report;
- Invoices/receipts for all travel, equipment, supplies, contractual, and other costs;
- UCC filing proof for equipment acquired with project funds by for-profit recipients and subrecipients;
- Explanation of cost share for invoicing period;
- Analogous information for some subrecipients; and
- Other items as required by DOE.

xi. Potential Liability Issues

Operator/well owner liability and DOE liability related to wellbore insurance are issues that may affect the scope, schedule, and budget for selected projects. General liability insurance typically covers third party bodily injury and property

damage claims arising from an insured's liability (caused by negligence or acts of omission) at the site. Site operators typically provide insurance for their direct employees, but may not be willing or able to insure outside researchers working at their site. Downhole tool insurance may also be obtained to cover the partial or full replacement cost of a tool that becomes lost or stuck within a well during operations. Given the complexity of liability issues, details regarding insurance may need to be reviewed and agreed upon during award negotiations.

V. Application Review Information

A. Technical Review Criteria

i. Full Applications

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

- **Topic Area 1 - Pilot**

Criterion 1: Technical Merit, Innovation, and Impact (50%)

- Level of technical quality, clarity, and completeness of application
- Sufficient data provided on the condition of the well and feasibility of the proposed re-work / re-completion
- Willingness of site operator to allow the full range of potential testing activities to occur in the proposed well(s)
- Sufficient data provided on target well(s) including stratigraphy,/lithologic column, temperature profile, baseline flow rate, results of injection/flow tests, well completion history, etc., illustrating that proposed wells will meet DOE goals for this effort.
- Adequacy of site characterization data including basic geologic data, geophysical/geological logs, seismic surveys as relevant to seismic and environmental risk.
- Adequacy and completeness of the Statement of Project Objectives (SOPO) including a descriptions of how all objectives will be met

Criterion 2: Project Management Plan (10%)

- Soundness of the project management concept with respect to proposed tasks and organizational structure to achieve project/phase objectives
- Clarity and completeness of a plan to address potential risks and liabilities (e.g., technical, financial, and environmental) that are associated with the project including a discussion of the proposed well rework (as applicable) and collaboration with FORGE awards.
- Likelihood of achieving project objectives through realistic milestones, timely schedule, and task structure

Criterion 3: Team and Resources (40%)
This criterion involves consideration of the following factors:

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the site and available wells to support the work including extent of the characterization, planning and regulatory and environmental permitting of the target site
- The reasonableness of the budget and spend plan for the proposed project and objectives.

- **Topic Area 2 - Amplify**

Criterion 1: Technical Merit, Innovation, and Impact (50%)

- Technical merit and feasibility of the proposed work (i.e., is it based on sound scientific/engineering principles and on an understanding of current state of the art technology/methods in the geothermal industry, is it feasible to accomplish and deploy proposed technology within the project time-frame)
- Extent that proposed well stimulation methods are field-ready, have demonstrated successful functionality in the field (regardless of industry use) and will advance the state-of-the-art in EGS deployment.
- Adequacy of existing site characterization data and geologic/geothermal model including data on rock properties, stratigraphy/lithology, temperature profile, petrologic/mineralogical evaluations of cuttings/core, geophysical/geological logs, stress data, etc. to support project objectives
- Availability and adequacy of historic seismic data from the proposed project area

Criterion 2: Project Management Plan (10 %)

- Soundness of the project management concept with respect to proposed tasks and organizational structure to achieve project/phase objectives
- Clarity and completeness of a plan to address potential risks and liabilities (e.g., technical, financial, and environmental) that are associated with the project including a discussion of the proposed well rework and/or stimulation plan (as applicable)
- Likelihood of achieving project objectives through realistic milestones,

timely schedule, and task structure
- Appropriateness of proposed Go/no-go decision points

Criterion 3: Team and Resources (40%)
- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work including Extent of the characterization, planning and regulatory and environmental permitting of the target site
- The degree to which the proposed team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

ii. Criteria for Replies to Reviewer Comments

EERE has not established separate criteria to evaluate Replies to Reviewer Comments. Instead, Replies to Reviewer Comments are attached to the original applications and evaluated as an extension of the Full Application.

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA, by the standards set forth in EERE's Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011) and the guidance provided in the "DOE Merit Review Guide for Financial Assistance," effective April 14, 2017, which is available at: https://energy.gov/management/downloads/merit-review-guide-financial-assistance-and-unsolicited-proposals-current.

C. Other Selection Factors

i. Program Policy Factors

In addition to the above criteria, the Selection Official may consider the following program policy factors in determining which Full Applications to select for award negotiations:

- The degree to which the proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;
- The degree to which the proposed project, including proposed cost share, optimizes the use of available EERE funding to achieve programmatic objectives;
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers;
- The degree to which the proposed project is likely to lead to increased employment and manufacturing in the United States;
- The degree to which the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty;
- Whether the proposed project will occur in a Qualified Opportunity Zone or otherwise advance the goals of Qualified Opportunity Zones[6]. The goals include spurring economic development and job creation in distressed communities throughout the United States.
- The degree to which the proposed project, or group of projects, represent a desired geographic and/or geologic distribution (considering past awards and current applications); and
- The degree to which the proposed project supports complementary efforts or projects (e.g. FORGE, etc.), which, when taken together, will best achieve the research goals and objectives.

D. Evaluation and Selection Process

i. Overview

The evaluation process consists of multiple phases; each includes an initial eligibility review and a thorough technical review. Rigorous technical reviews of eligible submissions are conducted by reviewers that are experts in the subject matter of the FOA. Ultimately, the Selection Official considers the recommendations of the reviewers, along with other considerations such as program policy factors, in determining which applications to select.

