American-Made Geothermal Geophone Prize

PHASE 3 RULES

March 2024

Preface

The U.S. Department of Energy's Geothermal Geophone Prize will be governed by 15 U.S.C. §3719 and this Official Rules document. This is not a procurement under the Federal Acquisitions Regulations and will not result in a grant or cooperative agreement under 2 CFR 200. The Prize Administrator reserves the right to modify this Official Rules document if necessary and will publicly post any such notifications as well as notify registered prize participants.

Date	Modification
08/23/22	Modifications to this rules document include: Removed "technical assistance request" under Section 2.5 "What to Submit" on page 15. This was replaced with "voucher slide."
06/02/23	Modifications to this rules document include: Updated important dates for Phase 2 and Phase 3 on page 13. This update occurred because the Phase 2 submission deadline was extended to December 1, 2023.
7/21/2023	Modifications to the rules document include: • Additional context provided about the frequency response, noise levels, and wide bandwidth specifications in Section 1.3, Prize Performance Goals starting on page 8. Additional explanation provided for the definition of a three-component sensor in Section 5.17 Definitions, paragraph 1, starting on page 37.
11/1/2023	Modifications to the rules document include: Updated the Phase 2 and Phase 3 dates. Phase 2 deadline is extended from December 1, 2023, to February 1, 2024.
2/20/2024	Modifications to the rules document include: Updated Prize Performance Goals Column 3 from "Acceptable" to "Target" and Column 4 from "Ideal Target" to "Long-Term Ideal." A sentence was also included under the chart to specify these changes.

Contents

1 Executive Summary

The American-Made High-Temperature Geothermal Geophone Prize aims 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.

1.1 Prizes

The Phase 3: Build Contest offers up to two cash prizes of $350,000. Additionally, the two winning teams will have the option to work with LBNL to deploy and test their prototype sensor in a high-temperature borehole at a geothermal field site.

The Geothermal Geophone Prize offers a total prize pool of $2.55 million in cash and $1.1 million in vouchers across 3 phases. In Phase 3, teams fabricate prototypes of their high-temperature seismometer and use continual customer and stakeholder feedback to substantially advance their prototype to meet the Prize Performance Goals. Prototypes will undergo a set of independent evaluation procedures by SNL.

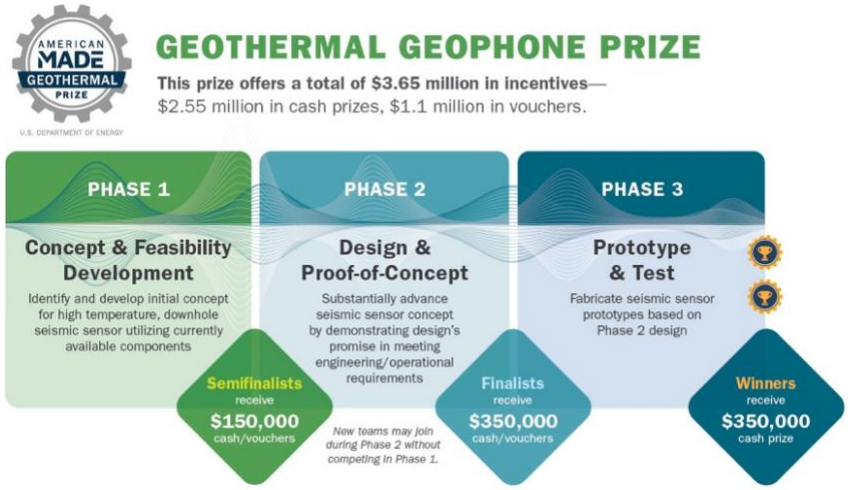

Figure 1. The Geothermal Geophone Prize offers three escalating rounds and substantial cash and other benefits to spark innovation in high temperature seismic sensors.

1.2 Key Dates

- **Phase 3–Opens: March 26, 2024** (anticipated)
- **Phase 3–Submission Closes: August 15, 2025** (anticipated)
- **Phase 3–Winner Announcement: October, 2025** (anticipated)

1.3 Eligibility and Competitors

All Phase Eligibility

The competition is open only to individuals; private entities (for-profits and nonprofits); non-federal government entities such as states, counties, tribes, and municipalities; and academic institutions; subject to the following requirements:

- An individual prize competitor (who is not competing as a member of a group) must be a U.S. citizen or permanent resident.
- A group of individuals competing as one team may win, provided that the online account holder of the submission is a U.S. citizen or permanent resident. Individuals competing as part of a team are eligible to participate if they are legally authorized to work in the United States.
- Private entities must be incorporated in and maintain a primary place of business in the United States.
- Academic institutions must be based in the United States.
- 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 participating in Federal programs are not eligible to compete.
- Individuals participating in a foreign government talent recruitment program[1] sponsored by a country of risk[2] and teams that include such individuals are not eligible to compete.
- Entities owned by, controlled by, or subject to the jurisdiction or direction of a government of a country of risk are not eligible to compete.
- To be eligible, an individual authorized to represent the competitor must agree to and sign the following statement upon registration with HeroX:

  I am providing this submission package as part of my participation in this prize. I understand that the information contained in this submission will be relied on by the federal government to determine whether to issue a prize to the named competitor. 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

[1] Foreign Government-Sponsored Talent Recruitment Program is defined as an effort directly or indirectly organized, managed, or funded by a foreign government, or a foreign government instrumentality or entity, to recruit science and technology professionals or students (regardless of citizenship or national origin, or 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 relocate physically to the foreign state for the above purpose. Some programs allow for or encourage continued employment at United States 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.

