

Nonprofit Evaluation **Project Innerspace**



Table of Contents

Table of Contents	1
Summary	2
What Is Project InnerSpace?	4
How Could Project InnerSpace Help Address Climate Change?	5
Key ideas: Project InnerSpace's strategy	
Unlocking Geothermal's Potential for a Net-Zero Grid	5
Project InnerSpace's Strategies	
GeoMap: Mapping Next-Gen Geothermal's Global Potential	7
GeoFund: Financing First-of-a-Kind Geothermal Projects	
Building Momentum for Next-Gen Geothermal Energy in the Public and Private Sectors	
Project InnerSpace's Theory of Change	9
Assessment of Project InnerSpace's Ability to Execute Its Activities	
GeoMap: Mapping Next-Gen Geothermal's Global Potential	11
GeoFund: Financing First-of-a-Kind Geothermal Projects	
Building Momentum for Geothermal Energy in the Public and Private Sectors	. 14
Examining the Assumptions Behind Project InnerSpace's Theory of Change	15
Is There Room for More Funding?	. 20
Project InnerSpace's 2025 Funding Status	.20
Project InnerSpace's 2023 DOE Award Is Highly Restricted and Would Not Fund Its	
Core Activities	
Are There Major Co-Benefits or Potential Risks?	
Key Uncertainties and Open Questions	
Bottom Line and Next Steps	. 24

This report was last updated in October 2025.

We conducted expert interviews regarding Project InnerSpace to inform this evaluation report. We corresponded with Project InnerSpace multiple times to stay updated on its strategic priorities, current activities, and room for more funding. We also reviewed materials on Project InnerSpace's website and media coverage. Unless otherwise cited, information in this report comes from direct correspondence with Project InnerSpace.

Questions and comments are welcome at hello@givinggreen.earth

Summary

What is Project InnerSpace?

Project InnerSpace is a U.S.-based nonprofit organization focused on expanding geothermal energy globally. Its core activities include GeoMap, which maps subsurface data that can help characterize geothermal resources, and Geothermal Exploration Opportunities Fund (GeoFund), which supports geothermal projects that may otherwise experience a funding "valley of death." It also builds momentum for geothermal energy in the public and private sectors through convenings, as well as policy research and education.

• How could Project InnerSpace help address climate change?

Geothermal energy can reduce greenhouse gas emissions by providing carbon-free heat and electricity as an alternative to burning fossil fuels. We believe Project InnerSpace can help fight climate change by speeding up the rollout of next-generation geothermal technologies.

• What is new for Project InnerSpace in 2025?

Project InnerSpace expanded GeoMap to include new regions, such as India, Southeast Asia, and the Middle East. GeoMap was also central to major partnerships with the International Energy Agency and Rhodium Group, showing geothermal's potential to meet global electricity demand and power U.S. data centers.

Project InnerSpace also expanded its *Future of Geothermal* reports to include Pennsylvania and New Mexico, and hosted several Geothermal House events, reaching over 4,000 participants across political lines.

• Is there room for more funding?

In October 2025, Project InnerSpace self-reported a \$4 million funding gap for the remainder of 2025 based on its \$11.5 million (USD) budget. It plans to maintain the same budget for 2026. It currently has around \$5 million in donor proposals pending that could be used for 2026 if it fills its 2025 budget gap, but otherwise has not raised any funds for 2026. This funding gap represents the operating budget required to maintain everyday operations.

Project InnerSpace anticipates a multi-year funding gap for expanding the following opportunities: integrating artificial intelligence into GeoMap's global data set (\$6 million), launching five to six GeoFund projects (\$3.5 million), and funding



additional Future of Geothermal policy reports and stakeholder engagement (\$2 million). Overall, we think it is likely that Project InnerSpace can use additional funding productively.

Are there major co-benefits or potential risks?

A major co-benefit of Project InnerSpace's work is its potential for creating jobs, specifically for oil and gas workers who might otherwise be opponents of the energy transition.

At the same time, we think oil and gas industry involvement in geothermal expansion poses potential conflict-of-interest risks. We describe geothermal energy's major co-benefits and adverse effects more generally in our advancing next-gen geothermal energy strategy report.

What are the key uncertainties and open questions?

Funding Project Innerspace represents a "bet" that next-generation geothermal systems will be technically effective and reduce in cost, such that geothermal energy plays a significant role in the global energy mix. There is significant uncertainty about whether next-generation geothermal technology will indeed be successful.

What is the bottom line, and what are the next steps?

We recommend Project InnerSpace as a Top Climate Nonprofit based on its potential for high impact, its influence in the geothermal sector, and our assessment of its ability to execute. We also think its emphasis on fast iteration and quickly getting next-gen geothermal technologies on a learning curve complements that of Clean Air Task Force, another Top Climate Nonprofit, whose geothermal workstream focuses on super-hot rock geothermal energy.



What Is Project InnerSpace?

Project InnerSpace is a U.S.-based organization focused on expanding geothermal energy globally. 1 Its core activities include GeoMap, which maps geothermal resources, and the Geothermal Exploration Opportunities Fund (GeoFund), which bridges funding gaps for first-of-a-kind geothermal projects. Project InnerSpace also builds momentum for geothermal energy in the public and private sectors by hosting conferences and events and establishing an ecosystem of support among stakeholders.

Project InnerSpace was founded in 2022.2 It is led by Jamie Beard, the founder of the Geothermal Entrepreneurship Organization, the Texas Geothermal Institute, and the PIVOT conference series, which builds momentum within the oil and gas industry for geothermal development. She also serves on the board of the Texas Geothermal Energy Alliance, an industry association.3 In October 2025, Project InnerSpace had 22 employees.4

⁴ We determined the number of staff by counting the number of people listed under "Leadership" and "Team InnerSpace" on Project InnerSpace's About page. https://projectinnerspace.org/about/



¹ U.S. base: "Locations (1) Primary: Houston, U.S." LinkedIn, Project InnerSpace. 501(c)(3): "Project InnerSpace is a 501(c)3 non-profit focused on expanding the use of geothermal energy globally." Project InnerSpace, "About" n.d.

² "Project InnerSpace (InnerSpace), a multi-phase initiative focused on accelerating global geothermal prospecting and development has launched." ThinkGeoenergy, "Project InnerSpace Launches to Accelerate Geothermal Anywhere" 2022.

³ "InnerSpace is led by Jamie Beard, an internationally recognized leader in the 'geothermal anywhere' movement, founder of the Geothermal Entrepreneurship Organization (GEO), the Texas Geothermal Institute (TGI), and the Pivot 'From Hydrocarbons to Heat' conference series. She serves on the Board of the Texas Geothermal Energy Alliance (TxGEA), an industry association focused on supporting the growth and development of geothermal in Texas." ThinkGeoenergy. "Project InnerSpace Launches to Accelerate Geothermal Anywhere" 2022.