[6] Opportunity zones were added to the Internal Revenue Code by section 13823 of the Tax Cuts and Jobs Act of 2017, codified at 26 U.S.C. 1400Z-1. The list of designated Qualified Opportunity Zones can be found in IRS Notices 2018-48 (PDF) and 2019-42 (PDF). Further, a visual map of the census tracts designated as Qualified Opportunity Zones may also be found at Opportunity Zones Resources. Also see, frequently asked questions about Qualified Opportunity Zones.

ii. Pre-Selection Interviews

As part of the evaluation and selection process, EERE may invite one or more applicants to participate in Pre-Selection Interviews. Pre-Selection Interviews are distinct from and more formal than pre-selection clarifications (See Section V.D.iii of the FOA). The invited applicant(s) will meet with EERE representatives to provide clarification on the contents of the Full Applications and to provide EERE an opportunity to ask questions regarding the proposed project. The information provided by applicants to EERE through Pre-Selection Interviews contributes to EERE's selection decisions.

EERE will arrange to meet with the invited applicants in person at EERE's offices or a mutually agreed upon location. EERE may also arrange site visits at certain applicants' facilities. In the alternative, EERE may invite certain applicants to participate in a one-on-one conference with EERE via webinar, videoconference, or conference call.

EERE will not reimburse applicants for travel and other expenses relating to the Pre-Selection Interviews, nor will these costs be eligible for reimbursement as pre-award costs.

EERE may obtain additional information through Pre-Selection Interviews that will be used to make a final selection determination. EERE may select applications for funding and make awards without Pre-Selection Interviews. Participation in Pre-Selection Interviews with EERE does not signify that applicants have been selected for award negotiations.

iii. Pre-Selection Clarification

EERE may determine that pre-selection clarifications are necessary from one or more applicants. Pre-selection clarifications are distinct from and less formal than Pre-Selection Interviews. These pre-selection clarifications will solely be for the purposes of clarifying the application, and will be limited to information already provided in the application documentation. The pre-selection clarifications may occur before, during or after the merit review evaluation process. Information provided by an applicant that is not necessary to address the pre-selection clarification question will not be reviewed or considered. Typically, a pre-selection clarification will be carried out through either written responses to EERE's written clarification questions or video or conference calls with EERE representatives.

The information provided by applicants to EERE through pre-selection clarifications is incorporated in their applications and contributes to the merit review evaluation and EERE's selection decisions. If EERE contacts an applicant

for pre-selection clarification purposes, it does not signify that the applicant has been selected for negotiation of award or that the applicant is among the top ranked applications.

EERE will not reimburse applicants for expenses relating to the pre-selection clarifications, nor will these costs be eligible for reimbursement as pre-award costs.

iv. Recipient Integrity and Performance Matters

DOE, prior to making a federal award with a total amount of federal share greater than the simplified acquisition threshold, is required to review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (currently FAPIIS) (see 41 U.S.C. 2313).

The applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM.

DOE will consider any written comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under federal awards when completing the review of risk posed by applicants as described in 2 C.F.R. § 200.205.

v. Selection

The Selection Official may consider the technical merit, the Federal Consensus Board's recommendations, program policy factors, and the amount of funds available in arriving at selections for this FOA.

E. Anticipated Notice of Selection and Award Negotiation Dates

EERE anticipates notifying applicants selected for negotiation of award and negotiating awards by the dates provided on the cover page of this FOA.

VI. Award Administration Information

A. Award Notices

i. Ineligible Submissions

Ineligible Concept Papers and Full Applications will not be further reviewed or considered for award. The Contracting Officer will send a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE Exchange. The notification letter will state the basis upon which the Concept Paper or the Full Application is ineligible and not considered for further review.

ii. Full Application Notifications

EERE will notify applicants of its determination via a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE Exchange. The notification letter will inform the applicant whether or not its Full Application was selected for award negotiations. Alternatively, EERE may notify one or more applicants that a final selection determination on particular Full Applications will be made at a later date, subject to the availability of funds or other factors.

iii. Successful Applicants

Receipt of a notification letter selecting a Full Application for award negotiations does not authorize the applicant to commence performance of the project. If an application is selected for award negotiations, it is not a commitment by EERE to issue an award. Applicants do not receive an award until award negotiations are complete and the Contracting Officer executes the funding agreement, accessible by the prime recipient in FedConnect.

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. The applicant must be responsive during award negotiations (i.e., provide requested documentation) and meet the negotiation deadlines. If the applicant fails to do so or if award negotiations are otherwise unsuccessful, EERE will cancel the award negotiations and rescind the Selection. EERE reserves the right to terminate award negotiations at any time for any reason.

Please refer to Section IV.J.ii. of the FOA for guidance on pre-award costs.

iv. Alternate Selection Determinations

In some instances, an applicant may receive a notification that its application was not selected for award and EERE designated the application to be an alternate. As an alternate, EERE may consider the Full Application for federal funding in the future. A notification letter stating the Full Application is designated as an alternate does not authorize the applicant to commence performance of the project. EERE may ultimately determine to select or not select the Full Application for award negotiations.

v. Unsuccessful Applicants

EERE shall promptly notify in writing each applicant whose application has not been selected for award or whose application cannot be funded because of the unavailability of appropriated funds.

B. Administrative and National Policy Requirements

i. Registration Requirements

There are several one-time actions before submitting an application in response to this FOA, and it is vital that applicants address these items as soon as possible. Some may take several weeks, and failure to complete them could interfere with an applicant's ability to apply to this FOA, or to meet the negotiation deadlines and receive an award if the application is selected. These requirements are as follows:

1. **EERE Exchange**
   Register and create an account on EERE Exchange at https://eere-Exchange.energy.gov.
   This account will then allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Applicants should also designate backup points of contact so they may be easily contacted if deemed necessary. **This step is required to apply to this FOA.**

   The EERE Exchange registration does not have a delay; however, **the remaining registration requirements below could take several weeks to process and are necessary for a potential applicant to receive an award under this FOA**.

2. **DUNS Number**
   Obtain a DUNS number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform.

3. **System for Award Management**
   Register with the SAM at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called a Marketing Partner ID Number (MPIN) are important steps in SAM registration. Please update your SAM registration annually.

