



U.S. DEPARTMENT OF ENERGY



American-Made Geothermal Geophone Prize

RULES

AUGUST 2022

Official Rules

The American-Made High-Temperature Geothermal Geophone Prize is designed to catalyze the development of high-temperature, downhole capable seismic monitoring for enhanced geothermal systems (EGS) in the American instrumentation community. This is accomplished through a series of prize competitions and the development of a diverse and powerful support network that leverages national laboratories, energy incubators, and other resources from across the United States. Winning Phase 2 is required to compete in Phase 3; however, new teams may join during Phase 2 without competing in Phase 1: Concept.

Modifications

All modifications are [HIGHLIGHTED] in the body of the rules document.

Mod. No.	Date	Description
1	08/23/22	Modifications to this rules document include: <ul style="list-style-type: none"><li data-bbox="558 432 1409 495">• Removed “technical assistance request” under section 2.5 “What to Submit” on page 15. This was replaced with “voucher slide.”

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1 Program Summary

1.1 Introduction: A Two-Pronged Approach

The American-Made Geothermal Geophone Prize, administered under the authority of the America COMPETES Reauthorization Act of 2010, consists of two parallel and integrated features: the Phase 1, 2, and 3 **Contests** and the **American-Made Network**.

Competitors in the Phase 1, 2, and 3 Contests participate in three escalating challenges. The contests provide a total of \$3.65 million in incentives—\$2.55 million in cash prizes, \$1.1 million in vouchers—to drive the development of high-temperature, downhole seismometers from concept to prototype testing in three years through an accelerated schedule.

The American-Made Network continues to flourish in support of this and other American-Made Challenges by amplifying competitors' efforts through connections with: (1) the U.S. Department of Energy's (DOE's) national laboratories and their world-class research facilities and expertise; and (2) a private-sector stakeholder community that actively assists entrepreneurs with bringing innovative ideas and concepts to market. This community includes incubators, investors, philanthropists, fabrication facility managers, and seasoned industry leaders, all of whom provide technical insight, marketing expertise, product validation, and other support. Throughout the competition, these diverse experts are labeled "Connectors" and comprise key components of the Network.

1.2 Background

Geothermal environments pose significant challenges for survivability of tools, components, and equipment because they require materials and components that can withstand harsh geothermal conditions, including variable subsurface stresses resulting from high temperatures, high rock strengths, and corrosive working fluids. Because of these environmental challenges and the small size of the U.S. geothermal market, manufacturing components/tools specifically for geothermal environments can be prohibitively expensive. Many existing subsurface characterization tools designed for use in other lower temperature environments for the oil and gas sector, for example, would be very helpful if they could be hardened to enable long-term, high-temperature capable downhole sensing.

These downhole sensors are important to geothermal development and increased deployment of geothermal energy because they facilitate the collection of rich data sets that give us information about geothermal reservoirs, which exist some 8000–12,000+ feet beneath our feet. These specialized tools facilitate high-resolution, in-situ monitoring of the subsurface in general but are especially important for enhanced geothermal systems (EGS) development, because the data they collect allow us to understand how the reservoir rock is evolving before, during, and after EGS stimulations, which involve the injection of water into the subsurface to create or re-open existing fractures that allow us to access stranded heat. In order to perform successful stimulations and ultimately develop successful and efficient EGS reservoirs, we need to understand the subsurface conditions, such as in-situ stress states, induced seismicity, strain, and permeability; the reliable deployment of robust, high-temperature and high-sensitivity monitoring tools are the key to collecting this information.

Downhole wide-bandwidth sensors that measure real-time seismicity are a family of tool that has an especially important place in EGS development. Tracking micro-seismicity (small magnitude seismic events that are so deep and small they are not felt on surface) allows us to understand and monitor changes in the subsurface before, during, and after stimulation and ensures safe geothermal operations. Improving the ability to monitor and locate micro-seismic events at high temperature and very close to the

reservoir (deep in the subsurface!) will provide a wealth of additional information on the induced fracture system resulting from stimulation efforts. Current wide-bandwidth high-sensitivity seismic sensors are, however, not capable of operating in high-temperature EGS¹ environments long-term, meaning that they cannot be placed at depths that allow them to be close to EGS reservoirs and stimulation activities, which would allow for the collection of higher-resolution and more accurate data. Without this high-resolution, real-time micro-seismic data to inform how our reservoir is growing, geothermal developers cannot fully utilize valuable micro-seismic data to adjust operations and design the most effective and efficient EGS reservoirs.

The [Geothermal Technologies Office](#) (GTO) is focused on advancing EGS technology because it has the potential to enable the development 60 gigawatts of projected geothermal electricity capacity by 2050 (as highlighted in the *GeoVision: Harnessing the Heat Beneath Our Feet* report²). Achieving this level of deployment requires technical innovations in EGS, however. One of the critical areas centers around advances in subsurface sensing, which requires the expertise of the high-temperature electronics community (HTE). Growth in HTE applications across multiple sectors has been significant in the last decade and is ripe for adaptation to the seismic sensor technology space.

The American-Made Geothermal Geophone Prize is designed to spark innovation and take advantage of this opportunity.

Spearheaded by the GTO within the Office of Energy Efficiency and Renewable Energy (EERE) at DOE, and in partnership with the [National Renewable Energy Laboratory](#) (NREL) and [Lawrence Berkeley National Laboratory](#) (LBNL), the Geophone Prize spurs creativity and addresses the challenges of operating seismic sensors in geothermal environments. The Geophone Prize comprises three progressive competitions that catalyze innovation in the U.S. geothermal industry by harnessing the advances HTE can provide in tool design and functionality. In addition, it incentivizes the nation's innovators and entrepreneurs to rapidly discover, research, iterate, and deliver new high-temperature seismic sensor solutions with enhanced performance. This new initiative not only provides cash prizes, but also engages America's incubators, investors, universities, 17 national laboratories, and others to help participants achieve their goals.

The Geophone Prize adapts the successful program structure used for other American-Made Challenges: a series of prize competitions combined with the use and expansion of the American-Made Network. The unique American-Made Network takes a structured approach to bring diverse sources of support—such as DOE's national laboratories, business incubators, and prototype fabrication facilities—together under one umbrella. This network approach is designed to be flexible and scalable, and extend across numerous technology domains and sectors.

The Geophone Prize is designed to bring together the world's best-in-class research base with its unparalleled entrepreneurial support system consisting of pioneering makerspaces, dozens of energy incubators, universities, and 17 national laboratories to create a sweeping portfolio of innovations primed for demonstrating the promise that high-temperature seismic sensing holds for revolutionizing approaches for engineering for extreme environments. This Prize structure simultaneously enables the rapid development of technology and strengthens critical connections for commercialization.

¹ FORGE Roadmap

² U.S. Department of Energy (DOE). 2019. *GeoVision: Harnessing the Heat Beneath Our Feet*. <https://www.energy.gov/sites/prod/files/2019/06/f63/GeoVision-full-report-opt.pdf>.

The program makes it faster and easier for our nation to transform innovative research and ideas into early-stage concepts and then build prototypes ready for testing. Competitors are eligible to win cash prizes and other benefits, as well as connect with mentoring, training, and receive other services from the American-Made Network community, positioning participants to make a long-term impact on the U.S. HTE sector.

1.3 Prize Performance Goals

GTO has developed the performance goals below for devices developed under the Geophone Prize.