How Could Project InnerSpace **Help Address Climate Change?**

Key ideas: Project InnerSpace's strategy

- Geothermal as clean firm power for a net-zero grid: Geothermal energy offers constant, carbon-free electricity, making it a critical complement to wind and solar in building a reliable zero-emissions grid.
- **Next-generation geothermal technologies offer global potential:** Technologies like Enhanced Geothermal Systems, inspired by deep drilling techniques utilized for oil and gas extraction, can access geothermal resources in new areas and greatly expand geothermal's reach.
- Project InnerSpace drives geothermal innovation and deployment: It supports next-gen geothermal through initiatives like GeoMap (a global geothermal resource mapping tool) and GeoFund (which finances early-stage geothermal projects).
- Project InnerSpace builds awareness and policy support across sectors: Through events, state- and region-specific roadmaps, and policy research and education, Project InnerSpace works to increase public, private, and government support for next-gen geothermal. We think this can help attract investment, reducing barriers to commercialization and deployment.

Unlocking Geothermal's Potential for a Net-Zero Grid

Geothermal energy can help address climate change by providing carbon-free heat and electricity as an alternative to burning fossil fuels. It is a source of clean firm power, meaning it can generate electricity at any time, regardless of weather conditions. This class of electricity generators is crucial to providing a source of baseload power that ensures the grid runs reliably even when there are long periods of low power from variable renewable energy sources (VRE) such as solar and wind. We view clean firm



power and VRE as complementary and think both are essential to building out a zero-emissions grid.

In general, we think an energy portfolio that includes clean firm power provides a more feasible path to net-zero emissions than one based on intermittent renewables alone.⁵ Several net-zero models suggest the U.S. must quadruple clean firm power—adding 700-900 GW by 2050—to support renewables and rising electricity demand.⁶ In addition, we think geothermal could play a role in meeting the projected increase in electricity demand from the artificial intelligence (AI) industry, and has value propositions outside of electricity generation (e.g., providing carbon-free heat to decarbonize heavy industry).⁷

Technology improvements that borrow from U.S. oil and gas (O&G) development could open new areas for deployment and unlock previously inaccessible energy.8 These next-generation geothermal technologies are less mature than conventional geothermal technologies but are reservoir-independent. For example, enhanced geothermal systems (EGS) use hydraulic fracturing to inject water deep underground, creating artificial reservoirs instead of relying on natural ones. Next-gen geothermal technologies, such as enhanced and advanced geothermal systems, could be especially promising for expanding geothermal deployment globally.

For more information on clean firm power, please see our strategy report on unleashing clean energy in the U.S. For more technical information on next-gen geothermal, please see our strategy report on advancing next-generation geothermal.

⁸ "Advances in technology are opening new horizons for geothermal, promising to make it an attractive option for countries and companies all around the world. These techniques include horizontal drilling and hydraulic fracturing honed through oil and gas developments in North America." IEA, 2025



⁵ In general, we believe the U.S. needs more clean, firm capacity to reach net-zero. "System level decarbonization modeling, regardless of renewables deployment, suggests that the U.S. would need significantly more clean, firm capacity to reach net-zero (Figure 3)." Kozeracki et al, 2023. ⁶ "System-level decarbonization modeling suggests that the U.S. will need to guadruple the

existing clean firm power supply available on the grid today, adding between 700 and 900 GW by 2050 to build a decarbonized, functioning grid system capable of supporting wind and solar buildout and increased demand." DOE, 2025.

⁷ Demand for electricity: "Military bases and data centers offer one particular benefit for the geothermal industry as it seeks to get its legs under it: They are facilities that are willing to pay a premium for power that is both clean and always on, even if it is substantially more expensive than more intermittent sources like wind or solar." Elbein, 2024. Decarbonizing heavy industry: "Instead of using combustion to convert chemical energy in a zero-carbon fuel to heat, zero-carbon heat can also be harvested directly from environmental sources, like solar radiation and geothermal energy." Thiel and Stark, 2021.

Project InnerSpace's Strategies

Project InnerSpace helps companies develop next-gen geothermal technologies by reducing financial risks and closing funding gaps. It builds momentum, and potentially demand, for next-gen geothermal through convenings, as well as policy research and education. We think Project InnerSpace's efforts to get next-gen geothermal technologies to commercialization faster help accelerate learning-by-doing and drive down costs faster than the counterfactual. We summarize Project InnerSpace's activities below:

GeoMap: Mapping Next-Gen Geothermal's Global Potential

GeoMap is a <u>publicly available map</u> that characterizes geothermal resources by sharing relevant subsurface data, such as heat depth and rock types. It is intended to be global and includes different modules, such as its <u>Surface & Subsurface Modules</u> and <u>Techno-Economic Sensitivity Tool</u>, which estimates potential costs and reduced emissions. To develop its map, Project InnerSpace collates and digitizes existing subsurface data from sources such as oil and gas companies and geological surveys. In places without oil and gas drilling, Project InnerSpace extrapolates based on known geological features and water well data collected from local agencies. It uses Al to predict the data's suitability using training data from places with oil and gas wells. By showing next-gen geothermal's global potential, we think GeoMap could accelerate deployment by reducing financial risks related to early-stage exploration and by generating excitement for geothermal, unlocking more investments.

As of October 2025, GeoMap includes modules for Africa, North America, India, Southeast Asia, and the Middle East. Project InnerSpace prioritizes locations based on where the world's largest population centers will be in 2050 and where additional coal and natural gas capacity is expected. It plans to eventually include all continents and the world's top 100 population centers.¹⁰

GeoFund: Financing First-of-a-Kind Geothermal Projects

Project InnerSpace launched GeoFund in 2025 to support first-of-a-kind geothermal pilot projects that may have difficulty securing traditional forms of project financing.

¹⁰ "Additional continents and high resolution case studies will be released on the GeoMap™ tool over the next 12-24 months, with the goal of inclusion of all continents and the world's top 100 population centers within 36 months." <u>Project InnerSpace, accessed 2024</u>.



⁹ "Phase 1 of Project InnerSpace will produce high-resolution geothermal prospecting maps to provide information about the quality and depth of geothermal resources within a 100 kilometer radius of the world's population centers, serving as a project development and prospecting model of accelerated development of geothermal resources. Phase 1 will convene a global team of subsurface experts to publish a freely accessible, publicly available set of geothermal resource maps, which will be utilized by industry, startups, and funding entities to reduce pre-project subsurface and project siting risk." Project InnerSpace, 2022.