4. **FedConnect**
   Register in FedConnect at https://www.fedconnect.net. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf.

5. **Grants.gov**
   Register in Grants.gov (http://www.grants.gov) to receive automatic updates when Amendments to this FOA are posted. However, please note that Concept Papers and Full Applications will not be accepted through Grants.gov.

6. **Electronic Authorization of Applications and Award Documents**
   Submission of an application and supplemental information under this FOA through electronic systems used by the DOE, including EERE Exchange and FedConnect.net, constitutes the authorized representative's approval and electronic signature.

ii. Award Administrative Requirements

The administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR Part 200 as amended by 2 CFR Part 910.

iii. Foreign National Access Under DOE Order 142.3A, "Unclassified Foreign Visits and Assignments Program"

All applicants selected for an award under this FOA may be required to provide information to DOE in order to satisfy requirements for foreign nationals' access to DOE sites, information, technologies, equipment, programs or personnel. A foreign national is defined as any person who is not a U.S. citizen by birth or naturalization. If a selected applicant (including any of its subrecipients, contractors or vendors) anticipates involving foreign nationals in the performance of its award, the selected applicant may be required to provide DOE with specific information about each foreign national to ensure compliance with the requirements for access approval. National laboratory personnel

already cleared for site access may be excluded. Access approval for foreign nationals from countries identified on the U.S. Department of State's list of State Sponsors of Terrorism must receive final approval authority from the Secretary of Energy or the Secretary's assignee before they commence any work under the award.

iv. Subaward and Executive Reporting

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency Act of 2006 (FFATA) are contained in 2 CFR Part 170. Prime recipients must register with the new FFATA Subaward Reporting System database and report the required data on their first tier subrecipients. Prime recipients must report the executive compensation for their own executives as part of their registration profile in SAM.

v. National Policy Requirements

The National Policy Assurances that are incorporated as a term and condition of award are located at: http://www.nsf.gov/awards/managing/rtc.jsp.

vi. Environmental Review in Accordance with National Environmental Policy Act (NEPA)

EERE's decision whether and how to distribute federal funds under this FOA is subject to NEPA (42 U.S.C. 4321, *et seq.*). NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE's NEPA website, at https://www.energy.gov/nepa.

While NEPA compliance is a federal agency responsibility and the ultimate decisions remain with the federal agency, all recipients selected for an award will be required to assist in the timely and effective completion of the NEPA process in the manner most pertinent to their proposed project. If DOE determines certain records must be prepared to complete the NEPA review process (e.g., biological evaluations or environmental assessments), the recipient may be required to prepare the records and the costs to prepare the necessary records may be included as part of the project costs.

For both topic areas, many field-based activities such as well logging and/or rework may be required depending on the current operational status of the well. Also, operation of downhole tools and monitoring equipment will likely be required in order to fully assess well conditions prior to any potential well stimulation activities.

Please provide sufficient information to describe the extent of environmental benefits and impacts resulting from the proposed project including assumptions and quantitative data – provide as much information as possible on topics including, but not limited to, cultural and biological resources, handling/disposal of geothermal and power plant working fluids, road construction, transmission lines, and site restoration.

Sufficiently characterize the technical work to be accomplished and all historical and future environmental related activities in support of the proposed technical work. Include completed documents or links to completed documents and identify work remaining to be completed. These documents include, but are not limited to, permits, regulatory approvals, environmental assessments and environmental impact statements.

In the Technical Volume, GTO will request that the applicants list the various environmental and regulatory requirements that must be satisfied before, during, and after the project is implemented. These requirements should include all statutory, regulatory, and permitting requirements that would be applicable to the proposed project, including the National Environmental Policy Act (NEPA). Applicants will be instructed to: (1) explain any environmental requirements that have already been satisfied; (2) identify any issues, conditions, concerns and/or constraints associated with on-going permitting efforts; and (3) set forth a plan to satisfy the remaining requirements and the anticipated time frame for meeting those requirements.

Selected applicants will submit EQ1 forms during award negotiations.

vii. Applicant Representations and Certifications

1. **Lobbying Restrictions**
   By accepting funds under this award, the prime recipient agrees that none of the funds obligated on the award shall be expended, directly or indirectly, to influence Congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. §1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

2. **Corporate Felony Conviction and Federal Tax Liability Representations**
   In submitting an application in response to this FOA, the applicant represents that:

a. It is **not** a corporation that has been convicted of a felony criminal violation under any federal law within the preceding 24 months; and

b. It is **not** a corporation that has any unpaid federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

For purposes of these representations the following definitions apply:

A Corporation includes any entity that has filed articles of incorporation in any of the 50 states, the District of Columbia, or the various territories of the United States [but not foreign corporations]. It includes both for-profit and non-profit organizations.

3. Nondisclosure and Confidentiality Agreements Representations
In submitting an application in response to this FOA the applicant represents that:

a. It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contactors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a federal department or agency authorized to receive such information.

b. It **does not and will not** use any federal funds to implement or enforce any nondisclosure and/or confidentiality policy, form, or agreement it uses unless it contains the following provisions:

(1) *''These provisions are consistent with and do not supersede, conflict with, or otherwise alter the employee obligations, rights, or liabilities created by existing statute or Executive order relating to (1) classified information, (2) communications to Congress, (3) the reporting to an Inspector General of a violation of any law, rule, or regulation, or mismanagement, a gross waste of funds, an abuse of authority, or a substantial and specific danger to public health or safety, or (4) any other whistleblower protection. The definitions, requirements, obligations, rights, sanctions, and liabilities created by controlling Executive orders and statutory provisions are incorporated into this agreement and are controlling.''*

(2) The limitation above shall not contravene requirements applicable to Standard Form 312 Classified Information Nondisclosure Agreement (https://fas.org/sgp/othergov/sf312.pdf), Form 4414 Sensitive Compartmented Information Disclosure Agreement (https://fas.org/sgp/othergov/intel/sf4414.pdf), or any other form issued by a federal department or agency governing the nondisclosure of classified information.