Rank	Designs and prototypes must meet the following performance metrics: Specification	Acceptable	Ideal (Target)
1	Temperature Survivability (duration) *	225 °C for up to 6 months and 250 °C for up to 1 month	225 °C for multiple years and 250 °C for up to 6 months
2	Number of Channels *	3-component sonde, single level	3-component sonde, multilevel array
3	Frequency Range	0.05 – 1,000 Hz	0.005 – 2,000 Hz
4	Dynamic Range	135 dB	165 dB
5	Noise Floor	50 ng/√Hz [@ 1Hz]	10 ng/√Hz [@ 1Hz]
6	Maximum Pressure Capable	10,000 psi	20,000 psi
7	Clamping Pressure	10x tool/sonde weight	20x tool/sonde weight
8	Length of Data Transmission	3,000 meters	4,000 meters
9	Deployable Behind Casing	No	Yes
10	Tool Diameter	HQ	NQ
11	Clamping	Requires external clamping device	Comes with own borehole clamping system

* Required

The EGS sector needs high-temperature borehole sensors with high-performance specifications; **sensors with high sensitivity, wide bandwidth, and sufficient signal to noise that are capable of long-term deployments at high temperature with high reliability and durability.** These high-performance sensors are already available for low-temperature and shallow deployments; however, high-temperature deep deployments are much trickier for high-performance sensors. Existing high-temperature sensors have some of the desired qualities, or they have all qualities but degrade or die after a few weeks and must be pulled out of the wellbore and replaced. GTO and EGS need **sensors that can consistently perform, for multiple-year deployments, in deep high-temperature settings.**

The performance specifications listed in the table above are ranked in order of criticality. Systems are required to be **three-component and meet the minimum temperature specification of 225 °C.** For the other numerical specifications (items 3 through 8) the sensor should be within 20% of the listed acceptable value. Note that the specifications also include the length of the cable, with the reason being that the data (digital, analog, optical, or other signal) needs to be of sufficient amplitude and quality to be able to be transmitted over long distances and be recorded with conventional seismic recording devices. That is, **the total sensing system needs to include the means of transmitting the data to the surface.**

Sensor designs are not required to include a system for clamping in a borehole but do need to keep clamping in mind. Systems should be **capable of being clamped into at least an HQ size hole (3 3/8 in or**

96 mm) using either a clamping device designed by the team or utilizing existing third-party clamping designs and tools.

1.4 Contests: Phase 1, 2, and 3

The Phase 1, 2, and 3 Contests fast-track efforts to identify, develop, and test disruptive seismic sensor solutions to meet geothermal industry needs. Each stage includes a contest period when participants work to rapidly advance their solutions. In Phase 1 of the contest, eligible applicants are invited to develop a high-level design to meet the prize performance goals (participant eligibility requirements can be found in Section 1.6). For the Phase 2 Contest, DOE invites winners of the Phase 1 and new participants, individually or as a team, to further refine their designs and perform bench-scale proof-of-concept testing of their designs. For the Phase 3 Contest, winners of Phase 2 will fabricate and conduct performance testing of their advanced functional seismometer prototypes based on their Phase 2 design at a qualified testing facility. Phase 3 winners will have the opportunity to work with LBNL to field their prototype in an active geothermal field.

Phase 1: Concept: Participants demonstrate that they have identified and developed an initial concept for a high-temperature, downhole seismic sensor that utilizes currently available components, or a prototype currently under development. They also propose a path to design, prototype, and test a proof of concept.

- Phase 1: Concept competitors will be evaluated by a panel of experts from industry, national laboratories, and government. Up to eight winners will each receive \$75,000 in cash and \$75,000 in National Laboratory vouchers. Winners will then be eligible to compete in the Phase 2 and 3 Contests.³
- Winners will have the opportunity to receive concept design feedback in one-on-one sessions with LBNL staff prior to the Phase 2 Contest submission date.⁴

Phase 2: Make: Participants will work to substantially advance their seismic sensor concept by demonstrating their design's promise in meeting engineering and operational requirements outlined by the team. Additionally, it is expected that competitors make significant progress in teaming and partnerships capable of building and testing a functioning initial prototype bench-tested under specified temperature and pressure conditions (see Section 3).

- The up to five Phase 2: Winners will receive \$250,000 in cash and \$100,000 in National Laboratory vouchers.

Phase 3: Build: Competitors fabricate seismic sensor prototypes based on their Phase 2 design. Phase 3 Contest competitors will be evaluated by a panel of experts during a live Phase 3 Demo Day event at the conclusion of the phase, using—in part—engineering and technical performance criteria previously submitted by each team.

- Up to two winners will win \$350,000 in cash and have the option to work with LBNL to conduct field testing of their prototype sensor.

³ See Phase 1 eligibility requirements under Section 2.7.

⁴ See Section 6.2 for more information.

This set of three contests offers a total of \$3.65 million in incentives—\$2.55 million in cash prizes and \$1.1 million in vouchers.

1.4.1 Contest Funding

Contest	Winners	Prizes
Phase 1: Concept (6 Months)	Up to 8	Up to \$600,000 in cash prizes and \$600,000 in vouchers, with cash prizes of \$75,000 per winner and \$75,000 in vouchers.
Phase 2: Make (10 Months)	Up to 5	Up to \$1.25 million in cash prizes and \$500,000 in vouchers, with each winner receiving \$250,000 in cash and \$100,000 in vouchers.
Phase 3: Build (15 Months)	Up to 2	Up to \$700,000 in cash prizes, with each winner receiving \$350,000 in cash prizes.

1.5 American-Made Network

The American-Made Network aims to cultivate resources and build connections that enhance, accelerate, and amplify the efforts of the competitors. The objective is to link participants with ideas, people, resources, financing, and relevant industry expertise, all of which are necessary for long-term success.

The Network is composed of the following elements:

- Prize and Network Administrator: The National Renewable Energy Laboratory:** DOE has partnered with NREL to administer the Geothermal Prize. As the administrator, NREL helps competitors locate and leverage the vast array of national laboratory resources. NREL also connects elements of the Network with the competitors, as described below.
- Vouchers:** Winners of the Phase 1 & 2 Contests receive vouchers that they may use to fund work at national laboratories and other facilities to accelerate the production, testing, improvement, or validation of prototypes. Voucher guidelines are posted on the [Geophone Prize website](#), and include information for competitors as well as for entities interested in helping competitors through the voucher program.
- Connectors:** Connectors are entities capable of helping competitors navigate the innovation process, and identify, recruit, and support contest participants. Connectors can be from incubators, universities, think tanks, industry, or any group seeking to help competitors win by performing support activities such as:
 - Attracting a diverse range of talented individuals to become contest competitors;
 - Helping competitors connect with design and prototyping experts and facilities, as well as mentors and relevant industry partners; and
 - Providing in-kind resources, tools, and facilities to fabricate, test, and prototype high-temperature seismometer solutions.

Connectors who support participants that go on to win any of the Phase 1, 2 or 3 Contests will be financially rewarded; see details in the table below.

1.5.1 Connector Funding

Recognition Reward Name	Anticipated Number of Awards	Dollar Amounts	Details
Mobilize	Up to 1 per winning Phase 1 competitor (8 competitors)	\$40,000 pool; \$5,000 per competitor	Distributed to Connectors for recruiting or mentoring a winning competitor in in the Phase 1 Contest.
Phase 2 Mentor	Up to 1 per winning Phase 2 competitor (5 competitors)	\$37,500 pool; \$7,500 per competitor	Distributed to Connectors for mentoring a winning competitor in Phase 3 of the prize.
Phase 3 Mentor	Up to 1 per non-winning Phase 3 competitor (3 competitors)	\$22,500 pool; \$7,500 per competitor	Distributed to Connectors for mentoring a team who competed in but did not win Phase 3.
	Up to 1 per winning Phase 3 competitor (2 competitors)	\$25,000 pool; \$12,500 per competitor	Distributed to Connectors for mentoring a winning competitor in Phase 3 of the prize.

The Connector Guidelines with details on the Recognition Awards can be found at <https://www.herox.com/GeophonePrize/resources>.

Entities interested in participating as a Connectors can visit the following site for details: <https://network.americanmadechallenges.org/>.