GeoFund intends to derisk projects and catalyze future funding by providing low- or no-interest loans. Its first round focused on evaluating and supporting community-scale geothermal projects—such as geothermal heat for greenhouses and heating-and-cooling—in low- and middle-income countries (LMICs). In 2026, Project InnerSpace is committing to another five to six community-scale projects. It is also working with its network of investors and businesses to develop financial mechanisms to finance larger, next-gen geothermal projects that same year.

Project InnerSpace said GeoFund will start with easy-to-launch pilots that can gain social acceptance, and that it will focus on countries where geothermal projects are not yet widespread. It said these projects are often unfunded because they are unsupported by existing financing mechanisms. GeoFund's first project, funded in 2025, is a cold storage and fruit dehydration facility in Tapri, India. 11 It may consider projects in Asia, Africa, and Central/South America in the future.¹²

Building Momentum for Next-Gen Geothermal Energy in the Public and **Private Sectors**

Our understanding is that Project InnerSpace has helped generate interest in next-gen geothermal on several different fronts:

- Project InnerSpace hosts large-scale events to socialize next-gen geothermal: Project InnerSpace hosts PIVOT, an annual global conference series on geothermal energy that aims to "build momentum within the oil and gas industry toward making an urgent pivot to geothermal energy production."13 Project InnerSpace also hosted its Geothermal House events—immersive art-meets-science experiences held in cities like Austin, Davos, and D.C.—reaching 4,000+ participants across political lines.
- Project InnerSpace builds state- and region-specific cases for next-gen geothermal: Project InnerSpace has participated in efforts to make a case for

¹³ PIVOT: "PIVOT is a global conference series launched in 2020 featuring thought leaders and change makers who are building the future of geothermal energy. PIVOT's mission is to build momentum within the oil and gas industry toward making an urgent pivot to geothermal energy production, with the goal of global, scalable geothermal development across the industry by 2030." Project InnerSpace, 2023. Giving Green note: Project InnerSpace hosts PIVOT in partnership with other organizations. "In the spirit of this theme, we are hosting this year's PIVOT in partnership with The World Geothermal Congress, Geothermal Rising, and the Society of Petroleum Engineers to bring you an action-packed month of in-person and virtual events around the world." Project InnerSpace, 2023.



¹¹ "GeoFund's first funded project in Tapri India... The new cold storage facility will provide 500 tons of storage and fruit dehydration capacity, allowing farmers to preserve quality, cut waste, and sell at premium prices." PR Newswire, 2025.

¹² "Further projects in Asia, Africa, and Central/South America are under consideration for future funding rounds of GeoFund." PR Newswire, 2025.

- geothermal investment in Texas and roadmap its future. 14 In 2025, it expanded its Future of Geothermal report series to include Pennsylvania and New Mexico. It will also release global reports (India, Indonesia, U.K.) in the latter half of 2025.
- Project InnerSpace carries out policy research and education. In 2024, Project InnerSpace expanded its scope to include U.S. policy work, such as examining incentives that could expand geothermal energy use in agriculture and data centers. 15 In 2025, it partnered with the International Energy Agency and the Rhodium Group, showing geothermal's potential to meet global electricity demand and power U.S. data centers, respectively. Project InnerSpace also worked with the Carnegie Endowment for International Peace to outline potential pathways to scaling next-gen geothermal internationally. It is also working with other stakeholders to build demand for geothermal heat in the U.S. and develop policy options that could catalyze funding for next-gen geothermal projects. We think demand aggregation, such as pooling major energy buyers together, can help reduce risks for early commercial projects and signal customer interest.¹⁶

Project InnerSpace's Theory of Change

We think Project InnerSpace's core activities—GeoMap and GeoFund—can lower financial risks for companies and boost geothermal deployment relative to the counterfactual; we develop a theory of change to describe the effects of its activities in Figure 1. We also think Project InnerSpace's efforts to promote geothermal energy can have secondary effects that raise the odds of supportive U.S. policies being passed. Additionally, we believe Project InnerSpace's mapping efforts in particular can be a useful tool for policy development and advocacy in its mapped areas, making it more likely that supportive policies will be passed. We think these inputs can increase the speed of geothermal innovation, enhance global spillover effects, and accelerate emissions reductions compared to the counterfactual.

¹⁶ "As three of the world's largest energy buyers, aggregating the demand of Google, Microsoft, and Nucor can help reduce the risk for developer considering early commercial projects, thus also giving them access to investments and other financing facilities. Demand aggregation and procurement is only the first step in the project delivery framework that the companies are attempting to pilot. The next enabling levers will be to bring a clear customer voice to policymakers and other stakeholders on long-term ecosystem improvements, and developing new enabling tariff structures in partnership with energy providers and utilities.' Cariaga, 2024.



¹⁴ Jamie Beard and Bryant Jones from Project InnerSpace are listed as lead authors of *The Future* of Geothermal in Texas. University of Texas, Austin, 2023.

¹⁵ The Future of Geothermal reports include policy roadmaps sourced from local engagement with chapter authors and industry partners. According to Project InnerSpace, it frequently works in coalitions to advocate for renewable energy incentives such as tax credits and grants/loans. It also works on clarifying laws around owning and selling heat as a resource to enable the business model for direct-use heat for residential and industrial decarbonization.

We examine the evidence for how well Project InnerSpace executes its inputs in the sections below.

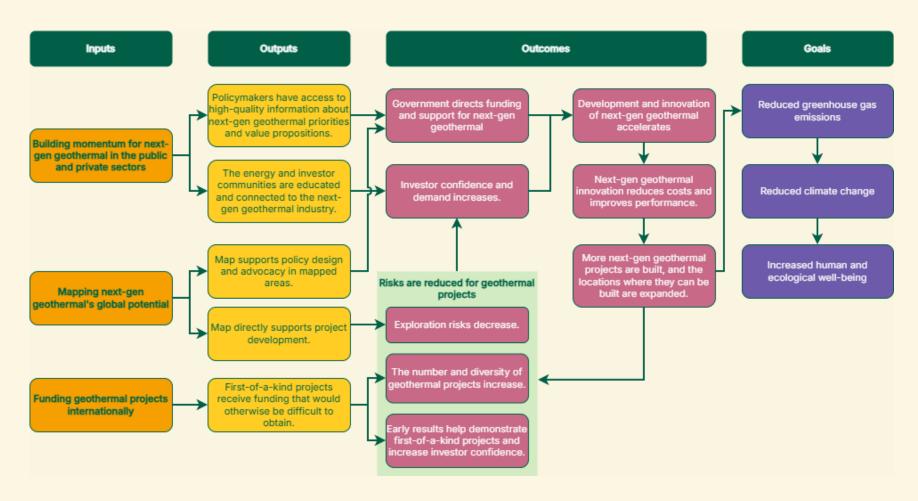


Figure 1: Project InnerSpace's theory of change

Assessment of Project InnerSpace's Ability to Execute Its Activities

GeoMap: Mapping Next-Gen Geothermal's Global Potential

In general, we have a positive impression of Project InnerSpace's ability to make the connections needed for GeoMap, in terms of finding the requisite data, recruiting talent, and communicating its findings.