(3) Notwithstanding the provision listed in paragraph (a), a nondisclosure or confidentiality policy form or agreement that is to be executed by a person connected with the conduct of an intelligence or intelligence-related activity, other than an employee or officer of the United States government, may contain provisions appropriate to the particular activity for which such document is to be used. Such form or agreement shall, at a minimum, require that the person will not disclose any classified information received in the course of such activity unless specifically authorized to do so by the United States government. Such nondisclosure or confidentiality forms shall also make it clear that they do not bar disclosures to Congress, or to an authorized official of an executive agency or the Department of Justice, that are essential to reporting a substantial violation of law.

viii. Statement of Federal Stewardship

EERE will exercise normal federal stewardship in overseeing the project activities performed under EERE awards. Stewardship Activities include, but are not limited to, conducting site visits; reviewing performance and financial reports; providing assistance and/or temporary intervention in unusual circumstances to correct deficiencies that develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the project objectives have been accomplished.

ix. Statement of Substantial Involvement

EERE has substantial involvement in work performed under awards made as a result of this FOA. EERE does not limit its involvement to the administrative requirements of the award. Instead, EERE has substantial involvement in the direction and redirection of the technical aspects of the project as a whole. Substantial involvement includes, but is not limited to, the following:

1. EERE shares responsibility with the recipient for the management, control, direction, and performance of the project.

2. EERE may intervene in the conduct or performance of work under this award for programmatic reasons. Intervention includes the interruption or modification of the conduct or performance of project activities.

3. EERE may redirect or discontinue funding the project based on the outcome of EERE's evaluation of the project at the Go/no-go decision point(s).

4. EERE participates in major project decision-making processes.

5. The DOE Geothermal Technologies Office will be involved in site characterization, reservoir creation and oversight of the management of the reservoir. Specific involvement may include:

   - Halting an activity if detailed performance specifications are not met
   - Providing joint technical collaboration with recipient
   - Monitoring to permit specified kinds of direction and redirection of work because of interrelationships with other projects
   - DOE reserves the right to permanently or temporarily withdraw any well from operations if they no longer serve the goals of the "Pilot" initiative

x. Intellectual Property Management Plan (IPMP)

Topic Area 1 – Pilot
Within 30 days of selection, applicants must submit an executed IPMP between the members of the consortia or team.

Topic Area 2 - Amplify
With the full application, applicants must submit an executed IPMP between the members of the consortia or team. Past experience has shown that there is some variance between geothermal operators regarding the proprietary nature of certain tools, zonal isolation methods, well stimulation technologies, and operational data. It would be useful to DOE to have this information included with full applications.

For both Topic Areas, the award will set forth the treatment of and obligations related to intellectual property rights between EERE and the individual members. The IPMP should describe how the members will handle intellectual property rights and issues between themselves while ensuring compliance with federal intellectual property laws, regulations, and policies (see Sections VIII.K.-VIII.N. of this FOA for more details on applicable federal intellectual property laws and

regulations). Guidance regarding the contents of IPMP is available from EERE upon request.

The following is a non-exhaustive list of examples of items that the IPMP may cover:

- The treatment of confidential information between members (e.g., the use of NDAs);
- The treatment of background intellectual property (e.g., any requirements for identifying it or making it available);
- The treatment of inventions made under the award (e.g., any requirements for disclosing to the other members on an application, filing patent applications, paying for patent prosecution, and cross-licensing or other licensing arrangements between the members);
- The treatment of data produced, including software, under the award (e.g., any publication process or other dissemination strategies, copyrighting strategy or arrangement between members);
- Any technology transfer and commercialization requirements or arrangements between the members;
- The treatment of any intellectual property issues that may arise due to a change in membership of the consortia or team; and
- The handling of disputes related to intellectual property between the members.

xi. Subject Invention Utilization Reporting

In order to ensure that prime recipients and subrecipients holding title to subject inventions are taking the appropriate steps to commercialize subject inventions, EERE may require that each prime recipient holding title to a subject invention submit annual reports for ten (10) years from the date the subject invention was disclosed to EERE on the utilization of the subject invention and efforts made by prime recipient or their licensees or assignees to stimulate such utilization. The reports must include information regarding the status of development, date of first commercial sale or use, gross royalties received by the prime recipient, and such other data and information as EERE may specify.

xii. Intellectual Property Provisions

The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at http://energy.gov/gc/standard-intellectual-property-ip-provisions-financial-assistance-awards.

xiii. Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement. This helpful EERE checklist can be accessed at https://www.energy.gov/eere/funding/eere-funding-application-and-management-forms. See Attachment 2 Federal Assistance Reporting Checklist, after clicking on "Model Cooperative Agreement" under the Award Package section.

GTO will require submission of applicable project data to the National Geothermal Data System (NGDS) / Geothermal Data Repository (GDR) on a regular basis for both topic areas.

Daily operations reports will be anticipated during field-based operations for both topic areas.

The recipient may be asked to provide a Project Update Report, an Operating Plan, and/or a Peer Review Report.

Awardees will also provide a Baseline Well Status Report detailing the costs of historical and proposed well workover processes/technologies to be used.

Award recipients will be expected to submit or present the following reports, at a minimum:

- Technical and Financial reports will be submitted quarterly;
- Technical and Financial reports will be submitted annually;
- Phase 1 Report;
- Phase 2 Report;
- Preliminary Stimulation Report within two weeks of stimulation (if applicable);
- Final Stimulation Report, for public dissemination, within two months of stimulation (if applicable);
- Phase 3 Report;
- Final Report;
- Annual Operating Plan;
- Peer/Program Review Report; and
- Other reports as deemed necessary by the GTO Project Officer.

xiv. Go/no-go Review

Each project selected under this FOA will be subject to a periodic project evaluation referred to as a Go/no-go Review. At the Go/no-go decision points, EERE will evaluate project performance, project schedule adherence, meeting

milestone objectives, compliance with reporting requirements, and overall contribution to the EERE program goals and objectives. Federal funding beyond the Go/no-go decision point (continuation funding) is contingent upon (1) availability of federal funds appropriated by Congress for the purpose of this program; (2) the availability of future-year budget authority; (3) recipient's technical progress compared to the Milestone Summary Table stated in Attachment 1 of the award; (4) recipient's submittal of required reports; (5) recipient's compliance with the terms and conditions of the award; (6) EERE's Go/no-go decision; (7) the recipient's submission of a continuation application; and (8) written approval of the continuation application by the Contracting Officer.