1.6 Eligibility

1.6.1 Eligible Competitors

- The competition is open to the following entities: private (for-profits and nonprofits), nonfederal government entities (such as states, counties, tribes, and municipalities), academic institutions, and individuals subject to the following requirements:
 - Individuals can compete alone or as a group. A representative of a private entity can also register the entity to compete by itself or as the lead organization of a group of entities. Teams can also be composed of a mix of individuals and entities or organizations.
 - An individual prize competitor (who is not competing as a member of a group) must be a United States citizen or a legal permanent resident.
 - A group of individuals competing as one team may win, provided the team captain and HeroX account holder for the team submission is a United States citizen or a legal permanent resident.

- Individuals competing as part of a team may participate if they are legally allowed to work in the United States.
- Private entities must be incorporated in and maintain a primary place of business in the United States with majority domestic ownership and control. If an entity seeking to compete does not have majority domestic ownership and control, EERE may consider issuing a waiver of that eligibility requirement where (1) the entity otherwise meets the eligibility requirements; (2) the entity is incorporated in and maintains a primary place of business in the United States; and (3) the entity submits a compelling justification. EERE may require additional information before making a determination on the waiver request. See Section 5.16 for more information on the waiver process.
- Academic institutions must be based in the United States.

1.6.2 Ineligible Competitors

- DOE employees, employees of sponsoring organizations, members of their immediate families (e.g., spouses, children, siblings, or parents), and persons living in the same household as such persons, whether or not related, are not eligible to participate in the prize.
- Individuals who worked at DOE (federal employees or support service contractors) within six months prior to the submission deadline of any contest are not eligible to participate in any prize contests in this program.
- Federal entities and federal employees are not eligible to participate in any portion of the prize.
- DOE national laboratory employees cannot compete in the prize.
- Entities and individuals publicly banned from doing business with the U.S. government, such as entities and individuals debarred, suspended, or otherwise excluded from or ineligible for participation in federal programs are not eligible to compete.
- Entities and individuals identified as a restricted party on one or more screening lists of the Departments of Commerce, State, and Treasury are not eligible to compete. See the Consolidated Screening List.

Individuals participating in foreign government talent recruitment programs⁵ of foreign countries of risk are not eligible to compete. Further, teams that include individuals participating in foreign government talent recruitment programs of foreign countries of risk⁶ are not eligible to compete. Participation in a foreign government talent recruitment program could conflict with this objective

⁵ A foreign government talent recruitment program is defined as an effort directly or indirectly organized, managed, or funded by a foreign government to recruit science and technology professionals or students (regardless of citizenship or national origin, and whether having a full-time or part-time position). Some foreign government-sponsored talent recruitment programs operate with the intent to import or otherwise acquire from abroad, sometimes through illicit means, proprietary technology or software, unpublished data and methods, and intellectual property to further the military modernization goals and/or economic goals of a foreign government. Many, but not all, programs aim to incentivize the targeted individual to physically relocate to the foreign state for the above purpose. Some programs allow for or encourage continued employment at U.S. research facilities or receipt of federal research funds while concurrently working at and/or receiving compensation from a foreign institution, and some direct participants not to disclose their participation to U.S. entities. Compensation could take many forms including cash, research funding, complimentary foreign travel, honorific titles, career advancement opportunities, promised future compensation, or other types of remuneration or consideration, including in-kind compensation.

⁶ Countries currently deemed at risk by the U.S. government include Russia, Iran, North Korea, and China.

by resulting in unauthorized transfer of scientific and technical information to foreign government entities.

To be eligible, the team captain will be required to sign the following statement:

I am providing this submission package as part of my participation in this prize. I understand that I am providing this submission to the Federal Government. I certify under penalty of perjury that the named competitor meets the eligibility requirements for this prize competition and complies with all other rules contained in the Official Rules document. I further represent that the information contained in the submission is true and contains no misrepresentations. I understand false statements or misrepresentations to the Federal Government may result in civil and/or criminal penalties under 18 U.S.C. § 1001 and § 287.

In keeping with the goal of growing a community of innovators, competitors are encouraged to form multidisciplinary teams while developing their concept. The HeroX platform provides a space where parties interested in collaboration can post information about themselves and learn about others who are also interested in competing in this contest.

1.7 Important Dates

- **Phase 1: Concept—5 months**
 - Phase 1: Concept submission opened: **4/22/2022**
 - Phase 1: Concept submission deadline: **9/29/2022**
 - Phase 1: Concept quarterfinalists announced; Phase 2 Contest begins: **12/1/2022**

- **Phase 2: Make—10 months**
 - Phase 2: Make submission opened: **12/1/2022**
 - Phase 2: Make submission deadline: **10/1/2023**
 - Phase 2: Make semifinalists announced; Phase 3 Contest begins: **12/1/2023**

- **Phase 3: Build—15 months**
 - Phase 3: Build submission opens: **12/1/2023**
 - Phase 3: Build submission deadline: **3/1/2025**
 - Phase 3: Build finalists evaluated at Demo Day: **TBD**
 - All dates are subject to change, including contest openings, deadlines, and announcements. Sign up for updates at <https://www.herox.com/GeophonePrize>.



U.S. DEPARTMENT OF ENERGY

GEOTHERMAL GEOPHONE PRIZE

This prize offers a total of \$3.65 million in incentives—
\$2.55 million in cash prizes, \$1.1 million in vouchers.

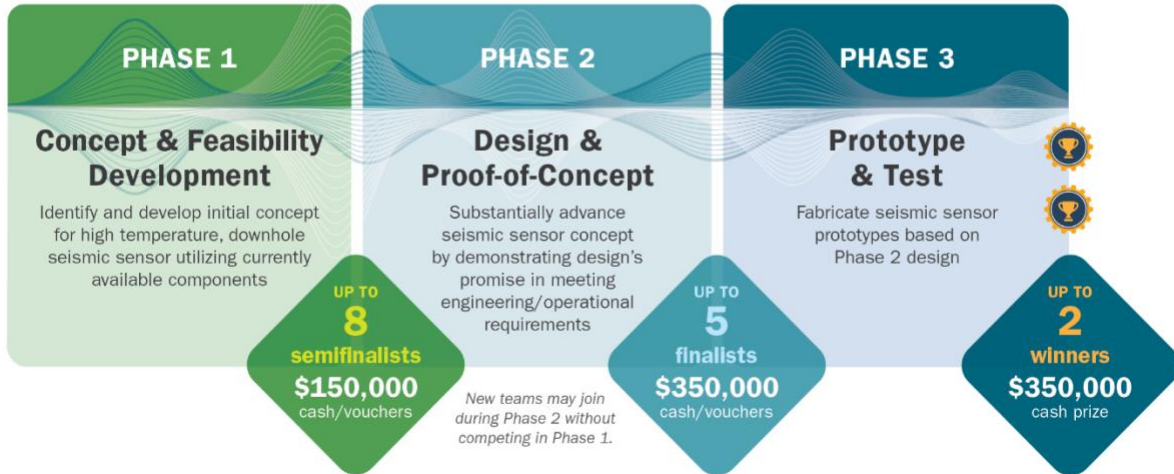


Figure 1. The Geothermal Geophone Prize offers three escalating rounds and substantial cash and other benefits to spark innovation in high temperature seismic sensors.

2. Phase 1: Concept Rules

2.1 Introduction

The Phase 1: Concept is the first contest in the Geothermal Geophone Prize, offering a total of \$600,000 in cash prizes and up to \$600,000 in National Laboratory vouchers.

2.2 Goal

Competitors will propose a high-temperature seismic sensor concept and demonstrate the availability of possible high-temperature components.

2.3 Prizes to Win

The Phase 1 Contest offers each of the contest winners (up to 8) a \$75,000 cash prize and up to \$75,000 in vouchers.

Phase 1: Concept winners will have the opportunity to receive concept design feedback in 2 one-on-one sessions with LBNL staff and/or prize connectors prior to the Phase 2: Make submission date (up to a total of 2 hours of consulting time). Only Phase 1: Concept winners are eligible to receive design consultation.

2.4 How to Enter

Complete a submission package online at <https://www.herox.com/GeophonePrize> before the contest closing date.