We are optimistic about Project InnerSpace's ability to connect GeoMap with users because—according to numerous researchers and funders we interviewed—Project InnerSpace is a highly engaged convener of research universities, as well as both geothermal and oil and gas companies. We think it is especially promising that Project InnerSpace is leading the U.S. Department of Energy's (DOE) Geothermal Energy from Oil and Gas Demonstrated Engineering (GEODE) Initiative. GEODE connects geothermal experts with oil and gas experts, who we think would bring useful knowledge to expanding geothermal energy; we think there are potential synergies between GEODE and GeoMap.¹⁷ Since GeoMap's launch in 2023, it has grown to 2,600 users across 100 countries. Users include individuals from academia, industry, finance, government, and media. According to Project InnerSpace, around 1,800 unique organizations actively engage with the platform (Figure 2).

[&]quot;On September 10, 2024, an exciting collaboration kicked off to expand geothermal energy deployment and shape the nation's future energy landscape. The Geothermal Technologies Office's (GTO) GEODE initiative, short for Geothermal Energy from Oil and Gas Demonstrated Engineering, will leverage the expertise and experience of the oil and gas sector to boost geothermal energy nationwide. Backed by \$10 million from GTO, the project's phase will lay the groundwork for a comprehensive roadmap to unlock geothermal energy's potential. Led by Project InnerSpace, GEODE is convening experts from both industries to leverage oil and gas industry know-how for geothermal innovation and identify areas for future GEODE research, pending appropriations." Geothermal Technologies Office, 2024.



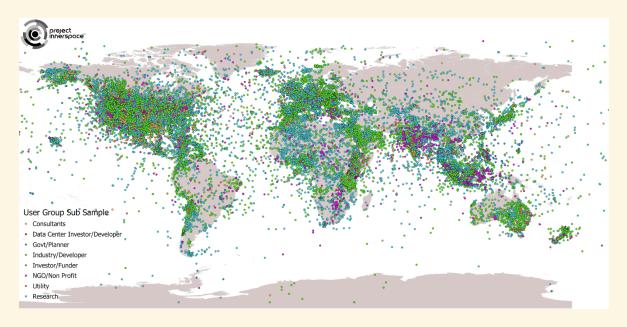


Figure 2: GeoMap user queries shown by location and by sectors. 18

We think it is plausible that Project InnerSpace's work could help facilitate deals for further next-gen geothermal projects, leading to faster learning and cost decreases relative to the counterfactual. As an example of GeoMap's usefulness to industry, Project InnerSpace shared the following testimonial from Sage Geosystems, a next-gen geothermal start-up:

Sage Geosystems uses Project InnerSpace's GeoMap tool to rapidly derisk prospectivity for geothermal resources in terms of heat, presence of faults, regional stress states, and lithologies at targeted depths.

GeoMap also provides valuable information on power grids and power plant infrastructure, which is otherwise difficult to find for numerous countries that lack digital databases for this type of infrastructure.¹⁹

¹⁹ Email correspondence with Project InnerSpace, 2025-10-30.



¹⁸ Email correspondence with Project InnerSpace, 2025-10-30.

Additionally, Project InnerSpace's North America module has identified multiple U.S. sites with the potential for future geothermal exploitation.²⁰ We think some of these locations could be low-hanging fruit for building next-gen geothermal systems, such as military bases and data centers that could be willing to pay a premium for clean firm power.²¹ Indeed, the U.S. Department of Defense (DoD) has expressed interest in building its military installations' energy resilience, and as of April 2024, there are now seven DoD installations with ongoing geothermal projects.²²

We also think it is a positive sign that Project InnerSpace is collaborating with Google on GeoMap because we think Google's data and software capabilities can increase GeoMap's likelihood of success.²³

²³ "Project InnerSpace has announced a partnership with Google focused on expanding the use and adoption of geothermal energy worldwide. The collaboration unites the subsurface expertise and resources of Project InnerSpace, a non-profit organization focused on removing barriers to the growth and development of geothermal energy globally, and the data and software capabilities of Google, a global technology leader working to run its operations on 24/7 carbon-free energy and contribute to the decarbonization of global energy systems. Project InnerSpace and Google intend to leverage their respective strengths to address critical challenges facing geothermal development, including the development of a global geothermal resource mapping and assessment tool." Cariaga, 2023.



²⁰ "The GeoMap data shows that virtually every military base in the West, and most of those in Texas, sits atop geothermal resources suitable to generate electric power — a fact that has not been lost on the Department of Defense, which is funding pilot projects at six military bases across the West. The data also shows that most of the active coal plants in the West — plants that rely on using heat from fossil fuels to generate electricity — sit atop hot rock within a mile of the surface. That includes active coal plants like North Valmy in Nevada, Fayette in Texas or the California-supplying Intermountain power plant in Utah — plants where an active planet-heating resource could potentially be replaced with carbon-free heat from below. But it also includes a broad array of decommissioned coal plants — sites that still sit in the center of webs of power lines that could onboard future clean power onto the grid while avoiding the roadblocks around permitting new transmission corridors. The Geomap researchers found that many of the West's other sites — greenhouses, meatpacking facilities, chemical plants and data centers — sit atop heat that could be tapped directly, without needing to generate electricity, which is a cheaper proposition." Elbein, 2024.

²¹ "Military bases and data centers offer one particular benefit for the geothermal industry as it seeks to get its legs under it: They are facilities that are willing to pay a premium for power that is both clean and always on, even if it is substantially more expensive than more intermittent sources like wind or solar. " Elbein, 2024

²² Energy resilience: "The Department of Defense (DoD) is expanding efforts to enhance installation energy resilience using geothermal energy. Next-generation geothermal technologies show potential to produce onsite round-the-clock carbon-free energy year-after-year increasing resilience and eliminating the need for fuel deliveries during long-term power disruptions. Threats from wildfires, extreme weather, cybersecurity attacks are increasing, and geothermal energy is an ideal solution to support DoD missions and communities with power." Defense Innovation Unit, 2024. Seven installations: "There are now seven installations with ongoing projects under this geothermal initiative." Defense Innovation Unit, 2024.

GeoFund: Financing First-of-a-Kind Geothermal Projects

GeoFund has successfully funded its first community-scale geothermal project. We think its feasibility is likely high because our understanding is that it faces financing barriers and not technical barriers. We think it is too early to assess how catalytic this grant will be because Project InnerSpace funded its first project in 2025. We are not yet sure how well its funding model will translate to first-of-a-kind next-gen geothermal technologies, as these projects have a riskier profile. However, we see this early financing as critical to the future commercialization of next-generation geothermal systems, and are cautiously optimistic that Project Innerspace can find a niche in which to provide catalytic capital.

