

# **Geothermal Technologies Office**

## **Quarterly Stakeholder Meeting**

### **October 2022 Transcript**

#### **Welcome and Office Updates (Slides 1-9)**

#### **Kevin Jones, DOE FORGE Manager and Strategy Lead**

Good afternoon, everyone—or good morning or evening, depending on where you are! I'm Kevin Jones, Technical Project Officer in the Geothermal Technologies Office—or GTO—and I help manage the FORGE project, which is GTO's flagship Enhanced Geothermal Systems demonstration project. I am a geoscientist by background and spent over 11 years in the oil and gas industry serving in a variety of roles that spanned the oil and gas asset life cycle. I joined GTO to be a part of the energy transition and am proud to share that I recently completed my first year of Federal service.

Now, on behalf of the entire GTO team, thank you for joining our quarterly webinar. We're always excited for these webinars, where we get opportunity to share all the great things happening in our office.

Here is our agenda for today. We'll start off with some news and updates from the Department of Energy and the Office of Energy Efficiency and Renewable Energy. Then we'll move on to GTO specific news and updates. We'll get Program and Project updates from each of the GTO program managers, then we'll touch on some upcoming events, and we'll finish off with a question-and-answer session.

We have a lot of great updates to share today, so let's jump right in! As we go through the presentation, you can enter questions into the Q&A box at any time during the webinar. First, some highlights from the Department of Energy, DOE, and the Office of Energy Efficiency and Renewable Energy, or EERE, of which GTO is part.

The first thing we'd like to highlight is DOE's effort to embed equity and justice values throughout the organization and in all its work. The department recently hosted Justice Week to discuss these efforts both internally and with external communities, stakeholders, and sovereign tribal nations. The internal sessions included discussions of DOE's Diversity, Equity, Inclusion, and Accessibility Strategic Plan with Energy Secretary Jennifer Granholm and Deputy Secretary David Turk, including the department's implementation of President Biden's Justice40 initiative. The Justice40 initiative set the goal that 40% of the overall benefits of certain Federal investments—including investments in clean energy and energy efficiency—to flow to disadvantaged communities. External sessions provided an opportunity for the public to learn about ways to engage with and provide feedback on DOE's activities. The week was an important way to highlight DOE's plans for an equitable transition to a new energy system.

I'm sure most of you have caught news of recent legislative activity, so we'll just touch quickly on a few key provisions related to geothermal. The just-passed Inflation Reduction Act, or IRA, includes significant focus on reducing energy cost burdens for families and addressing the climate emergency. For geothermal, this includes an extension of the investment tax credit and production tax credit for geothermal projects, as well as tax credits for installing heat pumps. And, just yesterday, the Department of the Treasury and the Internal Revenue Service released a request for information to gather public input on key climate and clean energy tax incentives in the IRA. The link for more information is [here](#), and we encourage anyone who's interested in providing input to check it out.

Here in the GTO office, we continue to grow! We've welcomed a number of new team members since our last staff update. Joining the EGS team is Jon Payne, joining our Operations team are Triphelia Hunter and Sebastian Ames who will support budget execution. Fatimah Alyas and Casey Rath will support communications, and Jessica Quintanar and Sudeep Kanungo will support project management. It's great to have you all on board!

And, as we discussed in our last quarterly webinar, the Bipartisan Infrastructure Law, or BIL, includes a provision for four enhanced geothermal systems demonstration projects in different geographic settings, including one east of the Mississippi. We are currently reviewing responses to a request for information about those projects, in preparation to release a funding opportunity. You can subscribe to our Drill Down newsletter to make sure you get the update when that funding opportunity is released.

BIL, which I just mentioned, also includes \$500 million to demonstrate the technical and economic viability of carrying out clean energy projects, including geothermal projects, on current and former mine lands across America. Led by DOE's new Office of Clean Energy Demonstrations, the Clean Energy Demonstration Program on Current and Former Mine Land seeks to carry out five clean energy projects in geographically diverse regions. Although at least two of the projects must be solar, geothermal is also eligible. DOE currently has an open Request for Information out about these projects, with plans for a Funding Opportunity Announcement, or FOA, in 2023.