As a result of the Go/no-go Review, DOE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

The Go/no-go decision is distinct from a non-compliance determination. In the event a recipient fails to comply with the requirements of an award, EERE may take appropriate action, including but not limited to, redirecting, suspending or terminating the award.

xv. Conference Spending

The recipient shall not expend any funds on a conference not directly and programmatically related to the purpose for which the grant or cooperative agreement was awarded that would defray the cost to the United States government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States government would otherwise exceed $20,000, thereby circumventing the required notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

xvi. Uniform Commercial Code (UCC) Financing Statements

Per 2 CFR 910.360 (Real Property and Equipment) when a piece of equipment is purchased by a for-profit recipient or subrecipient with federal funds, and when

the federal share of the financial assistance agreement is more than $1,000,000, the recipient or subrecipient must:

Properly record, and consent to the Department's ability to properly record if the recipient fails to do so, UCC financing statement(s) for all equipment in excess of $5,000 purchased with project funds. These financing statement(s) must be approved in writing by the Contracting Officer prior to the recording, and they shall provide notice that the recipient's title to all equipment (not real property) purchased with federal funds under the financial assistance agreement is conditional pursuant to the terms of this section, and that the government retains an undivided reversionary interest in the equipment. The UCC financing statement(s) must be filed before the Contracting Officer may reimburse the recipient for the federal share of the equipment unless otherwise provided for in the relevant financial assistance agreement. The recipient shall further make any amendments to the financing statements or additional recordings, including appropriate continuation statements, as necessary or as the Contracting Officer may direct.

VII. Questions/Agency Contacts

Upon the issuance of a FOA, EERE personnel are prohibited from communicating (in writing or otherwise) with applicants regarding the FOA except through the established question and answer process as described below. Specifically, questions regarding the content of this FOA must be submitted to: WellsofOpportunity@ee.doe.gov. Questions must be submitted not later than three (3) business days prior to the application due date and time. Please note, feedback on individual concepts will not be provided through Q&A.

All questions and answers related to this FOA will be posted on EERE Exchange at: https://eere-exchange.energy.gov. **Please note that you must first select this specific FOA Number in order to view the questions and answers specific to this FOA**. EERE will attempt to respond to a question within three (3) business days, unless a similar question and answer has already been posted on the website.

Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov.

VIII. Other Information

A. FOA Modifications

Amendments to this FOA will be posted on the EERE Exchange website and the Grants.gov system. However, you will only receive an email when an amendment or

a FOA is posted on these sites if you register for email notifications for this FOA in Grants.gov. EERE recommends that you register as soon after the release of the FOA as possible to ensure you receive timely notice of any amendments or other FOAs.

B. Government Right to Reject or Negotiate

EERE reserves the right, without qualification, to reject any or all applications received in response to this FOA and to select any application, in whole or in part, as a basis for negotiation and/or award.

C. Commitment of Public Funds

The Contracting Officer is the only individual who can make awards or commit the government to the expenditure of public funds. A commitment by anyone other than the Contracting Officer, either express or implied, is invalid.

D. Treatment of Application Information

Applicants should not include trade secrets or commercial or financial information that is privileged or confidential in their application unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the FOA. Applicants are advised to not include any critically sensitive proprietary detail

If an application includes trade secrets or information that is commercial or financial, or information that is confidential or privileged, it is furnished to the Government in confidence with the understanding that the information shall be used or disclosed only for evaluation of the application. Such information will be withheld from public disclosure to the extent permitted by law, including the Freedom of Information Act. Without assuming any liability for inadvertent disclosure, EERE will seek to limit disclosure of such information to its employees and to outside reviewers when necessary for merit review of the application or as otherwise authorized by law. This restriction does not limit the Government's right to use the information if it is obtained from another source.

Concept Papers, Full Applications, Replies to Reviewer Comments, and other submissions containing confidential, proprietary, or privileged information must 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 or otherwise. 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 cover sheet of the Concept Paper, Full Application, Reply to Reviewer Comments, or other submission must be marked as follows and identify the specific pages containing trade secrets, confidential, proprietary, or privileged information:

Notice of Restriction on Disclosure and Use of Data:
Pages [list applicable pages] of this document may contain trade secrets, 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. [End of Notice]

The header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: "Contains Trade Secrets, Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure." In addition, each line or paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

E. Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation, the Go/no-go Reviews and Peer Reviews, the government may seek the advice of qualified non-federal personnel as reviewers. The government may also use non-federal personnel to conduct routine, nondiscretionary administrative activities, including EERE contractors. The applicant, by submitting its application, consents to the use of non-federal reviewers/administrators. Non-federal reviewers must sign conflict of interest (COI) and non-disclosure acknowledgements (NDA) prior to reviewing an application. Non-federal personnel conducting administrative activities must sign an NDA.

F. Notice Regarding Eligible/Ineligible Activities

Eligible activities under this FOA include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

G. Notice of Right to Conduct a Review of Financial Capability

EERE reserves the right to conduct an independent third party review of financial capability for applicants that are selected for negotiation of award (including personal credit information of principal(s) of a small business if there is insufficient information to determine financial capability of the organization).