Building Momentum for Geothermal Energy in the Public and Private Sectors

We have a positive impression of Project InnerSpace's ability to build momentum for geothermal energy in the public and private sectors. For example, before Project InnerSpace's inception, Jamie Beard played a significant role in promoting geothermal energy in Texas. Her collaboration with several Texas academics culminated in *The Future of Geothermal in Texas* report, which laid out evidence-based pathways for building geothermal energy in the state. Also, Project InnerSpace, as part of a cross-industry consortium, was awarded a DOE grant to promote technology transfer between the geothermal and oil and gas industries.²⁴ The GEODE consortium includes over 100 entities across the oil and gas and geothermal sectors. Beyond direct technology transfer, we believe the GEODE initiative could also assist fossil fuel workers in transitioning to new jobs and make a strong case for the geothermal industry's job-creating potential.

Additionally, we have heard from numerous geothermal stakeholders that Project InnerSpace has played an important role in generating excitement about geothermal energy. We believe this is reflected in Project InnerSpace's press coverage throughout the years, which includes mentions and profiles in major media outlets.²⁵

In September 2024, Project InnerSpace hosted its first Geothermal House event during Climate Week NYC to showcase technologies, foster networking, and bring stakeholders



²⁴ "Fueled by \$10 million in funding from the U.S. Department of Energy (DOE), this initial roadmapping phase sets the foundation for a comprehensive plan to harness geothermal energy's vast potential, leveraging the extensive experience and technologies from the oil and gas industry. The GEODE consortium brings together experts from over 100 partner entities across the energy industry, led by Project InnerSpace and the Society of Petroleum Engineers. DOE expects GEODE will be a 5-year effort, with the consortium issuing competitive solicitations of up to \$155 million for research activities over the latter four years, pending appropriations." GEODE, 2024.
²⁵ New York Times: ""It's been hard for geothermal to fight its way into the conversation," said Jamie Beard, founder of Project InnerSpace, a Texas-based nonprofit that promotes geothermal." Plumer, 2023. WIRED: Streshinsky, 2023. National Public Radio: Zomorodi and Delahoussaye, 2022.

together. In 2025, we heard from one next-gen geothermal company that Geothermal House has helped it facilitate at least three of its investment deals. We see this as promising evidence of Project InnerSpace's role as an ecosystem builder. Overall, we believe Project InnerSpace and its events are well-positioned to generate leads for a couple of reasons. First, we think Project InnerSpace has expansive ties to the next-gen geothermal industry and can bring the right people in the room with its connections. Secondly, there is currently excitement over geothermal technologies, such as growing interest in using clean power for data centers.²⁶

Examining the Assumptions Behind Project InnerSpace's Theory of Change

Below, we discuss and evaluate the main assumptions related to our understanding of Project InnerSpace's theory of change. For each assumption, we rank whether we have low, medium, or high certainty about the assumption.²⁷ Our assessment is based on both primary and secondary evidence, as well as our general impression of the plausibility of the assumption. Importantly, a number of the stages of Project InnerSpace's theory of change may not be amenable to easy measurement or quantification, are not supported by a robust evidence base, or are expected to occur in the future but have not occurred as of yet. Additional assumptions related to next-gen geothermal technologies, but not specific to Project InnerSpace, can be found in our strategy report on advancing next-gen geothermal energy.

1. Financing and de-risking next-gen geothermal addresses a key barrier to commercialization and deployment (high certainty)

²⁷ We describe our certainty as low/medium/high to increase readability and avoid false precision. Since these terms can be interpreted differently, we use rough heuristics to define them as percentage likelihoods the assumption is, on average, correct. Low = 0-60%, medium = 70-80%, high = 80-100%.



²⁶ Al and data centers: "During a "fireside chat" at Geothermal House, a day-long summit on geothermal energy sponsored by Project InnerSpace, a geothermal nonprofit, Mike Schroepfer, the former CTO of Meta who is now a climate venture investor, said the demand for power from AI was "the best news ever." He argued that having companies with big power needs and deep pockets was much better for clean energy development than having a stagnant grid that's just trying to replace dirty power plants." Zeitlin, 2024. Tech interest in next-gen geothermal: "Google is partnering with startup Fervo, which has developed new technology for harnessing geothermal power. Since they're using different tactics than traditional geothermal plants, it is a relatively small project with the capacity to generate 3.5 MW. For context, one megawatt is enough to meet the demand of roughly 750 homes. The project will feed electricity into the local grid that serves two of Google's data centers outside of Las Vegas and Reno. It's part of Google's plan to run on carbon pollution-free electricity around the clock by 2030. To reach that goal, it'll have to get more sources of clean energy online. And it sees geothermal as a key part of the future electricity mix that can fill in whenever wind and solar energy wane." Calma, 2023.

Most of Project InnerSpace's inputs aim to derisk next-gen geothermal, whether by decreasing exploration risks through GeoMap or crowding in additional finance. We have high certainty that these are the right levers to pull to get next-gen geothermal to commercialization because they help address a key challenge outlined by DOE in its Pathways to Commercial Lift-off report: high up-front costs and risks.²⁸ According to DOE, "the fastest path to enable next-generation scale-up is early capital to finance new demonstration projects."29 We think Project InnerSpace's work on building momentum for next-gen geothermal has helped connect the industry to strategic investors and investor-offtakers, and has built interest among oil and gas majors. GeoFund, once expanded to first-of-a-kind next-gen geothermal projects, could further crowd in funding.

2. Resource characterization mapping addresses a substantial obstacle to increased geothermal deployment. (high certainty)

We have high certainty that resource characterization mapping, such as GeoMap, addresses a substantial obstacle to increased geothermal deployment.

Pre-drilling and exploratory activities account for a small portion of project costs, but are critical to project success.³⁰ Specifically, before drilling and testing, there is considerable uncertainty regarding the quality of geothermal resources at a given site. During the exploration stage, developers can fail to find resources suitable for commercially viable production.³¹ (See **Figure 3** for a conceptual model of risks and costs in geothermal

³¹ "In new ("green field") geothermal projects, the highest risks are faced during the early stages of surface reconnaissance and exploration drilling (Stages I & II). During these early stages of development, there is considerable uncertainty regarding the flow capacity and temperature of the resource, namely, the ability to drill commercially productive wells that will supply a specified generation capacity for a specified length of time is poorly known. This leads to uncertainty in the



²⁸ See Table 2: Challenges confronting the pathway to commercial scale for next-generation geothermal liftoff and potential solutions as determined from analysis and interviews. DOE, 2025. ²⁹ "The fastest path to enable next-generation scale-up is early capital to finance new demonstration projects. This will reduce developer time spent raising equity and increase the asset base, triggering a positive feedback loop in which future projects benefit from the drilling improvements demonstrated from past projects, have lower costs, and require less equity. It will also increase the incentive for developers to expand to new sites." DOE, 2025.