DOE is hosting workshops to provide an overview of the program to interested stakeholders, gather feedback, and help stakeholders network in anticipation of the FOA. The workshop that was focused on the Eastern U.S. was held September 20<sup>th</sup> and 21<sup>st</sup> at Oak Ridge National Lab, the one focused on the Western U.S. will be held on October 11<sup>th</sup> and 12<sup>th</sup> at the National Renewable Energy Laboratory in Golden, Colorado, and there's a virtual workshop scheduled for October 25<sup>th</sup> and 26<sup>th</sup>. You can find more information and registration details for the upcoming workshops at the link shown [here](#).

I know that was a lot of information, and it's just a hint of all that DOE and EERE are doing. So, to stay on top of everything I just covered and all the great news coming out of DOE and EERE, you can sign up for EERE's Weekly Jolt and follow Secretary Granholm, DOE, and EERE on social media using the information and handles shown [here](#).

Shifting gears now to GTO updates, let's start by talking about the Geothermal Rising Conference---I wish we could insert an applause track here, because it was awesome. It was terrific to see everyone in person after a few years away, and there was a palpable feeling of

optimism in the air about the potential for geothermal to play a major role in the energy transition. GTO hosted a booth filled with information about our initiatives and programs, and it was busy! Thanks so much to everyone who stopped by to chat and grab a few of our project postcards. During the conference sessions, GTO's Acting Director Lauren Boyd gave a plenary talk and participated in a panel discussion, the National Renewable Energy Laboratory hosted a roundtable about our Geothermal Collegiate Competition, and there were numerous technical sessions related to GTO-funded work.

And I can't forget the fun and excitement of announcing the winners of our Geothermal Manufacturing Prize! Launched in 2020 as the first geothermal-focused prize in the American-Made Challenges prize program, the Geothermal Manufacturing Prize was a \$4.65-million competition designed to spur innovation and address manufacturing challenges related to operating in harsh geothermal environments. The goal was to harness additive manufacturing to improve geothermal tool design, fabrication, and functionality, and encourage innovators to discover new advanced manufacturing solutions. Over the past two-and-a-half years, innovators from across the country worked on their technologies, earning cash prizes and other incentives along the way.

We announced winners for the prize at GRC, with two teams from Houston, TX, taking home half a million dollars—in big checks!—each. Team Downhole Emerging Technologies developed an all-metal, retrievable packer system designed specifically for geothermal environments, while Team Ultra-High Temperature created a labyrinthian heat sink to address temperature limitations in logging and measurement tools. While those two teams were our winners, all of the prize competitors demonstrated exceptional creativity and we look forward to what they do next.

In our final office update, I'm happy to share that we've just released our peer review report. For six days in May, GTO conducted a virtual peer review. Peer review is an important process at EERE, allowing us to review and evaluate the progress and accomplishments of our supported projects and the degree to which those projects have delivered results and have progressed technically. In the 2022 GTO peer review, more than 60 projects across five technology panels were reviewed by 70 reviewers. The report details the entire review, including the process we used, the projects that were included, and the resulting scores and review comments.

The report provides a great opportunity to learn about the work in GTO's portfolio and our progress, and we hope you'll take the opportunity to read the summary report, which you can find at the link on the screen. You can also access the report through a related article in the news section of GTO's website.

And with that, I'll turn the mic over to Alexis McKittrick, program manager for our Hydrothermal Resources and Low-Temperature and Coproduced Resources programs.

**Lithium Extraction From Geothermal Brines, INGENIOUS project, GeoDAWN Project, The Geothermal Energy from Oil and gas Demonstrated Engineering Funding Opportunity, Community Geothermal Heating and Cooling Design and Deployment Initiative (Slides 10-15)**

**Alexis McKittrick, Hydrothermal and Low Temperature Program Manager**

Thanks, Kevin. As with all of our quarterly webinars, it's great to be here today to share some news about our office and projects. As Kevin mentioned, I manage both our Hydrothermal Resources program and our Low-Temperature and Coproduced Resources program. I'll start today with hydrothermal. As many of you know, reducing the costs to find, access, and sustain energy production from geothermal resources will ultimately increase geothermal deployment. GTO's hydrothermal program works to achieve that, with projects designed to make drilling and reservoir development more efficient and cost-effective, improve wellbore integrity, and accelerate the transfer of oil & gas technology to geothermal. To help us get there, our hydrothermal RD&D priorities include work in exploration, drilling, and critical materials.