H. Requirement for Full and Complete Disclosure

Applicants are required to make a full and complete disclosure of all information requested. Any failure to make a full and complete disclosure of the requested information may result in:

- The termination of award negotiations;
- The modification, suspension, and/or termination of a funding agreement;
- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

I. Retention of Submissions

EERE expects to retain copies of all Full Applications and Replies to Reviewer Comments, and other submissions. No submissions will be returned. By applying to EERE for funding, applicants consent to EERE's retention of their submissions.

J. Title to Subject Inventions

Ownership of subject inventions is governed pursuant to the authorities listed below:

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions;

- All other parties: The federal Non-Nuclear Energy Act of 1974, 42. U.S.C. 5908, provides that the government obtains title to new inventions unless a waiver is granted (see below);

- Class Patent Waiver: DOE has issued a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan are sufficient.

- Advance and Identified Waivers: Applicants may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to EERE within the timeframes set forth in the award's intellectual property terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784; and

K. Government Rights in Subject Inventions

Where prime recipients and subrecipients retain title to subject inventions, the U.S. government retains certain rights.

1. Government Use License

The U.S. government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world. This license extends to contractors doing work on behalf of the government.

2. March-In Rights

The U.S. government retains march-in rights with respect to all subject inventions. Through "march-in rights," the government may require a prime recipient or subrecipient who has elected to retain title to a subject invention (or their assignees or exclusive licensees), to grant a license for use of the invention to a third party. In addition, the government may grant licenses for use of the subject invention when a prime recipient, subrecipient, or their assignees and exclusive licensees refuse to do so.

DOE may exercise its march-in rights only if it determines that such action is necessary under any of the four following conditions:

- The owner or licensee has not taken or is not expected to take effective steps to achieve practical application of the invention within a reasonable time;
- The owner or licensee has not taken action to alleviate health or safety needs in a reasonably satisfied manner;
- The owner has not met public use requirements specified by federal statutes in a reasonably satisfied manner; or
- The U.S. manufacturing requirement has not been met.

Any determination that march-in rights are warranted must follow a fact-finding process in which the recipient has certain rights to present evidence and witnesses, confront witnesses and appear with counsel and appeal any adverse decision. To date, DOE has never exercised its march-in rights to any subject inventions.

L. Rights in Technical Data

Data rights differ based on whether data is first produced under an award or instead was developed at private expense outside the award.

"Limited Rights Data": The U.S. government will not normally require delivery of confidential or trade secret-type technical data developed solely at private expense prior to issuance of an award, except as necessary to monitor technical progress and evaluate the potential of proposed technologies to reach specific technical and cost metrics.

Government Rights in Technical Data Produced Under Awards: The U.S. government normally retains unlimited rights in technical data produced under government financial assistance awards, including the right to distribute to the public. However, pursuant to special statutory authority, certain categories of data generated under EERE awards may be protected from public disclosure for up to five years after the data is generated ("Protected Data"). For awards permitting Protected Data, the protected data must be marked as set forth in the awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

Potential data restrictions will be discussed with each project selected for negotiations leading to an award. In general, GTO would prefer to avoid long-term protections on data generated by these awards given that the results of projects from both topic areas will be used to inform field-based efforts at FORGE, which will likely be taking place immediately after or even concurrently with projects selected under this FOA.

Additionally, data restrictions may become more complicated should third parties to the award between DOE and the prime awardee become involved with the project. For example, a third-party entity such as a small business could run a geothermal tool in a well owned by the awardee, and potential data restrictions (outside of those in the actual financial award) would need to be agreed upon by all parties. The Data Management Plan developed with the award should address such issues, if applicable.

M. Copyright

The prime recipient and subrecipients may assert copyright in copyrightable works, such as software, first produced under the award without EERE approval. When copyright is asserted, the government retains a paid-up nonexclusive, irrevocable worldwide license to reproduce, prepare derivative works, distribute copies to the public, and to perform publicly and display publicly the copyrighted work. This license extends to contractors and others doing work on behalf of the government.

N. Export Control

The U.S. government regulates the transfer of information, commodities, technology, and software considered to be strategically important to the U.S. to protect national security, foreign policy, and economic interests without imposing undue regulatory burdens on legitimate international trade. There is a network of federal agencies and regulations that govern exports that are collectively referred to as "Export Controls". To ensure compliance with Export Controls, it is the prime recipient's responsibility to determine when its project activities trigger Export Controls and to ensure compliance.

Export Controls may apply to individual projects, depending on the nature of the tasks. When Export Controls apply, the recipient must take the appropriate steps to obtain any required governmental licenses, monitor and control access to restricted information, and safeguard all controlled materials. Under no circumstances may foreign entities (organizations, companies or persons) receive access to export controlled information unless proper export procedures have been satisfied and such access is authorized pursuant to law or regulation.

Applicants are advised that some of the results of the research conducted under this FOA are expected to be restricted for proprietary reasons and not published or shared broadly within the scientific community.

O. Personally Identifiable Information (PII)

All information provided by the applicant must to the greatest extent possible exclude PII. The term "PII" refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name. (See OMB Memorandum M-07-16 dated May 22, 2007, found at:
https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2007/m07-16.pdf

By way of example, applicants must screen resumes to ensure that they do not contain PII such as personal addresses, personal landline/cell phone numbers, and personal emails. **Under no circumstances should Social Security Numbers (SSNs) be included in the application**. Federal agencies are prohibited from the collecting, using, and displaying unnecessary SSNs. (See, the Federal Information Security Modernization Act of 2014 (Pub. L. No. 113-283, Dec 18, 2014; 44 U.S.C. §3551).

P. Annual Independent Audits

If a for-profit entity is a prime recipient and has expended $750,000 or more of DOE awards during the entity's fiscal year, an annual compliance audit performed by an independent auditor is required. For additional information, please refer to 2 C.F.R. § 910.501 and Subpart F.

If an educational institution, non-profit organization, or state/local government is a prime recipient or subrecipient and has expended $750,000 or more of federal awards during the non-federal entity's fiscal year, then a Single or Program-Specific Audit is required. For additional information, please refer to 2 C.F.R. § 200.501 and Subpart F.