[2] DOE has designated the following countries as foreign countries of risk: Iran, North Korea, Russia, and China. This list is subject to change.

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, and 31 U.S.C. §§ 3729-3733 and 3801-3812.

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.

Phase 3 Eligibility

- Only winners of Phase 2 are eligible to compete in Phase 3.
- In Phase 3: Build, competitors will submit a prototype for independent evaluation of performance at SNL. This required evaluation will be separate from the $100,000 voucher awarded to Phase 2 winners. After required evaluation is done, teams will submit a final Technical Narrative responding to the questions in Section 4.7.4. Competitors may include letters of support from potential commercial partners, if available.
- Competitors must be a for-profit business entity, such as a corporation or other organization that is formed in and maintains a primary place of business in the United States.

2 Background

2.1 Prize Background

The Geothermal Geophone Prize is part of the American-Made Challenges program, which is your fast track to the clean energy revolution. Funded by the U.S. Department of Energy, we incentivize innovation through prizes, training, teaming, and mentoring, connecting the nation's entrepreneurs and innovators to America's national labs and the private sector. 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 8,000–12,000+ 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. EGS stimulations involve the injection of water into the subsurface to create or reopen existing fractures that allow us to access stranded heat. 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 is the key to collecting this information.

Downhole wide-bandwidth sensors that measure real-time seismicity are a family of tools that has an especially important place in EGS development. Tracking microseismicity (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 it ensures safe geothermal operations. Improving the ability to monitor and locate microseismic events at high temperatures 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 EGS[3] 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 microseismic data to inform how a reservoir is growing, geothermal developers cannot fully utilize valuable microseismic 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 of 60 gigawatts of projected geothermal electricity capacity by 2050

[3] U.S. Department of Energy. 2019. *Frontier Observatory for Research in Geothermal Energy*. https://www.energy.gov/eere/geothermal/articles/frontier-observatory-research-geothermal-energy-roadmap.

(as highlighted in DOE's *GeoVision: Harnessing the Heat Beneath Our Feet* report).[4] 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 DOE's Office of Energy Efficiency and Renewable Energy (EERE) 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 aims to be flexible, scalable, and extended across numerous technology domains and sectors.

The Geophone Prize brings together the world's best-in-class research base with its unparalleled entrepreneurial support system to create a sweeping portfolio of innovations primed for demonstrating the promise that high-temperature seismic sensing holds for revolutionizing engineering approaches to extreme environments. This prize structure simultaneously enables the rapid development of technology and strengthens critical connections for commercialization. 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; connect with mentoring and 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.

2.2 Prize Phases

The Geothermal Geophone Prize contains 3 phases – Concept, Make, Build – to incentivize efforts to identify, develop, and test disruptive seismic sensor solutions to meet geothermal industry needs.

The three phases:

Phase 1 – Concept & Feasibility Development

[4] 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.

Participants demonstrate that they have identified and developed a) an initial concept for a high-temperature, downhole seismic sensor that utilizes currently available components or b) 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.[5]

- 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.[6]

Phase 2 – Design & Proof-of-Concept

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 Phase 1 and 2 Official Rules).

- Up to five Phase 2 winners will receive $250,000 in cash and $100,000 in national laboratory vouchers.

Phase 3 – Prototype & Test

Competitors fabricate seismic sensor prototypes based on their Phase 2 design. Phase 3 Contest competitors will be required to test their prototype at Sandia National Laboratory (SNL) during Phase 3.

- 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.

2.3 Prize Program Goal Requirements

Only submissions relevant to the goals of this program are eligible to compete. The Prize Administrator must conclude that all 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.

- All activities that are described in and support the submission package are performed in the United States and have the potential to benefit the U.S. market.

- The proposed solution represents an innovation that will move the seismological community and geothermal industry beyond their current states.

- The proposed solution is not dependent on new, pending, or proposed federal, state, or local government legislation, resolutions, appropriations, measures, or policies.

[5] See Phase 1 eligibility requirements under Section 2.7.
[6] See Section 6.2 for more information.

- 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 consistent with a basic understanding of the U.S. market economy.
- The submission content sufficiently confirms the competitor's intent to commercialize early-stage technology and establish a viable U.S.-based business in the near future with revenues that do not solely depend on licensing fees of intellectual property.

GTO has developed the performance goals below for devices developed under the Geophone Prize. **Designs and prototypes must meet the following performance metrics:**

Rank	Specification	Target	Long-Term Ideal
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 [@ 1 Hz]	10 ng/√Hz [@ 1 Hz]
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

** Requirement for final packaged tool intended to be deployed in a well

*** Final tool diameter would need to fit in holes of this size

This chart was updated 2/20/2024 to change "Acceptable" in Column 3 to "Target" and "Ideal Target" in Column 4 to "Long-Term Ideal."