2.5 What to Submit

The following items constitute the submission package and must be submitted through the HeroX platform:

- Up to 90-second video (to be made public, not scored)
- Cover page content (to be made public, not scored)
- One PowerPoint slide (to be made public, not scored)
- **Voucher slide** (to be made public, not scored)
- Technical narrative about the innovation, team, and plan (not public, scored)
- Letters of commitment or support (optional).

Online Public Video—What is your innovation?	
<p>Suggested content you provide</p> <ul style="list-style-type: none"> • How you intend to tackle the seismometer challenge • How you will incorporate advances in the high-temperature componentry space into your solution and why it is transformational • Who you are and why you have a competitive edge • Creative content that conveys your submission in exciting and interesting ways. 	<p>Required submission format</p> <ul style="list-style-type: none"> • Ensure that your video is posted publicly online (e.g., YouTube, Vimeo). • The video should not exceed 90 seconds.
<ul style="list-style-type: none"> • <u>The American-Made Network may be able to help you with creating your video.</u> 	

Cover Page—List basic information about your submission	
<ul style="list-style-type: none"> • Project name • Innovation tagline (e.g., your mission in few words) • Link to your 90-second video online • Key project members (names, contacts, and links to their LinkedIn profiles). 	<ul style="list-style-type: none"> • Keywords that best describe your solution (e.g., components, equipment) • Your city, state, and nine-digit zip code • The partner(s), affiliate(s), and Connector(s)⁷ that significantly helped you⁸ advance your solution and the major items they helped with (if applicable).

Submission Summary Slide (will be made public)
<p>Make your own public-facing one-slide submission summary that contains technically specific details but can be understood by most people. There is no template, so feel free to present the information as you see fit. Please make any text readable in a standard printout and conference room projection.</p>

⁷ See description of Connector in Section 1. Program Summary.

⁸ Remember that you can incentivize Connectors to help by agreeing to identify them here to receive a cash reward for that help if you win the Ready! competition. See the description of Recognition Rewards in Section 1. Program Summary and the [Connector Guidelines](#) for details.

Voucher Work Slide (PowerPoint Slide(s))

Describe how you will use your voucher funds, including the entities you plan to engage and what they will do with the voucher funds. Provide one slide per entity you plan to engage.

2.5.1 Scored Items: Technical Narrative

Each statement for the Technical Narrative will be scored based on a 1–6 scale:

1	2	3	4	5	6
strongly disagree	disagree	slightly disagree	slightly agree	agree	strongly agree

You should answer each of the following three questions. The content bullets are organized by suggested content to guide your responses, but you must decide where to focus your answers. The individual answers to the three questions do not have a word limit; however, the aggregate response to these three questions must be less than or equal to 2,500 words. You may also include up to 10 supporting images, figures, tables, or graphs. The expert reviewers will score the questions based on the content you have provided that conforms to the limits described previously. Table, figure, and image descriptions, as well as footnotes, do not count against the word limit.

Narrative

Question 1: Innovation— What is your solution? How will you determine whether your solution has achieved success?

Suggested content you provide

- Describe your innovation’s unique value proposition and how it will lead to a device that meets the design metrics listed in Section 3.
- Define the design approach and specialized components required to manufacture the design.
- Discuss critical components that may not be commercially available or are hard to acquire.
- Explain (provide analysis to support) how your solution will lead to reliable indefinite deployment in high-temperature environments while collecting high-resolution seismic data (according to specification in Section 3) using high-temperature seismometers
- Specify expected performance goals and metrics relevant to your tool for design,

Each statement scored on a 1–6 scale

- The competitor identifies a critical failure point of downhole seismometers at temperatures >225°C.
- The design represents an innovative approach, built on reasonable assumptions, valid technical foundations, and lessons learned from other notable efforts in this space.
- The planned design approach is reasonably ambitious and validates critical assumptions needed to advance the proposed solution.
- The competitor provides compelling analysis that supports the efficacy of their proposed design to overcome critical failure points of seismic sensors deployed indefinitely at high temperature.
- Performance improvement goals and metrics are verifiable, and aggressive but attainable.

prototyping, and testing (see special instructions below).	
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Question 2: *Team*— Why is this the right team to solve this problem? What expertise is lacking and how will it be addressed?

<p>Suggested content you provide</p> <ul style="list-style-type: none"> • Introduce your team, explain how it came together, and highlight the knowledge and skills that make it uniquely capable of achieving success. • Highlight your team’s experience in high-temperature tool and/or seismic sensor development and how you have applied it to your specific innovation. • Describe what drives your team to realize this solution. • Explain why winning the Phase 1 Contest will substantively change the likely outcome for the proposed solution. • Describe your efforts to advance your solution concept prior to or since the announcement of the prize contest and highlight key milestones achieved. 	<p>Each statement scored on a 1–6 scale</p> <ul style="list-style-type: none"> • The team’s experience and track record demonstrate notable entrepreneurial qualities such as adaptability, creativity, decisiveness, and resourcefulness. • The team’s drive, knowledge, and complementary skill sets provide a strong competitive edge toward realizing this solution in the near future. • Winning the Phase 1 Contest will significantly increase the team’s chances of creating a viable prototype. • A considerable amount of high-quality effort was put into defining and advancing the proposed concept.
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Question 3: Plan—What is your plan to achieve your goals?

Suggested content you provide

- Describe where you stand in your solution’s development cycle and define goals for Phases 1 and 2 (based on the schedule listed in Section 1.5; **see special instructions below**).
- Describe your team’s readiness to meet your goals; what resources provided by the contest will help meet your goals?
- Provide a high-level budget and project management plan to meet your goals between the conclusions of the Phase 1 and 2 Contests, including how you will leverage program resources or other entities (include references to letters of support/commitment if applicable).

Each statement scored on a 1–6 scale

- The stated goals are ambitious, reduce risks, and show a commitment to an accelerated development cycle.
- Meeting the stated goals will demonstrate critical progress toward designing, fabricating, testing, and validating the functionality of this innovation.
- The proposed plan is appropriate and logical in order to achieve the stated goals.
- The proposed plan effectively uses resources available in-house or through this program to advance the innovation.

2.5.2 Special Instructions for Questions 1 and 3

Though design documentation will be application-specific, documentation should clearly demonstrate the functionality and performance benefits of the proposed concept over conventional technology. The finalized (digital) design must prove that the team can meet the entry-level requirements for Phase 2. This documentation should include either design engineering and/or manufacturing analysis steps taken that support the submitted design basis. Example design engineering content includes: CAD model renderings, engineering calculations, and finite element analysis along with a description of the calculation basis.

Use only specific, measurable, achievable, relevant, and timely (SMART) outcome-based goals—not activity-based—so that a neutral third party can validate them (if possible).

- For example: Demonstrate a definitive achievement of progress (e.g., achieve X% efficiency or X letters of interest signed); do **not** describe how you spent your time (e.g., provide a report, talk to customers, or perform experiments).
- Performance criteria can discuss planned improvements for tool, component, or equipment functionality and reductions in cost and manufacturing lead times, among other improvements as compared to the state of the art. All criteria cited should reflect input from international standards (e.g., ISO), peer-reviewed literature, or other verifiable benchmarking methods.
- In defining your SMART goals, include quantified, risk-reducing, meaningful, practical, and testable interim milestones

- SMART goals submitted for each phase application package should not be static. Teams should plan to assess and update goals based on their own efforts and through relevant stakeholder feedback (e.g., possible investors, customers, and experts in the solution space).
- The American-Made Network may be able to help you to formulate your SMART goals.

Letters of Commitment or Support (Optional)

Attach one-page letters (of support, intent, or commitment) from other relevant entities (e.g., potential users of the proposed innovation) to provide context. Letters of support from partners or others that are critical to the success of your proposed solution will likely increase your score. General letters of support from parties that are not critical to the execution of your solution will likely not factor into your score. Please limit letters of support to one page each.