Applicants and subrecipients (if applicable) should propose sufficient costs in the project budget to cover the costs associated with the audit. EERE will share in the cost of the audit at its applicable cost share ratio.

Q. Informational Webinar

EERE will conduct one informational webinar during the FOA process. It will be held after the initial FOA release but before the due date for full applications.

Attendance is not mandatory and will not positively or negatively impact the overall review of any applicant submissions. As the webinar will be open to all applicants who wish to participate, applicants should refrain from asking questions or communicating information that would reveal confidential and/or proprietary information specific to their project. Specific dates for the webinar can be found on the cover page of the FOA.

APPENDIX A – COST SHARE INFORMATION

Cost Sharing or Cost Matching

The terms "cost sharing" and "cost matching" are often used synonymously. Even the DOE Financial Assistance Regulations, 2 CFR 200.306, use both of the terms in the titles specific to regulations applicable to cost sharing. EERE almost always uses the term "cost sharing," as it conveys the concept that non-federal share is calculated as a percentage of the Total Project Cost. An exception is the State Energy Program Regulation, 10 CFR 420.12, State Matching Contribution. Here "cost matching" for the non-federal share is calculated as a percentage of the federal funds only, rather than the Total Project Cost.

How Cost Sharing Is Calculated

As stated above, cost sharing is calculated as a percentage of the Total Project Cost. FFRDC costs must be included in Total Project Costs. The following is an example of how to calculate cost sharing amounts for a project with $1,000,000 in federal funds with a minimum 20% non-federal cost sharing requirement:

- Formula: Federal share ($) divided by federal share (%) = Total Project Cost
  Example: $1,000,000 divided by 80% = $1,250,000

- Formula: Total Project Cost ($) minus federal share ($) = Non-federal share ($)
  Example: $1,250,000 minus $1,000,000 = $250,000

- Formula: Non-federal share ($) divided by Total Project Cost ($) = Non-federal share (%)
  Example: $250,000 divided by $1,250,000 = 20%

What Qualifies For Cost Sharing

While it is not possible to explain what specifically qualifies for cost sharing in one or even a couple of sentences, in general, if a cost is allowable under the cost principles applicable to the organization incurring the cost and is eligible for reimbursement under an EERE grant or cooperative agreement, then it is allowable as cost share. Conversely, if the cost is not allowable under the cost principles and not eligible for reimbursement, then it is not allowable as cost share. In addition, costs may not be counted as cost share if they are paid by the federal government under another award unless authorized by federal statute to be used for cost sharing.

The rules associated with what is allowable as cost share are specific to the type of organization that is receiving funds under the grant or cooperative agreement, though are generally the same for all types of entities. The specific rules applicable to:

- FAR Part 31 for For-Profit entities, (48 CFR Part 31); and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

In addition to the regulations referenced above, other factors may also come into play such as timing of donations and length of the project period. For example, the value of ten years of donated maintenance on a project that has a project period of five years would not be fully allowable as cost share. Only the value for the five years of donated maintenance that corresponds to the project period is allowable and may be counted as cost share.

Additionally, EERE generally does not allow pre-award costs for either cost share or reimbursement when these costs precede the signing of the appropriation bill that funds the award. In the case of a competitive award, EERE generally does not allow pre-award costs prior to the signing of the Selection Statement by the EERE Selection Official.

General Cost Sharing Rules on a DOE Award

1. Cash Cost Share – encompasses all contributions to the project made by the recipient or subrecipient(s), for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project.

2. In-Kind Cost Share – encompasses all contributions to the project made by the recipient or subrecipient(s) that do not involve a payment or reimbursement and represent donated items or services. In-Kind cost share items include volunteer personnel hours, donated existing equipment, donated existing supplies. The cash value and calculations thereof for all In-Kind cost share items must be justified and explained in the Cost Share section of the project Budget Justification. All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out the In-Kind cost share section of the Budget Justification.

3. Funds from other federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC subrecipients. Non-federal sources include any source not originally derived from federal funds. Cost sharing commitment letters from subrecipients must be provided with the original application.

4. Fee or profit, including foregone fee or profit, are not allowable as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

As stated above, the rules associated with what is allowable cost share are generally the same for all types of organizations. Following are the rules found to be common, but again, the specifics are contained in the regulations and cost principles specific to the type of entity:

(A) Acceptable contributions. All contributions, including cash contributions and third party in-kind contributions, must be accepted as part of the prime recipient's cost sharing if such contributions meet all of the following criteria:

(1) They are verifiable from the recipient's records.

(2) They are not included as contributions for any other federally-assisted project or program.

(3) They are necessary and reasonable for the proper and efficient accomplishment of project or program objectives.

(4) They are allowable under the cost principles applicable to the type of entity incurring the cost as follows:

a. For-profit organizations. Allowability of costs incurred by for-profit organizations and those nonprofit organizations listed in Attachment C to OMB Circular A–122 is determined in accordance with the for-profit cost principles in 48 CFR Part 31 in the FAR, except that patent prosecution costs are not allowable unless specifically authorized in the award document. (v) Commercial Organizations. FAR Subpart 31.2—Contracts with Commercial Organizations; and

b. Other types of organizations. For all other non-federal entities, allowability of costs is determined in accordance with 2 CFR Part 200 Subpart E.

(5) They are not paid by the federal government under another award unless authorized by federal statute to be used for cost sharing or matching.

(6) They are provided for in the approved budget.

(B) Valuing and documenting contributions

(1) Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that amounts chargeable to the project are determined on the basis of costs incurred. For real property or equipment used on the project, the cost principles authorize depreciation or use charges. The full value of the item may be applied when the item will be consumed in the performance of the award or fully depreciated by the end of

the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

a. The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or

b. The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.

(2) Valuing services of others' employees. If an employer other than the recipient furnishes the services of an employee, those services are valued at the employee's regular rate of pay, provided these services are for the same skill level for which the employee is normally paid.