While the target values are the requirements for the prize, DOE recognizes these are aggressive goals. The long-term ideal specifications are where DOE would like the prototype specifications to be with deployment.

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 only some of the desired qualities, or they have all the 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 multiyear 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 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**.

Additionally, **contestants are not limited to designing one 3C sensor to cover the full bandwidth** listed in the specifications. Instead, **a single sensor package (sonde) that includes two 3C sensors, one covering the low-frequency range and one covering the high-frequency range, is also acceptable as long as** they are packaged in a single borehole sonde and can be recorded simultaneously (or be multiplexed).

To show the frequency response of the sensor, contestants can plot the magnification curve (response curve) of the sensor as magnification (or dB) vs frequency (Hz), or sensitivity (V/m/s) vs frequency (Hz). An ideal sensor would have a flat curve between the low- and high-frequency range. Plotting the mean power spectral density is a common tool for quantifying the noise, and seismic power spectral density plots usually include the high- and low-earth noise U.S. Geological Survey model curves for reference. Further information and graphics can be viewed at the IRIS PASSCAL website[7].

2.4 Diversity Equity and Inclusion

DOE is committed to investing in innovations that deliver benefits to the American public and lead to commercialization of technologies and products that foster sustainable, resilient, and equitable access to clean energy. Further, DOE is committed to supporting the development of more diverse, equitable, inclusive, and accessible workplaces to help maintain the nation's leadership in science and technology.

As part of the application, applicants are required to describe how diversity, equity, and inclusion objectives will be incorporated in the project. Specifically, applicants are required to submit a Diversity, Equity, and Inclusion Plan that describes the actions the applicant will take to foster a welcoming and inclusive environment, support people from groups underrepresented in STEM, advance equity, and encourage the inclusion of individuals from these groups in the project; and the extent the project activities will be located in, or benefit underserved communities. The plan should include at least one SMART milestone per Budget Period supported by metrics to measure the success of the proposed actions and will be incorporated into the award if selected. The Diversity, Equity, and Inclusion Plan should contain the following information:

- Equity Impacts: the impacts of the proposed project on underserved communities, including social and environmental impacts.
- Benefits: The overall benefits of the proposed project, if funded, to underserved communities; and

[7] https://www.passcal.nmt.edu/

- How diversity, equity, and inclusion objectives will be incorporated in the project.

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

1. Include persons from groups underrepresented in STEM as PI, co-PI, and/or other senior personnel;
2. Include persons from groups underrepresented in STEM as student researchers or post-doctoral researchers;
3. Include faculty or students from Minority Serving Institutions as PI/co-PI, senior personnel, and/or student researchers, as applicable;
4. Enhance or collaborate with existing diversity programs at your home organization and/or nearby organizations;
5. Collaborate with students, researchers, and staff in Minority Serving Institutions;
6. Disseminate results of research and development in Minority Serving Institutions or other appropriate institutions serving underserved communities;
7. Implement evidence-based, diversity-focused education programs (such as implicit bias training for staff) in your organization;
8. Identify Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses and Veteran Owned Businesses to solicit as vendors and sub-contractors for bids on supplies, services, and equipment.

The Diversity, Equity, and Inclusion Plan must not exceed 5 pages. Save the Diversity, Equity and Inclusion Plan in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_DEIP".

2.5 Find Help – the American-Made Network

American-Made Network

The American-Made Network cultivates resources and builds connections that enhance, accelerate, and amplify competitors' efforts. The objective is to link participants with the people, resources, financing, perspectives, and industry expertise necessary for long-term success.

The network is comprised of the following elements:

1. **Prize and Network Administrator (NREL):** DOE has partnered with NREL to administer the American-Made Challenges. NREL, as the administrator, 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.

2. **Connectors:** Connectors are the cornerstones of the American-Made Network. These organizations support innovators to succeed in prize challenges and in the real world, providing them with the resources they need at any stage of competition. They are partners positioned to help provide program support, participant recruitment, event hosting, and more. Connectors gain access to novel innovators through the Network and can receive cash prizes for their support.

   Connectors that support participants in the prize are financially rewarded based on the table below.

Recognition Award	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 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
* Power Connectors and national labs are ineligible to receive Recognition Rewards.			

- Competitors and reviewers in any given prize program cannot also be a Connector for that prize program. If a Connector formally joins a team, they forego any financial incentive and recognition payment for that prize program.[8]
- Entities interested in participating as Connectors can visit the following site for details: https://network.americanmadechallenges.org/.

3. **Power Connectors**: Power Connectors are Connectors who play a more substantial role in the competition and receive funds to expand and amplify DOE and NREL's efforts. They are deeply involved with prize program execution, recruitment, and support. These organizations are contracted to perform a variety of tasks for specific prizes that advance program successes – extending the reach and improving the diversity and inclusivity of the Network overall.

2.6 Additional Requirements

Please read and comply with additional requirements in Appendix 1.

COMPETITORS WHO DO NOT COMPLY WITH THESE REQUIREMENTS MAY BE DISQUALIFIED.

[8] Additional details can be found in the Guidelines for Connector Recognition Rewards.