³⁰ Small share of project costs: "The costs of pre-drilling and exploration drilling activities are comparatively small with respect to overall development costs; however, they directly influence subsequent drilling success rates and thus have a major financial impact on projects. In a 2016 analysis, Wall and Dobson found that exploration drilling results led to drilling full-sized development wells less than one third of the time. Exploration, confirmation, and development-well drilling collectively account for 30%-50% of the costs of geothermal development (Bromley et al. 2010). The cascading effects of exploration activities—from pre-drilling geotechnical studies through exploration, confirmation, and development drilling—have a collective impact on overall project costs and success." U.S. Department of Energy, "GeoVision" 2019. Percentage of project costs: The Future of Geothermal in Texas, a report that includes various Project InnerSpace staff as lead authors, estimated that pre-development surveys, exploration, and appraisal constitute approximately 10 percent of total expenses for geothermal projects. See Table 5.3. Project cost phasing by geothermal technology. University of Texas, Austin, 2023.

projects.) Consequently, this high risk can hinder developers' ability to secure funding for exploration and initial drilling, leading to delays or stalled projects.³²

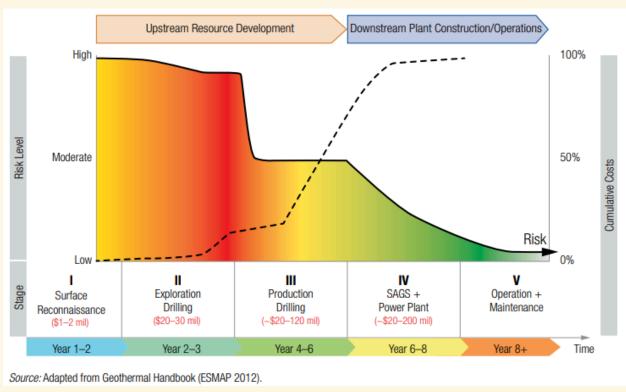


Figure 3: Conceptual model of risk and cumulative costs for geothermal projects³³.

Therefore, we believe that geothermal resource mapping can enhance the likelihood of project success by mitigating risks, shortening development timelines (and therefore reducing costs), and attracting more investors. We think this perspective aligns with some



likely overall cost to extract the geothermal fluids and reinjected the heat-depleted brine to replenish the reservoir. This uncertainty is considerably reduced after drilling and testing have confirmed the resource availability (following the completion of Stage II), which in turn allows the financial feasibility of proceeding with investment in subsequent development stages (Stages III and IV) to be ascertained." <u>Sanyal et al.</u>, 2016.

³² "While modest in comparison to the total cost of developing all of the stages of a geothermal project, the inability to raise funds for exploration and initial drilling can delay or sometimes even stall geothermal projects. Raising this risk capital can be particularly challenging for private-sector geothermal developers, since exploration drilling is typically funded with owner equity, which can be lost if the project turns out not to be feasible. Therefore, real or perceived "resource risk" has become a common barrier to advancing geothermal development around the world." Sanyal et al, 2016.

³³ Figure, Sanyal et al. 2016.

of the findings in DOE's GeoVision report, which advocates for increased resource assessments and improved site characterizations.34

We also think Project InnerSpace's mapping could help address some issues related to data scarcity and developing effective policies. For example, the absence of accessible and relevant data has hindered the development of renewable energy in Nigeria. 35 Indeed, geothermal's potential in Nigeria is not yet quantified and geothermal was excluded from the International Renewable Energy Agency's roadmap for transitioning Nigeria away from fossil fuels.³⁶ We are under the impression that improving the quality and quantity of geothermal-related data in data-scarce areas could help advocates develop policy recommendations and build momentum for geothermal energy, increasing the likelihood that supportive policies are passed and investments are made.

As a caveat, we think the usefulness of geothermal resource mapping will depend on data quality and representativeness and whether it is actually used by relevant stakeholders. We are concerned that legacy subsurface data will be location-biased and exhibit clustering (e.g., boreholes located close to other boreholes), which increases model

³⁶ "Apart from solar and hydro, there is a considerable dearth of information regarding the potential of renewable resources in the country. There is a need for comprehensive assessment of wind energy potential in the country for both on- and offshore wind. As observed from the analysis, the potential for geothermal, wave and tidal energy is yet to be quantified and thus, no plans yet to develop these renewable energy resources in the country. It is recommended that the federal government perform a detailed assessment to have a robust database of Nigeria's renewable energy potential. This will help to support planning for renewable energy development and also show the possible locations for renewables deployment." IRENA, 2023.



³⁴ "Variables such as market, transmission, and stakeholder support for a project cannot be determined without first understanding the resource potential—that is, where is the resource and what is its grade or quality? As such, the resulting economic determinations are only as accurate as the quality of the resource assessment data on which they are based. Mitigating uncertainty in resource assessments lowers the risk of unproductive exploration, thus reducing development costs." DOE, 2019.

³⁵ "Poor access to accurate and timely data or information on renewable energy has been a major barrier for effective policy and decision making in Nigeria. For example, it is difficult to ascertain the total wattage number of solar PV installations operational across the country. This is consistent with Sen and Ganguly [50] assertion that there is a lack of reliable data without which the generated output is likely impossible to be calculated. The absence of data recording stations constitutes a major barrier to the development of renewable energy, such as solar energy in Nigeria. Arguably, a lack of access to relevant data and inaccurate statistics remain a major barrier for renewable energy development in Nigeria." Adejanyu et al. 2020.

uncertainty.³⁷ We believe Project InnerSpace is aware of potential data quality issues and has plans to ensure quality control.

3. Project InnerSpace is increasing the speed of resource characterization mapping in LMICs relative to the counterfactual. (high certainty)

We have high certainty that Project InnerSpace is increasing the speed of resource characterization mapping in LMICs relative to the counterfactual.

The U.S. Geological Survey and the National Renewable Energy Laboratory are among the U.S. entities working on geothermal resource characterization.³⁸ Our understanding is that even with both of these major entities working on resource characterization, the U.S. still needs more data to reduce uncertainty and identify more resources.³⁹ We think that, if there is a need for more data in a wealthy country such as the U.S., there is probably a similar need in LMICs, where funding is likely scarcer. Additionally, we believe private companies are not motivated to make global maps public since public data would benefit their competitors. According to Project InnerSpace, if it did not exist, some of the mapping it plans on doing could be funded by governments, but this would probably occur on a piecemeal basis with varying quality and consistency.