(3) Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as cost sharing or matching if the service is an integral and necessary part of an approved project or program. Rates for volunteer services must be consistent with those paid for similar work in the recipient's organization. In those markets in which the required skills are not found in the recipient organization, rates must be consistent with those paid for similar work in the labor market in which the recipient competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.

(4) Valuing property donated by third parties.

a. Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the cost sharing or matching share must be reasonable and must not exceed the fair market value of the property at the time of the donation.

b. Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:

i. The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of

comparable space and facilities in a privately-owned building in the same locality.

ii. The value of loaned equipment must not exceed its fair rental value.

(5) Documentation. The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:

a. Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.

b. The basis for determining the valuation for personal services and property must be documented.

APPENDIX B – WAIVER REQUESTS AND APPROVAL PROCESSES: 1. FOREIGN ENTITY PARTICIPATION AS THE PRIME RECIPIENT; AND 2. PERFORMANCE OF WORK IN THE UNITED STATES (FOREIGN WORK WAIVER)

1. Waiver for Foreign Entity Participation as the Prime Recipient

As set forth in Section III.A.iii., all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a state or territory of the United States and have a physical location for business operations in the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

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

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

EERE may require additional information before considering the waiver request.

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

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

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

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

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

EERE may require additional information before considering the waiver request.

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

APPENDIX C – GLOSSARY

Applicant – The lead organization submitting an application under the FOA.

Continuation application – A non-competitive application for an additional budget period within a previously approved project period. At least ninety (90) days before the end of each budget period, the Recipient must submit to EERE its continuation application, which includes the following information:

i. A report on the Recipient's progress towards meeting the objectives of the project, including any significant findings, conclusions, or developments, and an estimate of any unobligated balances remaining at the end of the budget period. If the remaining unobligated balance is estimated to exceed 20 percent of the funds available for the budget period, explain why the excess funds have not been obligated and how they will be used in the next budget period.

ii. A detailed budget and supporting justification if there are changes to the negotiated budget, or a budget for the upcoming budget period was not approved at the time of award.

iii. A description of any planned changes from the negotiated Statement of Project Objectives and/or Milestone Summary Table.

Cooperative Research and Development Agreement (CRADA) – a contractual agreement between a national laboratory contractor and a private company or university to work together on research and development. For more information, see https://www.energy.gov/gc/downloads/doe-cooperative-research-and-development-agreements

Federally Funded Research and Development Centers (FFRDC) - FFRDCs are public-private partnerships which conduct research for the United States government. A listing of FFRDCs can be found at http://www.nsf.gov/statistics/ffrdclist/.

Go/no-go Decision Points – A decision point at the end of a budget period that defines the overall objectives, milestones and deliverables to be achieved by the recipient in that budget period. As of a result of EERE's review, EERE may take one of the following actions: 1) authorize federal funding for the next budget period; 2) recommend redirection of work; 3) discontinue providing federal funding beyond the current budget period; or 4) place a hold on federal funding pending further supporting data.

Project – The entire scope of the cooperative agreement which is contained in the recipient's Statement of Project Objectives.

Recipient or "Prime Recipient" – A non-federal entity that receives a federal award directly from a federal awarding agency to carry out an activity under a federal program. The term recipient does not include subrecipients.

Subrecipient – A non-federal entity that receives a subaward from a pass-through entity to carry out part of a federal program; but does not include an individual that is a beneficiary of such program. A subrecipient may also be a recipient of other federal awards directly from a federal awarding agency. Also, a DOE/NNSA and non-DOE/NNSA FFRDC may be proposed as a subrecipient on another entity's application. See section III.E.ii.

APPENDIX D – DEFINITION OF TECHNOLOGY READINESS LEVELS

TRL 1:	Basic principles observed and reported
TRL 2:	Technology concept and/or application formulated
TRL 3:	Analytical and experimental critical function and/or characteristic proof of concept
TRL 4:	Component and/or breadboard validation in a laboratory environment
TRL 5:	Component and/or breadboard validation in a relevant environment
TRL 6:	System/subsystem model or prototype demonstration in a relevant environment
TRL 7:	System prototype demonstration in an operational environment
TRL 8:	Actual system completed and qualified through test and demonstrated
TRL 9:	Actual system proven through successful mission operations

APPENDIX E – LIST OF ACRONYMS

COI	Conflict of Interest
DEC	Determination of Exceptional Circumstances
DMP	Data Management Plan
DOE	Department of Energy
DOI	Digital Object Identifier
EERE	Energy Efficiency and Renewable Energy
EGS	Enhanced Geothermal Systems
FAR	Federal Acquisition Regulation
FFATA	Federal Funding and Transparency Act of 2006
FOA	Funding Opportunity Announcement
FOIA	Freedom of Information Act
FORGE	Frontier Observatory for Research in Geothermal Energy
FFRDC	Federally Funded Research and Development Center
GAAP	Generally Accepted Accounting Principles
GDR	Geothermal Data Repository
GTO	Geothermal Technologies Office
IPMP	Intellectual Property Management Plan
M&O	Management and Operating
MPIN	Marketing Partner ID Number
MYPP	Multi-Year Program Plan
NDA	Non-Disclosure Acknowledgement
NEPA	National Environmental Policy Act
NGDS	National Geothermal Data System
NNSA	National Nuclear Security Agency
OMB	Office of Management and Budget
OSTI	Office of Scientific and Technical Information
P&A	Plug & Abandon
PII	Personal Identifiable Information
R&D	Research and Development
RFI	Request for Information
RFP	Request for Proposal
SAM	System for Award Management
SMART	Specific, Measurable, Achievable, Relevant, and Timely
SOPO	Statement of Project Objectives
SPOC	Single Point of Contact
STAT	Science Technology and Analysis Team
TIA	Technology Investment Agreement
TRL	Technology Readiness Level
UCC	Uniform Commercial Code
WBS	Work Breakdown Structure
WOO	Wells of Opportunity
WP	Work Proposal