Please read and comply with additional requirements about your submission in Section 5. COMPETITORS THAT DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

2.6 How We Score

The Prize Administrator screens all completed submissions, and in consultation with DOE, will assign completed submissions to a qualified panel of expert reviewers composed of subject matter experts who will score submissions according to the applicable judging criteria defined in Section 2.5 What to Submit. In order to be involved in the scoring of submissions, subject matter experts may not have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered participant in this contest, or have a familial or financial relationship with an individual who is a registered competitor.

The scoring of submissions will proceed as follows:

Scoring Weights: Each review criteria bullet for the Technical Narrative submission questions has equal weight. The score from an individual reviewer for the Technical Narrative will be the total sum of the scores for all bullets. All reviewers' scores will then be averaged for a final score for the submission package.

Interviews: GTO, at their sole discretion, may decide to hold a short interview with a subset of the Phase 1 Contest competitors. The interviews would be held prior to the announcement of winners and would serve to help clarify questions the reviewers may have. Attending interviews is not required, and interviews are not an indication of winning.

Final Determination of Winners: The Director of GTO is the judge of the competition and will make the final determination of winners. This determination will take into account reviewer scores, any interview findings, and program policy factors listed in Section 5.13.

Announcement: The Prize Administrator will work as quickly as possible, and winning teams should be notified within 2 months after the contest closes, when the Prize Administrator will request the necessary information to distribute cash prizes. The Prize Administrator will then publicly announce the winners. After winning the Phase 1 Contest prize, competitors will develop their solutions in accordance with their plan to compete in the Phase 2 Contest.

2.7 Program Goal Requirements

Only submissions relevant to the goals of this program are eligible to compete. The Prize Administrator must conclude that all of the following statements are **true** when applied to your submission:

- The proposed solution is responsive to the needs of the geothermal energy industry and meets the requirements described in Section 5.
- All activities that are described in and support the submission package are performed in the United States.
- The proposed solution represents an innovation that moves the seismological community and geothermal industries beyond their respective current states.
- The proposed solution is not dependent on new, pending, or proposed federal, state, or local government legislation, resolutions, appropriations, measures, or policies.
- The proposed solution does not involve the lobbying of any federal, state, or local government office.
- The proposed solution is based on fundamental technical principles and is realistic in scope and budget for the incentives provided in this program.

The submission content sufficiently confirms the competitor's intent to bring a high-temperature capable seismic sensor concept to an advanced prototype stage by the conclusion of the program.

2.8 Find Help

Visit <https://americanmadechallenges.org/network.html> to review and contact the members of the American-Made Network that have signed up to help you succeed.

2.9 Additional Requirements

Please read and comply with additional requirements in Section 5. Competitors that do not comply with these requirements may be disqualified.

3. Phase 2: Make Rules

3.1 Introduction

Phase 2: Make is the second contest of the Geothermal Geophone Prize's three-contest series and offers a total \$1.25 million in cash prizes, as well as \$500,000 in vouchers. Any eligible entity may compete in the Phase 2 Contest regardless of whether they were a competitor in the Phase 1 Contest. However, winning Phase 2: Make is required to compete in Phase 3: Build:

Phase 1: Concept winners competing in Phase 2: Make will have the opportunity to receive concept design feedback in one-on-one (time limited) sessions with LBNL experts. Phase 2: Make competitors who did not participate in the Phase 1 Contest (or who did participate but did not win) are not eligible to receive LBNL design consultation.

Phase 2: Make Prizes

- Up to 5 winners
- \$1,250,000 in total cash prizes and \$500,000 in total vouchers. Each winner will receive \$250,000 in cash and up to \$100,000 in vouchers.

3.2 Goal

Competitors will undertake rigorous fabrication and testing toward establishing an effective prototype fabrication and testing approach using their Phase 1 or independent concept.

3.3 Prizes to Win

The Phase 2 Contest offers up to 5 cash prizes of \$250,000.

Competitors will also each win \$100,000 in vouchers. Winners will negotiate the scope of work to be performed under a voucher and can choose one of the pre-identified Power Connectors who have streamlined agreements available, or a separate national laboratory and/or private facility to perform the work. More details on vouchers will be provided prior to the opening of Phase 2 and Phase 3 Contests.

3.4 Important Dates

- Expected Phase 2: Make submission opens: **TBD**
- Expected Phase 2: Make submission deadline: **TBD**
- Expected Phase 2: Make Winner notification: **TBD**

3.5 How to Enter

Complete a submission package online at <https://www.herox.com/GeophonePrize> before the contest closing date.

3.6 What to Submit

The following items constitute the submission package and must be submitted through the HeroX platform:

- Up to 120-second video (to be made public, not scored)
- Cover page content (to be made public, not scored)
- One PowerPoint slide (to be made public, not scored)
- Voucher Work Slide (to be made public, not scored)
- Technical narrative about the innovation, team, and plan (not public, scored)
- Letters of commitment or support (optional).

Online Public Video—What is your innovation

Suggested content you provide

- How you and your team have been tackling the seismometer challenge.
- How you are incorporating advances in the high-temperature componentry space into your solution and why it is transformational
- Who you are and why you have a competitive edge
- Creative content that conveys your submission in exciting and interesting ways.

Required submission format

- Ensure that your video is posted publicly online (e.g., YouTube, Vimeo)
- The video should not exceed 120 seconds.

- **The American-Made Network may be able to help you with creating your video.**

Cover Page—List basic information about your submission

- Project name
- Innovation tagline (e.g., your mission in a few words)
- Link to your 90-second video online
- Key project members (names, contacts, and links to their LinkedIn profiles).

- Keywords that best describe your solution (e.g., components, equipment)
- Your city and state
- The Connectors⁹ (up to 3) that significantly helped you advance your solution and the major items they helped with (if applicable)
- Other partners (if any).

⁹ See description of Connector in Section 1. Program Summary.

Submission Summary Slide (will be made public)

Make your own public-facing one-slide submission summary that contains technically specific details but can be understood by most people. There is no template, so feel free to present the information as you see fit. Please make any text readable in a standard printout and conference room projection.

Voucher Work Slide (PowerPoint Slide(s))

Describe how you will use your voucher funds, including the entities you plan to engage and what they will do with the voucher funds. Provide one slide per entity you plan to engage.

3.6.1 Scored Items: Technical Narrative

Each statement for the Technical Narrative will be scored on a 1–6 scale:

1	2	3	4	5	6
strongly disagree	disagree	slightly disagree	slightly agree	agree	strongly agree

You should answer each of the following three questions. The content bullets are organized by suggested content to guide your responses, but you must decide where to focus your answers. The individual answers to the three questions do not have a word limit; however, the aggregate response to these three questions must be less than or equal to 3,500 words. You may also include up to 15 supporting images, figures, tables, or graphs. The expert reviewers will score the questions based on the content you have provided that conforms to the limits described previously.

Narrative

Question 1: *Innovation*—What is your design solution and why will it be successful?

Suggested content you provide

- Describe your innovation’s unique value proposition.
- Describe your advanced design approach and results; provide documentation of the proof-of-concept design.
- Describe how your team has advanced the sensor design and testing of components.
- Provide a list of critical components that are hard to acquire or may not be commercially available.
- Describe updated analysis to support how your solution will lead to reliable indefinite deployment in high-temperature environments while collecting high-resolution seismic data (according to specification in Section 3) using high-temperature seismometers.

Each statement scored on a 1–6 scale

- The design represents an innovative approach, built on reasonable assumptions, valid technical foundations, and lessons learned from other notable efforts in this space.
- The design approach(es) undertaken in Phase 1 is(are) reasonably ambitious, and submitted documentation validates critical assumptions needed to advance the proposed solution toward prototyping.
- The competitor provides compelling analysis and bench-scale testing that supports the efficacy of their proposed design to overcome critical failure points of seismic sensors deployed indefinitely at high temperature.
- Performance improvement goals and metrics are verifiable, and aggressive but attainable.

Question 2: Team—What have you done to date and what qualities give you a competitive edge?