3 Phase One and Two (Complete)

3.1 Goal

Phases 1 and 2 are now closed. To reference Phase 1 and 2 rules, please see the complete rules document at Geophone Prize Official Rules.

4 Phase Three

4.1 Goal

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 required independent evaluation of prototypes at SNL facilities. Winning the Phase 2 Contest is required to be eligible to compete in the Phase 3 Contest.

Competitors fabricate prototypes of their high-temperature seismometer and use continual customer and stakeholder feedback to substantially advance their prototype to meet the Prize Performance Goals. Prototypes will undergo a set of independent evaluation procedures by SNL.

4.2 Prizes

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

Additionally, the two winning teams will have the option to work with LBNL to deploy and test their prototype sensor in a high-temperature borehole at a geothermal field site.

4.3 How to Enter

Go to HeroX and follow the instructions for registering and submitting all required materials before the phase deadline. Competitors also have the ability to form teams or find partners through the HeroX platform.

4.4 Important Dates

Refer to the timeline on HeroX for relevant dates and deadlines.

Event	Date	Update
Phase 3: Build submission opens	March 26, 2024	
Teams inform SNL on intent to hand-deliver prototype	July 1, 2024	See Section 4.6.2
Required evaluation call with SNL	January 15, 2025	See Section 4.6.4
Submissions of accompanying documentation for required independent evaluation	March 25, 2025	See Section 4.6.3
Voucher utilization close*	March 31, 2025	*Anticipated date*
Prototype delivery for evaluation submission	April 1, 2025	See Section 4.6
Required evaluation done at SNL	April 1, 2025–July 14, 2025	*Anticipated date*
Required evaluation results are sent to the competitor	July 15, 2025	*Anticipated date*
Phase 3: Build Submission Due	August 15, 2025	*Anticipated date*
Phase 3: Build winners notification	October, 2025	*Anticipated date*

* Winning teams of Phase 2 can utilize their voucher funds for support from a national laboratory or private facility through March 31, 2025. After this date, voucher funds will not be available.

4.5 Plan Phase Process

The Phase consists of the following steps: presubmission requirements, prototype submission, and final submission. Each section below will expand on these requirements.

1. **Presubmission Requirements** –Competitors will continue to finalize prototypes based on their submission to Phase 2 of the prize. Competitors will build their prototypes, complete the prototype evaluation submission package, and send or hand-deliver their prototype to SNL. To facilitate appropriate evaluation at SNL, an evaluation submission package is provided to competitors for them to fill out and submit with their prototypes. The prototypes will be tested, and the results will be provided to the competitors, the Prize Administrators, DOE, and the expert reviewers. Then the competitors will submit their final submission package.

2. **Prototype submission** – due April 1, 2025 and consisting of:

   Physical prototype – Physical prototypes are sent or delivered to SNL. Please see Section 3.8 for more information.

   Online accompanying documents – In addition to the prototypes mailed or hand-delivered directly to SNL, competitors must submit online documents through HeroX.

   Call with Sandia National Lab (SNL) – Teams are required to schedule a call with experts at SNL by January 15, 2025. Teams are highly encouraged to schedule calls early and before the January 15, 2025, deadline. Please contact Melanie Schneider at mbschne@sandia.gov to schedule the call. This call is to discuss your prototype evaluation and ensure that SNL staff can set up the appropriate testing facility for your prototype.

   To start, for this call please prepare:

   - A presentation of your prototype, including physical dimensions, data acquisition specifications, and power requirements
   - Models of your prototype and how it should be mounted to the shaker
   - Any additional information the SNL staff for testing and handling your equipment.

   Other criteria to prep for the call will be shared with teams during Phase 3.

   The results of the prototype evaluation at SNL will be provided to the competitors. The competitors will then submit their final submission package via HeroX. Evaluation results will be used as an evaluation factor in relation to the content included in all Phase 3 submission materials, specifically the performance of the prototype as it relates to the narrative on the expected results and goals from the evaluation, as well as with the overall final submission package.

3. **Final submission** – To enter Phase 3: Build, a competitor must complete a final submission package online (https://www.herox.com/geophoneprize) before the evaluation submission deadline. The final submission package is separate from the required evaluation at SNL for Phase 3. The final submission package is what will be reviewed and scored. The results from the required evaluation with SNL can be included in your final submission package.

4.6 What to Submit – Prototype Submission

All competitors are required to submit their prototype to SNL for prototype performance evaluation. Performance evaluation will be done for each prototype based on the Prize Performance. SNL has been chosen as the testing organization to ensure fairness and comparability across all submissions.

The results from the evaluation are anticipated to be provided to the competitor via the Prize Administrator within approximately 3 months following the prototype evaluation submission package deadline.

It is the responsibility of the researcher at SNL to examine the prototype upon receipt to determine if it is obviously untestable (e.g., broken, incomplete, improperly assembled). If the prototypes are NOT received or are obviously untestable, it is the competitor's responsibility to send new prototypes by the prototype submission deadline.

Early submission of prototypes is highly encouraged. The Geothermal Geophone Prize will prepay for the evaluation of eligible competitors (i.e., competitors that meet the HeroX registration deadline and overall prize eligibility guidelines).