³⁷ "Both borehole and seismic reflection data show significant clustering, with the borehole data also exhibiting a clustering and sampling bias with respect to depth. Non-representative sampling is an unavoidable consequence of collecting data to delineate resources for the exploration and production of geological resources (see Pyrcz and Deutsch, 2003). In the case of restricted depth of investigations during drilling this can also result in the underlying geological intervals not being sufficiently sampled to have a representative dataset, (e.g. Pyrcz and Deutsch, 2003). The ability to predict subsurface properties, such as temperature, relies on calibrating models against existing data. If the existing data are clustered, and there is a significant sampling bias then making predictions, based on models, away from data rich areas inevitably comes with an increased uncertainty. Representative datasets and associated statistics are vital for uncertainty modeling as sampling bias will bias any analysis of the uncertainties (Pyrcz and White., 2015)." Ireland et al. 2021.

³⁸ "The U.S. Geological Survey and the National Renewable Energy Laboratory developed national-scale assessments of conventional hydrothermal resources and EGS resources. The U.S. Geological Survey estimates more than 30 GWe of undiscovered conventional hydrothermal resource potential in the United States (Williams et al. 2008), and the National Renewable Energy Laboratory (Augustine 2016) estimates more than 5,000 GWe of EGS potential at depths between 3 and 7 kilometers (about 2 to 4 miles) across the country." DOE, 2019.

³⁹ "Improving the quantity and spatial resolution of national-scale assessment data will reduce uncertainty and can potentially identify more resources (in terms of quantity and geographic distribution) than estimated as of 2017. As an example, the GeoVision analysis considered sensitivity runs comparing regional, high-resolution EGS resource assessments with broader national-scale data assessments based on EGS resource data from Southern Methodist University. The result was the identification of more than 84 GWe of additional resources in the Great Basin area alone (Augustine et al. 2019)." DOE, 2019.

4. Improved geothermal resource characterization will lead to more projects being developed, and an increased number of projects developed will lead to lower costs (medium certainty)

We have medium certainty that improved geothermal resource characterization will lead to more projects being developed and that an increased number of projects developed will lead to lower costs.

As described earlier, we think GeoMap will decrease project risks and help projects attract more investments. In turn, we think that removing these obstacles will increase the number of developed geothermal projects. However, we are unsure of the extent to which mapping will increase the number of projects developed because exploration risks are not the only challenge that geothermal projects face. Geothermal projects face a mix of technical and non-technical barriers, and we do not think mapping is the sole solution for pushing next-gen geothermal technologies forward.

We think increasing the number of projects developed will lead to lower costs because some next-gen geothermal technologies will follow a learning curve. For example, enhanced geothermal systems (EGS), which create man-made reservoirs by injecting water underground, have become cheaper over time. Iterative improvements and technical advancements have helped EGS drop from an Overnight Capital Cost estimate of \$27,800 per kW in 2021 to a 2023 estimate of about \$14,700 per kW.⁴⁰ However, there is always considerable uncertainty over what kind of learning curve a new technology will follow. For more information, see our strategy report on advancing next-gen geothermal energy.

Is There Room for More Funding?

Project InnerSpace's 2025 Funding Status

Project InnerSpace would use additional donations to cover its funding gap for 2025. As of October 2025, it has a \$11.5 million budget for 2025 and faces a funding gap of \$4 million for the remainder of the year. It plans to maintain the same budget for 2026. It currently has around \$5 million in donor proposals pending that could be used for 2026 if it fills its 2025 budget gap, but otherwise has not raised any of its 2026 budget. According to Project InnerSpace, these operating budgets maintain the organization's basic, day-to-day operations and pay essential expenses.

Project InnerSpace anticipates a multi-year funding gap for expanding the following opportunities:

⁴⁰ "Field evidence resulted in a reduction of the Overnight Capital Cost (OCC) estimate of \$27,800 per kW in 2021 to a 2023 estimate of ~\$14,700 per kW." DOE, 2025.



- Integrating Al into GeoMap's global data set (\$6 million): Complete and maintain GeoMap, add new data sets and Al tools, form key partnerships, and include new techno-economic modeling to reduce project risk worldwide.
- Launching five to six GeoFund projects (\$3.5 million): Cover costs to evaluate
 and manage community-scale geothermal projects, expand into under-resourced
 regions, and grow the project pipeline to support local entrepreneurship and
 resilience. It is targeting around \$500,000 per project, in addition to staff costs.
 Extra donations to the GeoFund would allow Project InnerSpace to fund more
 projects.
- Funding additional Future of Geothermal policy reports and stakeholder engagement (\$2 million): Expand geothermal strategies in the U.S., Africa, South America, Mexico, and Japan through expert collaboration, regional reports, workshops, feasibility studies, and policy work. Costs include hiring consultants with local credibility and expertise to work as chapter authors. The \$2 million would support six to eight policy reports.

Project InnerSpace's major funders include the Bernard and Anne Spitzer Charitable Trust, the Dreamery Foundation, a third-party donor facilitated by Founders Pledge, the Grantham Foundation for the Protection of the Environment, Schmidt Futures, Quadrature Climate Foundation, and DOE.⁴¹ Project InnerSpace said its collaboration with Google on GeoMap has resulted in in-kind but not financial support. We think it is likely that Project InnerSpace will continue to receive funding from some subset of these funders and gain more funders as it becomes more well-known. However, we think the scope of Project InnerSpace's work means it can comfortably absorb a significant amount of additional funding.

U.S. Department of Energy: "Fueled by \$10 million in funding from the U.S. Department of Energy (DOE), this initial roadmapping phase sets the foundation for a comprehensive plan to harness geothermal energy's vast potential, leveraging the extensive experience and technologies from the oil and gas industry. The GEODE consortium brings together experts from over 100 partner entities across the energy industry, led by Project InnerSpace and the Society of Petroleum Engineers. DOE expects GEODE will be a 5-year effort, with the consortium issuing competitive solicitations of up to \$155 million for research activities over the latter four years, pending appropriations." GEODE, 2024.



⁴¹ Most of Project InnerSpace's funders: "Project InnerSpace is 100% funded by philanthropy, with our supporters including Schmidt Futures, the Grantham Foundation for the Protection of the Environment, Founder's Pledge, the Greenbridge Family Foundation, the Bernard and Anne Spitzer Charitable Trust, and the Dreamery Foundation." Project InnerSpace, accessed 2024. Quadrature Climate Foundation: "Project InnerSpace, Inc., Term 12 months, Grant amount \$500,000, Awarded date 13 Feb 2025, Funding to accelerate geothermal energy in the U.K. and Asia." Quadrature Climate Foundation, n.d.

Project InnerSpace's 2023 DOE Award Is Highly Restricted and Would Not Fund Its Core Activities.