Suggested content you provide

- Introduce your team, explain how it came together (including updates as applicable if the team participated in the Phase 1 contest), and highlight the knowledge and skills that make it uniquely capable of achieving success.
- Highlight your team’s experiences in this competition and in high-temperature tool and/or seismic sensor development and how you have applied this to your specific innovation.
- Describe why your team is passionate about your proposed solution.
- Explain why winning the Phase 2 Contest will substantively change the likely outcome for the proposed solution.
- Describe your efforts to undertake rigorous design processes, highlighting key engagements, relationships, and milestones.

Each statement scored on a 1–6 scale

- The team’s experience and track record demonstrate notable entrepreneurial qualities such as adaptability, creativity, decisiveness, and resourcefulness.
- The team’s drive, knowledge, and complementary skill sets provide a strong competitive edge toward realizing this solution in the near future.
- Winning the Phase 2 Contest will significantly increase the team’s chances of creating a viable high-temperature capable seismic sensor prototype.
- A considerable amount of high-quality effort was put into defining and advancing the design of the proposed solution.

Question 3: *Plan*—What is your plan to achieve your goals?

Suggested content you provide

- Describe where you stand in your high-temperature seismometer solution’s design development (**see special instructions below**).
 - For Phase 1 winners, provide the goals submitted in the Phase 1 Contest submission package and describe the actual outcomes to date. Update goals for the Phase 3 Contests, including the Phase 3 Demo Day (based on the schedule listed in Section 1.5).
 - For Phase 2 competitors who did not compete in Phase 1, define goals for Phase 3 Contests, including the Phase 3 Demo Day (based on the schedule listed in Section 1.5).
- Describe your team’s readiness to meet your goals; what resources provided by the contest will help meet your goals?
- Provide a high-level budget and project management plan to meet your goals through conclusion of the Phase 3 Contest, including how you will leverage program resources or other entities (include references to letters of support/commitment if applicable).

Each statement scored on a 1–6 scale

- The stated goals are ambitious, reduce risks, and show a commitment to an accelerated development.
- The competitors are successfully meeting prior goals and demonstrating continued critical design progress toward prototyping their innovation.
- Stated Phase 3 Contest goals, including the Phase 3 Demo Day goals, are ambitious, risk-reducing, and show a commitment to an accelerated solution development.
- Meeting the stated goals will demonstrate critical progress toward fabricating, testing, and validating the functionality of this proposed design.
- The proposed plan is appropriate and logical in order to achieve the stated goals.
- The proposed plan effectively uses resources available in-house or through this program to advance the innovation.

3.6.2 Special Instructions for Questions 1 and 3

- Benchtop testing results showing performance results of a 1-month test at a minimum temperature of 225 °C are required to demonstrate the performance of critical design components. Data should be provided to demonstrate component performance at temperature. For example, this could demonstrate the difference in performance from room temperature versus 225 °C or changes in function over time at high temperature.
- Performance criteria can discuss planned improvements for tool, component, or equipment functionality and reductions in cost and manufacturing lead times, among other improvements as compared to the state of the art. All criteria cited should reflect input from international standards (e.g., ISO), peer-reviewed literature, or other verifiable benchmarking methods.
- Use only specific, measurable, achievable, relevant, and timely (SMART) outcome-based goals—not activity-based—so that a neutral third party can validate them (if possible).

- For example: Demonstrate a definitive achievement of progress (e.g., achieve X% efficiency or X letters of interest signed); do **not** describe how you spent your time (e.g., provide a report, talk to customers, or perform experiments).
- In defining your SMART goals, include quantified, risk-reducing, meaningful, practical, and testable interim milestones.
- SMART goals submitted for each phase application package should not be static. All competitors should plan to assess and update goals based on their own efforts and through relevant stakeholder feedback (e.g., possible investors, customers, and experts in the solution space).
- The American-Made Network may be able to help you to formulate your SMART goals.

Letters of Commitment or Support (Optional)

Attach one-page letters (of support, intent, or commitment) from other relevant entities (e.g., potential users of the proposed innovation) to provide context. Letters of support from partners or others that are critical to the success of your proposed solution will likely increase your score. General letters of support from parties that are not critical to the execution of your solution will likely not factor into your score. Please limit letters of support to one page each.

Please read and comply with additional requirements about your submission in Section 5. COMPETITORS THAT DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

3.7 How We Score

The Prize Administrator screens all completed submissions, and in consultation with DOE, will assign completed submissions to a qualified panel of expert reviewers composed of subject matter experts who will score submissions according to the applicable judging criteria defined in Section 3.6 What to Submit. In order to be involved in the scoring of submissions, subject matter experts may not have personal or financial interests in, or be an employee, officer, director, or agent of any entity that is a registered participant in this contest, or have a familial or financial relationship with an individual who is a registered competitor.

The scoring of submissions will proceed as follows:

Scoring Weights: Each review criteria bullet for the Technical Narrative submission questions has equal weight. The score from an individual reviewer for the Technical Narrative will be the total sum of the scores for all bullets. All reviewers' scores will then be averaged for a final score for the submission package.

Interviews: GTO, at their sole discretion, may decide to hold a short interview with a subset of the Phase 2 Contest competitors. The interviews would be held prior to the announcement of winners and would serve to help clarify questions the reviewers may have. Attending interviews is not required, and interviews are not an indication of winning.

Final Determination of Winners: The Director of GTO will be the judge of the competition and will make the final determination of Phase 2 winners. This determination will take into account reviewer scores, any interview findings, and program policy factors listed in Section 5.13.

Announcement: The Prize Administrator will work as quickly as possible, and winning teams should be notified within 1 to 2 months after the contest closes, when the Prize Administrator will request the necessary information to distribute cash prizes. The Prize Administrator will then publicly announce the winners. After winning the Phase 2 Contest prize, competitors will develop their solutions in accordance with their plan to compete in the Phase 3 Contest.

3.8 Program Goal Requirements

Only submissions relevant to the goals of this program are eligible to compete. The Prize Administrator must conclude that all of the following statements are **true** when applied to your submission:

- You are a winner of the Phase 2 Contest of the Geothermal Geophone Prize.
- The proposed solution is responsive to the needs of the geothermal energy industry and meets the requirements described in Section 5.
- All activities that are described in and support the submission package are performed in the United States.
- The proposed solution represents an innovation that moves the seismological community and geothermal industries beyond their respective current states.
- The proposed solution is not dependent on new, pending, or proposed federal, state, or local government legislation, resolutions, appropriations, measures, or policies.
- The proposed solution does not involve the lobbying of any federal, state, or local government office.
- The proposed solution is based on fundamental technical principles and is realistic in scope and budget for the incentives provided in this program.
- The submission content sufficiently confirms the competitor's intent to bring a high-temperature capable seismic sensor concept to an advanced prototype stage by the conclusion of the program.

3.9 Find Help

Visit <https://americanmadechallenges.org/network.html> to review and contact the members of the American-Made Network that have signed up to help you succeed.

3.10 Additional Requirements

Please read and comply with additional requirements in Section 5. Competitors that do not comply with these requirements in Section 5 may be disqualified.

MORE DETAILS ON RULES FOR EACH CONTEST WILL BE PROVIDED PRIOR TO THE OPENING OF EACH SUBSEQUENT STAGE.

4. Phase 3: Build Rules

4.1 Introduction

Phase 3: Build is the third of the Geothermal Geophone Prize's three-contest series, offering a total of \$700,000 in cash prizes. Phase 3: Build begins with the announcement of the Phase 2 Contest winners, and includes a live demo day where all Phase 3 competitors must present to a panel of expert reviewers their prototype. Winning the Phase 2 Contest is required to be eligible to compete in the Phase 3 Contest.

Phase 3: Build Prizes

- Up to 2 winners
- \$700,000 in total cash prizes. Each winner will receive a cash prize of \$350,000.