One key area of focus for our hydrothermal team is the potential for lithium extraction from geothermal brines. Lithium is a critical element, especially for the transition to a clean energy economy, but domestic sources of it are rare. Finding ways to cost effectively extract lithium from enriched brines could provide a long-term, domestic source of this critical material. The goal of our research in this area is to add a value stream for geothermal production—ultimately encouraging the use of untapped geothermal resources in the area—while also confirming the Salton Sea as a cost-effective domestic source of lithium.

In addition to numerous projects related to lithium and geothermal brines, we just released an outreach tool called a StoryMap to help stakeholders understand just how much impact this research can have. The StoryMap's digestible format allows users to learn about lithium's geology, its role in renewable energy today, how it is currently obtained, and why the Salton Sea region of California may prove to be a key domestic source—with a little help from geothermal energy. You can find the StoryMap on GTO's website via the link shown on this slide. We hope you'll check it out to learn more about our work in this area and offer feedback on the tool.

I'd also like to provide a quick update on some of our investments in work to identify potential surface signals that indicate deeper, hidden geothermal systems.

In our INGENIOUS project, the team has completed multiple geological, geochemical, and geophysical datasets for the broader Great Basin region of the western U.S. They'll now move to the next phase, during which they will use the data to develop predictive exploration workflows for hidden geothermal systems.

Work also continues in our GeoDAWN project, where researchers are gathering subsurface data in the Walker Lane geologic zone in western Nevada and leveraging machine learning to develop deeper understanding of the geologic conditions and stress regime. They'll use this geophysical data to locate undiscovered geothermal resources and identify critical mineral deposits that can be mined for domestic use.

And building on GeoDAWN is our GeoFlight project, a partnership with the U.S. Geological Survey under which we'll collect data on hidden geothermal systems in California's Imperial Valley, which includes the Salton Sea.

These projects are important to help reduce cost and risk for geothermal operators, and we're excited to continue to see results.

For my last hydrothermal update, I just wanted to remind everyone about GEODE, an open funding opportunity in conjunction with our enhanced geothermal systems program that will help us leverage the similarities between geothermal and oil and gas. Short for Geothermal Energy

from Oil and gas Demonstrated Engineering, GEODE will form a consortium of experts to address technology and knowledge gaps in geothermal energy, based on best practices used within the oil and gas industry.

We launched GEODE because we know that tapping into the expertise, technologies, and experience of the larger domestic oil and gas industry can help overcome barriers and encourage private investment. These advances and access to capital can help the country realize the exponential growth potential of geothermal. An initial award of up to \$10 million will be used to select the entity to run the GEODE effort and create a plan for research and outreach. Subject to future Congressional appropriations, GTO will then fund up to an additional \$155 million to conduct that research and outreach through competitive solicitations. GEODE is currently open, with applications due October 28. You can get more information at the website shown here.

Ok, now I'll shift gears for a quick update from our Low-Temperature and Co-Produced Resources program. This portfolio focuses on technologies used with geothermal resources below a temperature of 300°F (150°C)—including geothermal heat pumps and district heating—as well as geothermal resources and hybrid power designs that can be co-developed with existing wellfield infrastructure and other clean energy technologies.

The main thing I want to highlight from our low-temp portfolio is a funding opportunity reminder. Our Community Geothermal Heating and Cooling Design and Deployment initiative is currently open and seeks to fund geographic coalitions to implement community geothermal systems. Through this work, we hope to increase deployment of such systems and foster innovative approaches, as well as to help communities build a workforce and advance environmental justice. Selected coalitions will submit data and information back to GTO, and we'll work with them to develop a set of test cases that can be replicated throughout the U.S. It's an exciting initiative and we're looking forward to seeing the applications—which are due next week, on October 11.

With that, I'll turn things over to Jeff Winick, acting program manager for our Data, Modeling, and Analysis, or DMA, program.