Evaluation results will be sent directly to the Prize Administrator, who will share individual results privately with each competitor.

Competitors are responsible for the delivery of the prototype to the SNL facility either by shipment or hand-delivery.

4.6.1 Shipment

Competitors are responsible for the cost of shipping their prototypes to the laboratory; however, the Prize Administrator will pay for the return shipping of prototypes to competitors following evaluation. It is the intention of the Prize Administrator to ensure that all prototypes are returned to competitors. However, it is agreed to and understood by the competitors that the prototypes may be destroyed and/or become unusable in the process of the evaluation, shipping, or handling. Therefore, competitors agree that DOE, NREL, SNL, American-Made Challenges, or any DOE or national lab employee is not at fault if the provided prototypes are returned in broken, damaged, or unusable condition.

Mailing instructions: Competitors should package prototype appropriately to shield against damage during shipping. Once shipped, competitors must email the evaluation laboratory and copy the Prize Administrator (geophoneprize@nrel.gov) with confirmation of shipment, team name, submission title, team captain name and contact, and tracking number. Contact and shipping information for the evaluation laboratory will be provided to registered eligible competitors after Phase 3 opens.

Melanie Schneider
Sandia National Laboratories
MO 293 RM 22 MS 1033
1515 Eubank Blvd SE
Albuquerque, NM 87123

Competitors should also provide their return mailing information to have their samples returned to them following evaluation including:

- Name
- Company
- Address

- State
- Zip code
- Phone number

Please note that neither DOE, NREL, nor SNL are responsible for any damage to the sample, nor are they responsible should the sample be unable to be tested for any reason. Although SNL plans to return prototypes to competitors, it makes no commitment to return devices.

Please have all submissions postmarked by April 1, 2025.

4.6.2 In-Person Delivery

A team member or team members from each team participating in Phase 3 of the Geophone Prize may also hand-deliver their prototype to SNL. Team members can coordinate with SNL on delivery of the prototype. The details of this delivery will be shared with participating teams during Phase 3.

Teams who plan to deliver their prototype to SNL are required to confirm their plan for delivery by July 1, 2024. Teams can confirm their plan by emailing geophoneprize@nrel.gov the first and last name of the individual who will deliver the prototype, the email and phone number of the individual, the team's name, and the estimated time frame for delivery. Please have the estimated time frame be between February 1 and February 15, 2025. The prototype is required to be delivered by no later than February 15, 2025. Submissions delivered after the February 15 prototype submission deadline will not be accepted.

Travel and expenses with delivery are the responsibility of the team. DOE or SNL will not be providing a budget for salary or other expenses for the delivery of the prototype.

4.6.3 Online Accompanying Documents

In addition to the prototypes mailed or hand-delivered directly to SNL, competitors must submit online documents through HeroX.

Competitors should use the template on HeroX[9] to complete the necessary table. Competitors should complete the table for their prototype and provide information on the dimensions of their prototypes.

Teams will need to provide to SNL:

- Physical specifications of tool:
  - Footprint (LxWxH) of prototype[10]
  - Weight of prototype
  - Orientation of tool to axis of motion
  - Attachment method to shaker.
- Data specifications:
  - Required data acquisition hardware and software
  - Required connections and adapters
  - Data output type (analog, digital)

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[9] https://www.herox.com/GeophonePrize/resources

[10] Sandia National Laboratory can currently accommodate up to a 42"-long tool in their oven. SNL's pressure vessel has a diameter of 5" and depth of 12". Teams need to ensure their prototype does not exceed the maximum dimension limit for testing.

    - Sampling rate
    - Expected voltage range of output (if known).
- Power requirements for prototype and data acquisition

All information can be included in the chart in the template provided on HeroX.

This information will be shared with the researchers at SNL doing the testing as well as provided to the external panel of reviewers.

4.6.4 Call with Sandia National Laboratory

Teams are required to schedule a call with experts at SNL by January 15, 2025. Teams are highly encouraged to schedule calls early and before the January 15, 2025, deadline. Please contact Melanie Schneider at mbschne@sandia.gov to schedule the call. This call is to discuss your prototype evaluation and ensure that SNL staff can set up the appropriate testing facility for your prototype.

To start, for this call please prepare:

- A presentation of your prototype, including physical dimensions, data acquisition specifications, and power requirements
- Models of your prototype and how it should be mounted to the shaker
- Any additional information the SNL staff for testing and handling your equipment.

Other criteria to prep for the call will be shared with teams during Phase 3.

4.6.5 Independent Evaluation Testing Procedures

SNL will conduct four tests to determine the sensitivity and reliability of the prototypes. The tests to be conducted are listed below.