In 2023, Project InnerSpace and a partner organization received \$165 million from DOE for GEODE. According to Project InnerSpace, this funding is restricted and does not cover its core activities. Additionally, \$155 million of this funding will be regranted through a competitive solicitation process; the remaining \$10 million will be split between the partner organizations, with Project InnerSpace receiving \$3 million for five years of work. Because this funding will not cover Project InnerSpace's core activities and is relatively low when divided across five years, we do not think this grant should significantly alter our view of Project InnerSpace's room for more funding.

Are There Major Co-Benefits or Potential Risks?

We think the primary co-benefit of Project InnerSpace's work is its potential for creating jobs. Promoting technology transfer from the oil and gas industry to geothermal could help former fossil fuel workers find high-paying jobs in the geothermal industry. In addition to creating jobs, this helps enable a just transition for former fossil fuel workers and could result in less backlash against the green transition from certain constituencies.

We think the primary potential risk of Project InnerSpace's work is the possibility of conflicting interests from oil and gas involvement if new geothermal development is centralized within the oil and gas sector. We outline this concern in our strategy report on advancing next-gen geothermal energy.

Key Uncertainties and Open Questions

 Whether next-generation technologies will advance quickly enough to allow substantially more geothermal power: There is uncertainty on geothermal's future cost-competitiveness because it is unclear how quickly next-generation



⁴² "Fueled by \$10 million in funding from the U.S. Department of Energy (DOE), this initial roadmapping phase sets the foundation for a comprehensive plan to harness geothermal energy's vast potential, leveraging the extensive experience and technologies from the oil and gas industry. The GEODE consortium brings together experts from over 100 partner entities across the energy industry, led by Project InnerSpace and the Society of Petroleum Engineers. DOE expects GEODE will be a 5-year effort, with the consortium issuing competitive solicitations of up to \$155 million for research activities over the latter four years, pending appropriations." GEODE, 2024.

technologies will improve and decrease in price. We also think there is some uncertainty about how easy it is to apply skills and techniques from the O&G industry to next-generation geothermal technologies. Ultimately, we think there is still value in supporting geothermal technologies because it diversifies the clean energy portfolio and hedges against the risk of a clean energy transition failing.

- Betting on different next-gen geothermal technologies: We are uncertain about which next-gen technologies will yield the greatest impact relative to investment: those nearing commercial development (e.g., enhanced geothermal systems) or those that are further from commercialization, but could be substantially more efficient (e.g., superhot rock geothermal). Giving Green is hedging its bets by supporting Project InnerSpace and Clean Air Task Force (CATF), which take different approaches to advancing geothermal energy. Project InnerSpace focuses on technologies that are new but further along in their development than super-hot rock geothermal, which is CATF's primary focus. We think super-hot rock geothermal energy is less certain to succeed, but if it becomes commercially viable, it could offer cheaper and abundant carbon-free energy. Due to this uncertainty, we think it is important for us to be technology-agnostic and diversify the next-gen geothermal technologies we support.
- Ability to execute as it grows: Project InnerSpace has grown to a staff size of 24 people since its launch in 2022 and now manages several large-scale projects. Our perception is that organizations undergoing rapid growth often experience "growing pains" if they do not have sufficient operational capacity and structure to carry out their work. In 2023, Project InnerSpace said it would protect against this concern by leaning on its advisors, who understand scale (e.g., leaders in technology, venture capital, and impact investing) and that it is confident that it will attract the talent it needs to achieve its goals, given that international subject matter experts and entrepreneurs have approached Project InnerSpace to volunteer their time. Since then, Project InnerSpace has hired additional leadership to add capacity and updated its organizational model. We do not have reasons to suspect Project InnerSpace is experiencing disproportional challenges with its growth, but we will monitor this uncertainty.
- Ability to bridge major financing gaps: We are unsure whether Project InnerSpace's work can overcome the fundamental problem that (a) next-gen geothermal requires a large upfront capital investment and (b) traditional capital sees it as high-risk, low-reward. Project InnerSpace tries to bridge this investment "valley of death" through GeoMap, GeoFund, and building momentum for next-gen geothermal. We think it is possible that the amount of funding that Project InnerSpace will catalyze may be too small to bridge the gap.



• **Project InnerSpace's cost-effectiveness:** We chose not to quantify Project InnerSpace's cost-effectiveness given the high uncertainty across key parameters. Instead, our general research into next-gen geothermal forms the basis of our evaluation. Our assessment of next-gen geothermal's potential to scale widely and cheaply informs our expectation that the contributions of highly effective organizations supporting these technologies could influence large emissions reductions. Our analysis of the technical, policy, investment, and philanthropy landscapes enables us to identify organizational strategies that we think are highly effective. By not modeling Project InnerSpace's organizational cost-effectiveness, we lose the ability to compare its cost-effectiveness with that of other giving opportunities. However, it is important to note that our cost-effectiveness analyses are generally uncertain and mainly serve to check if an opportunity's cost-effectiveness is on the same order of magnitude as our baseline for a Top Climate Nonprofit (\$1 per ton of CO₂e).

Bottom Line and Next Steps

We classify Project InnerSpace as one of our Top Climate Nonprofits addressing climate change. We think there is strong evidence to support its theory of change, that Project InnerSpace has positioned itself as a leader in the geothermal sector, and that it likely has room for more funding. Also, we think its strategy of fast iteration and quickly getting next-gen technologies on a learning curve complements that of CATF, another Giving Green Top Nonprofit, whose geothermal workstream focuses on superhot rock geothermal energy. We think this portfolio approach of supporting different geothermal technologies and strategies helps increase the likelihood of advancing the geothermal sector.

⁴³ As an example, some key parameters could include: geothermal's percent share of the global energy portfolio, which varies by country; the amount of fossil fuel burning that it displaces, which varies by country; the number of years which Project InnerSpace's activities speed up geothermal development relative to the counterfactual; the percent likelihood of success that activities by industry, nonprofits, and governments speed up geothermal development; the percent that Project InnerSpace contributes to sped up geothermal development relative to other actors; and global spillover effects from Project InnerSpace's activities.



Giving Green was founded to help donors cut through the complexity of climate philanthropy and direct their resources for maximum impact.

Our founder, Dan Stein, Ph.D., spent 15 years developing evidence-based strategies in global philanthropy. He saw people eager to fight climate change but paralyzed by its scale. In 2019, with support from IDinsight, he launched Giving Green to rigorously evaluate solutions and share clear guidance.

What began as a side project is now a team directing tens of millions of dollars to high-impact initiatives. Our success is shared—with donors ranging from kids donating allowances to retirees investing in a better future. We believe anyone can start small and still make a huge difference.

Thank you for joining us on the path to net zero. Together, we keep moving forward.