4.2 Goal

Competitors fabricate prototypes of their high-temperature seismometer and use continual customer and stakeholder feedback to substantially advance their prototype. Prototypes will be a set of standardized testing procedures by a third-party testing facility.

4.3 Prizes to Win

The Phase 3 Contest offers up to two cash prizes of \$350,000.

The two winning teams will also have to opportunity to work with LBNL to field test their prototype sensor in an active geothermal field.

Full rules for Phase 3: Build will be released at a later date.

5. Additional Terms and Conditions

5.1 Universal Contest Requirements

Your submission for the Geophone Prize is subject to the following terms and conditions:

- You must post the final content of your submission or upload the submission form online at <https://www.herox.com/GeophonePrize> before the stated deadline. Late submissions or any other form of submission do not qualify.
- The video submission, cover page, summary slide, and the summary field testing slide will be made public.
- The Technical Narrative, letters of commitment/support, and detailed field testing plan, as well as associated National Environmental Policy Act (NEPA) documentation, are not intended to be made public; however, see Section 5.10 regarding the Freedom of Information Act.
- All submissions that you wish to protect from public disclosure must be marked according to the instructions in Section 5.10. Unmarked or improperly marked submissions will be deemed to have been provided with unlimited rights and may be used in any manner and for any purpose whatsoever as provided in these Rules and Section 5.4 Submission Rights.
- You agree to release your submission video under a Creative Commons Attribution 4.0 International License (see <http://creativecommons.org/licenses/by/4.0/>).
- You must include all the required submission elements. The Prize Administrator may disqualify your submission after an initial screening if you fail to provide all required submission elements.
- Your submission must be in English and in a format readable by Microsoft Word. Scanned hand-written submissions will be disqualified.
- Submissions and competitors will be disqualified if any engagement with the Geophone Prize—including but not limited to the submission, the HeroX forum, or emails to the Prize Administrator—contains any matter that, at the sole discretion of DOE or NREL, is indecent, obscene, defamatory, libelous, lacking in professionalism, or demonstrates a lack of respect for people or life on this planet.
- If you click “Accept” on the HeroX platform and proceed to register for any of the contests described in this document, these rules form a valid and binding agreement between you and the U.S. Department of Energy and are in addition to the existing HeroX Terms of Use for all purposes relating to these contests. You should print and keep a copy of these rules. These provisions only apply to the contests described here and no other contests on the HeroX platform or anywhere else. To the extent that these rules conflict with the HeroX Terms of Use, these rules shall govern.
- The Prize Administrator, when feasible, may give competitors an opportunity to fix non-substantive mistakes or errors in their submission packages.

5.2 Verification for Payments

The Prize Administrator verifies the identity and role of a participant potentially qualified to receive the prizes. Receiving a prize payment is contingent upon fulfilling all requirements contained herein. The Prize Administrator notifies winning competitors using provided email contact information after the date that results are announced. Each competitor (or parent/guardian if under 18 years of age), is required to sign and return to the Prize Administrator, within 30 days of the date the notice is sent, a completed NREL Request for ACH Banking Information form, and a completed W9 form (<https://www.irs.gov/pub/irs-pdf/fw9.pdf>). At the sole discretion of the Prize Administrator, a winning competitor is disqualified from the competition and receives no prize funds if: (i) the person/entity cannot be contacted; (ii) the person/entity fails to sign and return the required documentation within the required time period; (iii) the notification is returned as undeliverable; (iv) the submission or person/entity is disqualified for any other reason.

5.3 Teams and Single-Entity Awards

The Prize Administrator awards a single dollar amount to the designated primary submitter, whether consisting of a single or multiple entity/entities. The primary submitter is solely responsible for allocating any prize funds among its member competitors as they deem appropriate. The Prize Administrator does not arbitrate, intervene, advise on, or resolve any matters between team members or between teams.

5.4 Submission Rights

The public videos in this contest must be submitted and released to the public by the competitor under a Creative Commons Attribution 4.0 International License (see <http://creativecommons.org/licenses/by/4.0/>).

By making a submission, and thereby consenting to the rules of the contest as described in Section 5.1, a competitor is granting to DOE, the Prize Administrator, and any other third parties supporting DOE in the contest a license to display publicly and use all parts of any submission for any other government purpose. The Technical Narrative, letters of commitment/support, and portions of submissions properly marked as protected, are not to be made public according to Section 5.1. This license includes posting or linking to the public portions of the submission on the Prize Administrator or HeroX applications, including the contest website, DOE websites, and partner websites, and the inclusion of the submission in any other media, worldwide. The submission may be viewed by DOE, the Prize Administrator, and reviewers for purposes of the contests, including but not limited to screening and evaluation purposes. The Prize Administrator and any third parties acting on their behalf will also have the right to publicize a competitor's name and, as applicable, the names of competitor team members and organizations that participated in the submission on the contest website indefinitely.

By entering, the competitor represents and warrants that:

1. Competitor's entire submission is an original work by competitor and competitor has not included third-party content (such as writing; text; graphics; artwork; logos; photographs; dialogue from plays; likeness of any third party; musical recordings; clips of videos, television programs, or motion pictures) in or in connection with the submission, unless (i) otherwise requested by the Prize Administrator and/or disclosed by competitor in the submission, and (ii) competitor has either obtained the rights to use such third-party content or the content of the submission is considered in the public domain without any limitations on use;

2. Unless otherwise disclosed in the submission, the use thereof by Prize Administrator, or the exercise by Prize Administrator of any of the rights granted by competitor under these rules, does not and will not infringe or violate any rights of any third party or entity, including without limitation patent, copyright, trademark, trade secret, defamation, privacy, publicity, false light, misappropriation, intentional or negligent infliction of emotional distress, confidentiality, or any contractual or other rights;
3. All persons who were engaged by the competitor to work on the submission or who appear in the submission in any manner have:
 - a. Given competitor their express written consent to submit the submission for exhibition and other exploitation in any manner and in any and all media, whether now existing or hereafter discovered, throughout the world;
 - b. Provided written permission to include their name, image, or pictures in or with the submission (or if a minor who is not competitor's child, competitor must have the permission of their parent or legal guardian) and competitor may be asked by Prize Administrator to provide permission in writing;
 - c. Not been and are not currently under any union or guild agreement that results in any ongoing obligations resulting from the use, exhibition, or other exploitation of the submission.

5.5 Copyright

Each competitor represents and warrants that the competitor is the sole author and copyright owner of the submission; that the submission is an original work of the applicant or that the applicant has acquired sufficient rights to use and to authorize others, including DOE, to use the submission, as specified throughout the rules; that the submission does not infringe upon any copyright or upon any other third-party rights of which the applicant is aware; and that the submission is free of malware.

5.6 Contest Subject to Applicable Law

All contests are subject to all applicable federal laws and regulations. Participation constitutes each participant's full and unconditional agreement to these Official Contest Rules and administrative decisions, which are final and binding in all matters related to the contest. This notice is not an obligation of funds; the final awards are contingent upon the availability of appropriations.

5.7 Resolution of Disputes

The U.S. Department of Energy is solely responsible for administrative decisions, which are final and binding in all matters related to the contest.

Neither the U.S. Department of Energy nor the Prize Administrator arbitrate, intervene, advise on, or resolve any matters between team members or among competitors.

5.8 Publicity

The winners of these prizes (collectively, "winners") will be featured on the DOE and NREL websites.

Except where prohibited, participation in the contest constitutes each winner's consent to DOE's and its agents' use of each winner's name, likeness, photograph, voice, opinions, and/or hometown and state information for promotional purposes through any form of media, worldwide, without further permission, payment, or consideration.

5.9 Liability

Upon registration, all participants agree to assume and, thereby, have assumed any and all risks of injury or loss in connection with or in any way arising from participation in this contest, development of any submission. Upon registration, except in the case of willful misconduct, all participants agree to and, thereby, do waive and release any and all claims or causes of action against the federal government and its officers, employees, and agents for any and all injury and damage of any nature whatsoever (whether existing or thereafter arising, whether direct, indirect, or consequential and whether foreseeable or not), arising from their participation in the contest, whether the claim or cause of action arises under contract or tort.