## **Data, Modeling, and Analysis: Datathon and Permitting (Slides 16-18)**

### **Jeff Winick, Acting Data Modeling and Analysis Lead**

Thanks, Alexis. As Alexis mentioned, I'm currently serving as the acting program manager for DMA while Sean Porse serves a detail in DOE's International Affairs office. In the DMA portfolio, we work to identify and address barriers to geothermal adoption in the U.S., and to validate and assess technical progress in the geothermal sector. This work applies across GTO's technology portfolio and helps direct and prioritize RD&D. DMA projects include evaluating trends, conducting impact analyses, conducting geothermal resource assessments, identifying best practices, and outlining key investments needed to refine the geothermal RD&D portfolio.

First, the DMA team recently engaged in a fun activity--the first ever GEO Datathon, organized by the Society of Petroleum Engineers. I also want to acknowledge the amazing work that Andy Adams from our DMA team and Kevin Jones also put into coordinating this effort with SPE. The

Datathon challenged participants to solve a geothermal engineering problem using real field data from GTO's Frontier Observatory for Research in Geothermal Energy project, which you likely know as FORGE. Participants used machine learning to create predictive models that can support future geothermal energy production, and they used one of the largest geothermal datasets assembled—including never-before-analyzed data.

The event ran from June 21 to July 25 and was open to both individuals and teams. The winners—Team Naturals from Stanford University—were announced at the PIVOT 2022 event at the end of July. It was a terrific experience and we hope there are more datathons in the future.

As we've highlighted in previous webinars, one of the key areas in which DMA is currently working is geothermal permitting—which is a critical barrier to expanding geothermal deployment. Project development timelines for geothermal projects are long. They can run 7–10 years, a vast majority of which is permitting time.

The DMA team has multiple projects underway to address this barrier, including a federal interagency task force comprising federal agencies subject to the 2021 Memorandum of Understanding to Establish a Program to Improve Public Land Renewable Energy Project Permit Coordination, plus state agencies from California and Nevada.

The task force supports requirements laid out in the Energy Act of 2020, including requirements to permit 25 GW of renewable energy production on federal land, and for the Bureau of Land Management's National Renewable Energy Coordination Office to report on issues related to leasing, permitting, siting, or producing geothermal energy.

The task force held a kick-off meeting back in March which was well attended with over 45 federal and state agency representatives in attendance. Over the summer the team convened a series of 3 stakeholder engagement meetings, one with geothermal developers, a second with environmental NGOs, and finally a tribal stakeholder engagement meeting. Following this, the Task Force held its final synthesis meeting in September and based on the findings from these meetings, NREL will be conducting a detailed analysis and are developing a report of stakeholder and agency findings and potential action items to be delivered to the parties denoted on this slide.

And now I'll turn things over to Lauren Boyd, our acting director and enhanced geothermal systems program manager, for updates from her side. Go ahead, Lauren.

## **Enhanced Geothermal Systems: FORGE solicitation, Geophone Prize, Earthshot, and Events (Slides 19-28)**

### **Lauren Boyd, Acting Director, GTO**

Thanks, Jeff. As many of you likely know, it's the presence of heat, permeability, and fluid underground that creates natural geothermal systems. In traditional geothermal systems used for electricity generation, underground pathways conduct fluids through the subsurface, carrying

energy in the form of heat to the earth's surface. But in many locations, rocks are hot enough to produce energy but lack the permeability or fluid to carry that heat to the surface. That's where enhanced geothermal systems—or EGS—come in, creating humanmade reservoirs and fractures sufficient to tap geothermal resources.

Our EGS program focuses on developing the technology to cost effectively deploy geothermal in places where it was previously inaccessible—thus opening up vast opportunities for U.S. geothermal development.

For our first update, I'll highlight news from our flagship research site—FORGE in Milford, Utah. In August, the FORGE team released our second competitive solicitation. Under this solicitation, the University of Utah—which leads FORGE—anticipates making up to 17 awards totaling up to \$44 million. The solicitation covers five topic areas, all ultimately aimed at improving EGS reservoir characterization, creation, and sustainability. Concept papers are due October 10, with full applications due in January 10, 2023.

In addition, Utah FORGE is inviting technology specialists and stakeholders from **outside** the Utah FORGE project to provide overviews of their prospects, technologies, and visions in a monthly webinar series. Utah FORGE will host these external perspectives via webinar on the second Tuesday of each month at 9 a.m. Mountain Time.