1. Self-Noise Test: Record output of device in low-noise environment to determine noise-floor of the prototype.
2. Seismic Testing at Geothermal Conditions:
    - Goal: Determine sensitivity, frequency range, and dynamic range of device
    - Prototypes will be mounted to a calibrated shaker system, and the system will be vibrated at increasing frequencies from 0.05 to 1,000 Hz
    - Frequency sweep will be repeated three times at five discrete temperatures: 25°C, 75°C, 125°C, 200°C, and 250°C.
3. Pressure and Temperature Survivability Testing:
    - Goal: Determine reliability of the prototype at elevated temperature and pressure
    - Prototypes will be installed in autoclave and tested at 5,000 psi and 250°C
4. Long-Term Temperature Survivability Testing:
    - Goal: Determine reliability of the prototype at elevated temperature over extended period
    - Prototypes will be placed in oven at 250°C for 1 month
    - There may be an option for teams depending on scheduling and timeline of testing for teams to extend the time prototypes will be tested past 1 month. This option will only be

available if time allows and will be communicated to teams during Phase 3.

SNL will provide reference data to correspond to the input parameters, including pressure, temperature, and vibration

4.7 What to Submit – Final Submission

A complete submission package for Phase 1 should include the following items:

- Cover page content
- Summary PowerPoint slide
- Technical narrative about the innovation, team, and plan
- Letters of commitment or support (optional)

The following details provide more guidance on what information to provide and how reviewers evaluate and score your submission. Reviewers will evaluate your submissions by assigning a single score for each scored submission section, based on their overall agreement or disagreement with a series of statements.

0	1	2	3	4	5	6
Non-responsive	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree

4.7.1 Cover Page Content (Will Be Made Public, Not Scored)

List basic information about your submission, including:

- Project name
- Innovative tagline (e.g., your mission in a few words)
- Key project members (names, contacts, and links to their professional online profiles)
- Keywords that best describe your solution (e.g., components, equipment)
- Your city, state, and nine-digit zip code.
- The (up to three) connectors[11] that significantly helped you[12] advance your solution and the major items they helped with (if applicable)
- Other partners (if any

4.7.2 Summary PowerPoint Slide (Will Be Made Public, Not Scored)

Make a public-facing, one-slide submission summary that contains technically specific details but can be understand by most audiences. There is no template, so competitors are free to present the information in any format. Any text must be readable in a standard printed page and a conference room projection and should be in at least 14-pt font.

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[11] See description of Connector in Section 1 of the Phase 1 Official Prize Rules.
[12] 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 The Phase 1 Official Prize Rules and the Connector guidelines for details.

4.7.4 Technical Narrative (Will Not Be Made Public, Scored)

You should answer each of the following four questions. The content bullets are only suggestions to guide your responses. You decide where to focus your answers. The individual answers to the four questions do not have a word limit; however, **the aggregate response to these four questions must not exceed 2,500 words,** not including captions, figures/graphs, or references. A word count must be included at the end of your submission (see template for details). You may also include **up to 15 supporting images, figures, or graphs**. The reviewers will score the questions based on the content you have provided.

Narrative Max 2,500 words and 5 supporting images or figures (PDF) Template:	
Question 1 *Innovation*: What makes your Phase 3 prototype successful?	
Suggested Content Competitor Provides ● Describe how your team has advanced the sensor design and testing of components since Phase 2. Describe how your design has evolved from the prototype produced in phase 2. ● Describe the dimensions, form, and functions of your prototype. This includes size of prototype, including weight and dimensions and feasibility of deployment. ● Describe what differentiates your prototype from existing technologies and what makes your technology innovative. ● Describe areas for further improvement in your design.	**A single score on a scale of 0-6 is provided for each of the following statements:** ● The design represents an approach built on reasonable assumptions, valid technical foundations, and lessons learned from other notable efforts in this space. ● The design is applicable to long-term field deployment and long-term commercialization. ● The submitted documentation validates critical assumptions needed to advance the proposed solution. ● The technology has features and a design that differentiate it from current technologies in the high-temperature seismic sensor space. ● Teams clearly state improvements and challenges to their seismic sensor. Team is aware of possible flaws in design and appropriately addresses future plans to address challenges.

Question 2 *Testing* – Describe what testing was done and what were the results?	
Suggested Content Competitor Provides ● Use the template provided under the HeroX resource tab and provide information on whether your prototype falls short, meets, or exceeds desired prize goals. ● Describe your benchtop testing results. ● Discuss insights on testing results.	**A single score on a scale of 0-6 is provided for each of the following statements:** ● The testing results presented meet the goals of the Geophone Prize. ● The competitor provides compelling analysis and bench-scale testing that supports the efficacy of their proposed design to overcome critical failure points of seismic

• Describe any challenges that occurred with testing, and how you are planning to resolve these challenges. • Discuss any testing completed outside of required SNL testing. How did these results differ? Include testing done with voucher funds.	sensors deployed indefinitely at high temperature. • Teams are clear around challenges faced and what improvements can be made to the sensor. Teams have thoroughly analyzed pitfalls. • When teams are not able to meet all prize goals, they are able to clearly address what improvements would allow them to meet those goals and reach the desired specs with future testing.
Question 3 *Plan* – What is your commercialization plan?	
Suggested Content Competitor Provides • 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). • Provide a risk assessment that identifies critical factors to be addressed in ensuring commercialization success. Identify any challenges or barriers to moving your seismic sensor design towards commercialization. Explain how your team plans to continue to address these challenges with the conclusion of Phase 3. • Present an up-to-date overview and high-level schedule of the planned steps, activities, and opportunities leading from the current technical readiness of your seismic sensor to achieve product commercialization in the current market.	**A single score on a scale of 0-6 is provided for each of the following statements:** • The stated commercialization plan is ambitious, reduces risks, and shows a commitment toward commercialization of the seismic sensor. • The competitor's plan reflects a coordinated and thorough management approach conveying that there is a high likelihood of success. • The risk assessment identifies critical factors to be addressed in ensuring product and commercialization success, with a justifiable approach to determining likelihoods and potential consequences. The challenges to commercialization are well thought out, and mitigation measures are realistic.