5.10 Records Retention and the Freedom of Information Act

All materials submitted to DOE as part of a submission become DOE records and are subject to the Freedom of Information Act. The following applies only to portions of the submission not designated as public information in the instructions for submission. If a submission 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 is withheld from public disclosure to the extent permitted by law, including the Freedom of Information Act. Without assuming any liability for inadvertent disclosure, DOE will seek to limit disclosure of such information to its employees and to outside reviewers when necessary for 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.

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 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. [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.

Competitors are notified of any Freedom of Information Act requests for their submissions in accordance with 29 C.F.R. § 70.26. Competitors may then have the opportunity to review materials and work with a Freedom of Information Act representative prior to the release of materials.

5.11 Privacy

If you choose to provide HeroX with personal information by registering or completing the submission package through the contest website, you understand that such information is transmitted to DOE and may be kept in a system of records. Such information is used only to respond to you in matters regarding your submission and/or the contest unless you choose to receive updates or notifications about other contests or programs from DOE on an opt-in basis. DOE and NREL are not collecting any information for commercial marketing.

5.12 General Conditions

DOE reserves the right to cancel, suspend, and/or modify the contest, or any part of it, at any time. If any fraud, technical failures, or any other factors beyond DOE's reasonable control impairs the integrity or proper functioning of the contests, as determined by DOE at its sole discretion, DOE may cancel the contest.

Although DOE indicates in the Phase 3 Contest that it will select two winners for the contest, DOE reserves the right to only select competitors that are likely to achieve the goals of the program. If, in DOE's determination, no competitors are likely to achieve the goals of the program, DOE will select no competitors to be winners and will award no prize money.

ALL DECISIONS BY DOE ARE FINAL AND BINDING IN ALL MATTERS RELATED TO THE CONTEST.

5.13 Program Policy Factors

While the scores of the reviewers will be carefully considered, it is the role of the Prize Administrator to maximize the impact of contest funds. Some factors outside the control of competitors and beyond the independent reviewers' scope of review may need to be considered to accomplish this goal. The following is a list of such factors. In addition to the reviewer's scores, the below program policy factors may be considered in determining winners:

- Geographic diversity and potential economic impact of projects in a variety of geothermal environments
- Whether the use of additional DOE funds and provided resources continue to be non-duplicative and compatible with the stated goals of this program and the DOE mission generally
- Entity diversity, from individuals to teams, small businesses, and corporations
- The degree to which the submission exhibits technological or programmatic diversity when compared to the existing DOE project portfolio and other competitors
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers

- The degree to which the submission is likely to lead to increased employment and manufacturing in the United States or provide other economic benefit to U.S. taxpayers
- The degree to which the submission will accelerate transformational technological, financial, or workforce advances in areas that industry by itself is not likely to undertake because of technical or financial uncertainty
- The degree to which the submission supports complementary DOE efforts or projects, which, when taken together, best achieve the research goals and objectives
- The degree to which the submission enables new and expanding market segments
- Whether the project promotes increased coordination with nongovernmental entities for the demonstration of technologies and research applications to facilitate technology transfer.

5.14 Return of Funds

As a condition of receiving a prize, competitors agree that if the prize was made based on fraudulent or inaccurate information provided by the competitor to DOE, DOE has the right to demand that any prize funds or the value of other non-cash prizes be returned to the government.

5.15 Request To Waive the “Domestic Ownership and Control” Eligibility Requirement

If an entity seeking to compete as the registered competitor does not have domestic ownership and control, the entity should include a waiver request that addresses the following waiver criteria and content requirements with their submission. EERE may consider issuing a waiver of that eligibility requirement where the entity submits a compelling justification; the entity is incorporated in and maintains a primary place of business in the United States; and the entity otherwise meets the eligibility criteria. There are no rights to appeal EERE’s decision on the waiver request.

5.15.1 Waiver Criteria

Any entity seeking a waiver must demonstrate to the satisfaction of DOE that its participation: (1) has a high likelihood of furthering the objectives of this prize competition and (2) aligns with the best interest of the U.S. industry and U.S. economic development.

5.15.2 Content for Waiver Request

A waiver request must include the following information:

- Entity’s name and place of incorporation;
- The location of the entity’s primary place of business;
- A statement describing the extent the entity is owned or control by a foreign government, agency, firm, corporation, or person who is not a citizen or permanent resident of the United States, including the applicable percentage of ownership/control;
- A compelling justification that addresses the waiver criteria stated above;
- A description of the project’s anticipated contributions to the U.S. economy;

- f. A description of how the entity has benefitted U.S. research, development, and manufacturing, including contributions to employment in the United States and growth in new U.S. markets and jobs; and
- g. A description of how the entity has promoted domestic manufacturing of products and/or services.

Requests should be emailed to the prize administration email: geophoneprize@nrel.gov.

5.16 National Environmental Policy Act Compliance

DOE's administration of the American-Made Geothermal Geophone Prize is subject to NEPA (42 USC 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 <http://nepa.energy.gov/>.

While NEPA compliance is a federal agency responsibility and the ultimate decisions remain with the federal agency, all participants seeking field testing cost reimbursement as part of winning the Geo! Contest will be required to assist in the timely and effective completion of the NEPA process in the manner most pertinent to their participation in the prize competition. To be eligible for field testing cost reimbursements, participants are required provide DOE with information on their planned field testing activities such that DOE can conduct a meaningful evaluation of the potential environmental impacts. While declining to submit information in support of the timely and effective completion of the NEPA process disqualifies that participant from field testing cost reimbursement consideration, the participant remains eligible to win the separate \$500,000 cash prize.

5.17 Definitions

Borehole Seismometer / Seismic Sensor is a device that detects earth movement produced by acoustic waves (seismic energy) and transforms the wave motion into an electrical signal in units of displacement, velocity, or acceleration. A high-temperature high-sensitivity borehole seismometer means a three-component sensor sonde with mutually orthogonal components, deployable in an EGS borehole and meeting the specifications set out in Table 1.3, and capable of being multilevel. Distributed optical borehole systems would still need to meet the relevant specifications.

Geothermal Energy is a renewable energy resource derived from the Earth's heat used for a spectrum of applications including direct-use and electricity generation, spanning temperature ranges from low (e.g., 100 °C) to high (e.g., 300 °C+). AM applications sought in this competition help advance tools, components, and equipment designed to drill, interrogate, monitor, and function in harsh subsurface (e.g., 200 °C+) environments during geothermal operations. Surface equipment associated with power generation, including turbines and other power plant components, are not considered responsive AM applications for purposes of this competition.

Prize Administrator means both the Alliance for Sustainable Energy operating in its capacity under the Management and Operating Contract for the National Renewable Energy Laboratory (NREL), and the U.S. Department of Energy Geothermal Technologies Office (GTO). When the Prize Administrator is referenced in this document, it refers to staff from both the Alliance for Sustainable Energy and GTO staff. Ultimate decision-making authority regarding contest matters rests with the directors of the GTO.

Connector or Connector Organization means an entity that seeks to support the efforts of the competitors. These must be U.S.-based organizations that have the capacity to connect competitors to mentoring, business resources, manufacturing resources, or introduce them to possible sources of

funding. This definition is intentionally broad so that many different types of entities are able to participate. Connectors earn recognition rewards based upon their support of the competitors. Further details can be found at: <https://americanmadechallenges.org/network.html>.

Voucher Funding: Vouchers are part of the prizes for the Phase 1 and Phase 2 Contests. In the case of a national laboratory, the funds are provided directly to the lab on behalf of the winner to conduct a mutually agreed upon scope of work between the lab and the winner. When vouchers are used at a non-national laboratory facility, the winners are reimbursed after the voucher work is complete. Further details about the voucher process are provided at <https://www.herox.com/GeophonePrize/resources>.