Registration is required and you can find more info at the link included here.

I also wanted to briefly highlight our Geothermal Geophone Prize. Spearheaded by GTO, in partnership with the National Renewable Energy Lab and Lawrence Berkeley National Lab, the Geophone Prize is intended to drive innovation in addressing the challenges of operating seismic sensors in geothermal environments.

These sensors collect data from subsurface geothermal reservoirs to tell us how the reservoir rock is evolving before, during, and after EGS stimulations, which helps us ensure safe and effective geothermal operations. The problem is that most existing seismic instruments can't withstand the high temperature and corrosive geothermal environments.

So we're using the prize to catalyze the development of high-temperature, downhole-capable seismic monitoring for EGS. The prize includes three progressive competitions. Phase 1 recently closed and judging is underway. Phase 2 is expected to open in December, and new teams are eligible to join even if they didn't participate in Phase 1—so we hope some of you will join us!

And now on to the BIG EGS news—our Enhanced Geothermal Shot!! Some of you may have heard that DOE and GTO earlier this month announced the Shot, which is an aggressive department-wide effort to dramatically reduce the cost of EGS—by 90%, to \$45 per MWh by 2035. Reaching this target would be game-changing and would open up possibilities for cost-effective clean geothermal energy nationwide.

In fact, we know there is enough technical EGS potential in the United States to meet the electricity needs of the entire world—at least five terawatts! Capturing even a fraction of that

resource through widescale commercial deployment could affordably power more than 40 million American homes and businesses. Investments in EGS can also exponentially increase opportunities for geothermal heating and cooling solutions nationwide.

Now, we know getting to this target will not be easy. EGS is definitely viable—and already in use in limited locations—but expanding it is not without its challenges. The rocks where we find EGS resources are hard—10–20X harder than sidewalks (>40,000 psi)—as well as corrosive, which impacts tools, electronics, and wellbore sustainability. It's also difficult to see what's below the subsurface, especially at EGS depths of 4,000 to even 10,000 feet, and we have work to do to improve the cost-effectiveness of new and existing technologies to drill to these depths !

To ensure we can reach the Enhanced Geothermal Shot target, GTO is going to continue on—and expand—our path of innovative RD&D to advance EGS. We'll particularly focus in the four areas shown on this slide, which we know will help us overcome the remaining EGS barriers:

- Driving down costs of things like cement and well casings;
- Advancing subsurface engineering so we can drill better wells, faster;
- Collecting more and better-quality data to help understand the subsurface;
- And improving zonal isolation, that helps us keep subsurface fluids where we need them for better energy capture.

So we're definitely enthusiastic about the Enhanced Geothermal Shot—and so is Energy Secretary Jennifer Granholm, who launched the Shot at the training facility of Plumbers Local 68 in Houston last month.

Guests from labor organizations, geothermal companies, non-profits, oil and gas companies, local government, and the national laboratories attended the announcement.

Also, stay tuned for a possible Earthshot summit early next year! Before we move to Q&A, I'd just like to highlight a few exciting upcoming events that GTO is part of.

First, we'll be sponsoring the International Ground Source Heat Pump Association's Conference and Expo in Las Vegas, December 6–8, and we will have a booth at the American Geophysical Union's fall 2022 meeting in Chicago December 12–16.

We are also gearing up for the next Stanford Geothermal Conference in February.

And finally- don't forget to sign up for our Drill Down newsletter to get updates about GTO events, or check the Events tab on our website.

And that wraps it up! We hope you've enjoyed the webinar. If you haven't already, now would be a great time to enter any questions you have in the chat. While we gather those for Q&A, I want to thank you all again for attending today.

I know I speak for everyone when I say it's been a pleasure to update you on GTO's activities. As I mentioned, you can stay on top of GTO events and news throughout the year by signing up for The Drill Down, and please remember we want to hear from you!

Email us at [DOE.Geothermal@ee.doe.gov](mailto:DOE.Geothermal@ee.doe.gov) to send us your resumes and CVs to be a reviewer, tell us what you'd like to hear on these quarterly webinars and in our newsletter, and just ideas about the future of geothermal energy with us.

Now I'll turn things over to our Stakeholder Outreach and Engagement Lead, Elisabet Metcalfe, to lead Q&A.