Special Instructions for Question 2

- For each of the bench tests completed at SNL for Phase 3, data should be provided to demonstrate prototype performance, for example: plots of self-noise, frequency response at ambient temperature versus 225°C, performance at high temperature and pressure, and any changes in prototype function over time at high temperature or during temperature cycling. Teams should also provide:
    - Plots of power spectral density across the frequency band for the bench tests described in the Phase 1 and 2 Official Prize Rules.
    - The transfer function between measured motion (units of acceleration, velocity, or

displacement) and the native output units of the prototype sensor, across the frequency band of interest.

- 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.

Reviewer Recommendation	
• There is no director corresponding submission requirement for this score. Rather, it is an overall assessment of all materials submitted in HeroX.	**A single score on a scale of 0-6 is provided for each of the following statements:** • The innovation, team, and plan should be strongly considered for a Phase 1 prize.

4.6.4 Submission Summary Slide (Will Be Made Public)

4.7.5 Letters of Support or Commitment (Optional)

Attach one-page letters (of support, intent, or commitment) from other relevant entities 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 do not submit multipage letters. If you are working with a utility partner outside of the three identified for this prize, you must include a letter of support from your utility partner.

4.8 How We Determine and Award Winners

The Prize Administrator screens all completed submissions and ensures that the teams are eligible. Then the Prize Administrator, in consultation with DOE, assigns subject-matter-expert reviewers who independently score the content of each submission. The reviewers will be composed of federal and nonfederal subject-matter experts and representatives from the utility partners with expertise in areas

relevant to the competition. They will review the competitor's submission package according to the criteria above.

4.8.1 Reviewer Panel Scoring

The scoring of submissions will proceed as follows:

- Experts will review each submission individually and assess the response from the competitor to each statement in the four criteria described in the tables in Section 3.6.3.
- Reviewers will score each section 1–6, depending on the degree to which the reviewer agrees that the submission reflects the statements for consideration.
- Each section score will be added together to generate a total score for the submission.
- The total scores from each reviewer will be averaged to produce a final score for the competing team/organization. This score will inform the judge's decisions on prize awards.

4.8.2 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.

4.8.3 Final Determination

The director of GTO will be the judge of the competition and will make the final determination of Phase 3 winners. This determination will consider reviewer scores, any interview findings, and program policy factors listed in the Phase 1 and 2 Official Prize Rules.

4.8.4 Announcement

Approximately 60 days after the contest closes, the Prize Administrator will notify the winners and request the necessary information to distribute the prizes. The Prize Administrator will then publicly announce the winners.

4.9 Additional Terms and Conditions

See Appendix 1 for additional requirements.

COMPETITORS THAT DO NOT COMPLY WITH THE ADDITIONAL REQUIREMENTS IN APPENDIX 1 MAY BE DISQUALIFIED.

Appendix 1: Additional Terms and Conditions

A.1 Requirements

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

- You must post the final content of your submission or upload the submission form online by 5 p.m. ET on prize deadline date, before the prize's phase submission period closes. Late submissions or any other form of submission may be rejected.
- All submissions that you wish to protect from public disclosure must be marked according to the instructions in Section 10 of Appendix 1 (Section A.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.
- You must include all the required elements in your submission. The Prize Administrator may disqualify your submission after an initial screening if you fail to provide all required submission elements. Competitors may be given an opportunity to rectify submission errors due to technical challenges.
- Your submission must be in English and in a format readable by Microsoft Word or Adobe PDF. Scanned hand-written submissions will be disqualified.
- Submissions will be disqualified if they contain any matter that, in the sole discretion of the U.S. Department of Energy or the National Renewable Energy Laboratory (NREL), is indecent, obscene, defamatory, libelous, and/or 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 prizes described in this document, these rules will form a valid and binding agreement between you and DOE 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 prize described here and no other prize on the HeroX platform or anywhere else.
- The Prize Administrator, when feasible, may give competitors an opportunity to fix nonsubstantive mistakes or errors in their submission packages.
- As part of your submission to this prize, you 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 the information contained in this submission will be relied on by the federal government to determine whether to issue a prize to the named competitor. 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, and 31 U.S.C. §§ 3729-3733 and 3801-3812.

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A.2 Verification for Payments

The Prize Administrator will verify the identity and role of all competitors before distributing any prizes. Receiving a prize payment is contingent upon fulfilling all requirements contained herein. The Prize Administrator will notify winning competitors using provided email contact information for the individual or entity that was responsible for the submission. Each competitor will be required to sign and return to the

Prize Administrator, within 30 days of the date on the notice, a completed NREL Request for ACH Banking Information form and a completed W9 form (https://www.irs.gov/pub/irs-pdf/fw9.pdf). In the sole discretion of the Prize Administrator, a winning competitor will be disqualified from the competition and receive no prize funds if: (I) the person/entity does not respond to notifications; (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.

In the event of a dispute as to any registration, the authorized account holder of the email address used to register will be deemed to be the competitor. The "authorized account holder" is the natural person or legal entity assigned an email address by an Internet access provider, online service provider, or other organization responsible for assigning email addresses for the domain associated with the submitted address. All competitors may be required to show proof of being the authorized account holder.

A.3 Teams and Single-Entity Awards

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

A.4 Submission Rights

By making a submission and consenting to the rules of the contest, 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 the parts of the submission that are designated as “public” for government purposes. 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, Prize Administrator, and judges 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 competitors’ names and, as applicable, the names of competitors’ team members and organization, which participated in the submission on the contest website indefinitely.

By entering, the competitor represents and warrants that:

1. The competitor’s entire submission is an original work by the competitor and the competitor has not included third-party content (such as writing, text, graphics, artwork, logos, photographs, 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 the 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 the competitor their express written consent to submit the submission for exhibition and other exploitation in any manner and in 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 the minor's parent or legal guardian) and the competitor may be asked by the prize administrator to provide permission in writing; and
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.

A.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 competitor or that the competitor 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 any other third-party rights of which the competitor is aware; and that the submission is free of malware.

A.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 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 award is contingent upon the availability of appropriations.

A.7 Resolution of Disputes

DOE is solely responsible for administrative decisions, which are final and binding in all matters related to the contest.

Neither DOE nor the Prize Administrator will arbitrate, intervene, advise on, or resolve any matters between team members or among competitors.

A.8 Publicity

The winners of these prizes (collectively, "winners") will be featured on 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.

A.9 Liability

Upon registration, all participants agree to assume all risks of injury or loss in connection with or in any way arising from participation in this contest. 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.

In accordance with the delegation of authority to run this contest delegated to the judge responsible for this prize, the judge has determined that no liability insurance naming DOE as an insured will be required of competitors to compete in this competition per 15 U.S.C. § 3719(i)(2). Competitors should assess the risks associated with their proposed activities and adequately insure themselves against possible losses.

A.10 Records Retention and 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 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, 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 will be notified of any Freedom of Information Act requests for their submissions in accordance with 29 C.F.R. § 70.26. Competitors may then review materials and work with a Freedom of Information Act representative prior to the release of materials. DOE does intend to keep all submission materials private except for those materials designated as "will be made public."

A.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 will be transmitted to DOE and may be kept in a system of records. Such information will be 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.

A.12 General Conditions

DOE reserves the right to cancel, suspend, and/or modify the prize, or any part of it, at any time. If any fraud, technical failure, or any other factor beyond DOE's reasonable control impairs the integrity or proper functioning of the prize, as determined by DOE in its sole discretion, DOE may cancel the prize. Any performance toward prize goals is conducted entirely at the risk of the competitor, and DOE shall not compensate any competitors for any activities performed in furtherance of this prize.

Although DOE may indicate that it will select up to several winners for each prize, 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.

DOE may conduct a risk review, using Government resources, of the competitor and project personnel for potential risks of foreign interference. The outcomes of the risk review may result in the submission being eliminated from the prize competition. This risk review, and potential elimination, can occur at any time during the prize competition. An elimination based on a risk review is not appealable.

A.13 Program Policy Factors

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

- Geographic diversity and potential economic impact of projects.
- Whether the use of additional DOE funds and provided resources are non-duplicative and compatible with the stated goals of this program and the DOE mission generally.
- The degree to which the submission exhibits technological or programmatic diversity when compared to the existing DOE project portfolio and other competitors.
- The degree to which the submission is likely to lead to increased employment and manufacturing in the United States or provide other economic benefits 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-funded efforts or projects, which, when taken together, will best achieve the goals and objectives of DOE.
- The degree to which the submission expands DOE's funding to new competitors and recipients who have not been supported by DOE in the past.
- The degree to which the submission enables new and expanding market segments.
- Whether the project promotes increased coordination with nongovernmental entities toward enabling a just and equitable clean energy economy in their region and/or community.

A.14 National Environmental Policy Act Compliance

This prize is subject to the National Environmental Policy Act (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 http://nepa.energy.gov/.

While NEPA compliance is a federal agency responsibility and the ultimate decisions remain with the federal agency, all participants in the Inclusive Energy Innovation Prize 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. Participants may be asked to provide DOE with information on fabrication and testing of their device such that DOE can conduct a meaningful evaluation of the potential environmental impacts.

A.15 Definitions

Prize Administrator means both the Alliance for Sustainable Energy operating in its capacity under the Management and Operating Contract for NREL and the DOE 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 Geothermal Technologies Office staff. Ultimate decision-making authority regarding prize matters rests with the Director of the Geothermal Technologies Office.

Voucher Funding – Vouchers are part of the prize and may only be used at national laboratories. The funds will be provided directly to the laboratory on behalf of the winner to conduct a mutually agreed upon scope of work between the laboratory and the team.

A.16 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.

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