

Geothermal Technologies Office Quarterly Stakeholder March 2022 Transcript

Welcome & Agenda Overview (Slides 1-2)

Cullen Henderson, GTO Operations Supervisor

Good afternoon, everyone—or maybe it's morning or evening where you are! I'm Cullen Henderson, Operations Supervisor for GTO. And whatever time zone you're in, thank you for joining our quarterly webinar. We're always excited for these webinars, where we get to share all the exciting things happening in the Geothermal Technologies Office.

We have a jam-packed hour for you! You'll hear updates from the Principal Deputy Assistant Secretary for DOE's Office of Energy Efficiency and Renewable Energy and get a quick rundown on GTO's budget, staff, and upcoming events. Our program managers will also highlight some recent and upcoming activities. Then, our director Sue Hamm will brief you on our Multi-Year Program Plan and invite our program managers to join her to discuss how the plan will drive GTO's activities. Also, we'll do a Q&A session at the end, so be sure to enter your questions using the Q&A option in Zoom.

Before we start, though, I'd like to turn things over to Doug Blankenship to share a few words about recent losses to the geothermal community. Go ahead, Doug.

In Memory of Steve Pye and J-C Rogiers (Slide 3) Doug Blankenship

Thanks for the opportunity to share a few thoughts. Now I'll turn things over to Sue Hamm, GTO director.

Intro to Kelly Speakes-Backman (Slide 4)

Sue Hamm, Director of GTO

Thank you, Doug, for those warm words for Steve and J-C. We know they will continue to be with us in spirit as we carry on the work to advance geothermal energy.

And now, I'd like to introduce Kelly Speakes-Backman, Principal Deputy Assistant Secretary for DOE's Office of Energy Efficiency and Renewable Energy, or EERE. In her role, Kelly leads and directs EERE—of which GTO is a part—in creating and sustaining American leadership in the transition to a global clean energy economy. She oversees the organization's nearly \$3B portfolio of research, development, demonstration, and deployment activities in energy efficiency, renewable energy, and sustainable transportation.

Kelly was unable to join us live today but was kind enough to provide us with remarks.

Kelly Speakes-Backman, Principal Deputy Assistant Secretary for EERE

Thanks, Sue. I'm excited to be here today with the geothermal community to talk about the exciting developments at the Department of Energy and in EERE.

It was almost year ago today that I last joined the quarterly webinar to discuss with you all the programmatic priorities of EERE, and how geothermal solutions and your community has an important role in the battle against this climate crisis we face. Secretary Granholm likes to say that DOE is

America's solutions agency, because we never back away from a challenge, and because of how many technologies and areas of society our work impacts.

For decades, DOE has been investing in innovative renewable energy and energy efficiency technologies. Now is the time to realize returns on those investments by getting energy solutions into the marketplace at scale as quickly as possible. As I said to those of you on this webinar a year ago, our mission in EERE is to accelerate the research, development, demonstration, and deployment of technologies and solutions to equitably transition America to net-zero greenhouse gas emissions economy-wide no later than 2050.

Creating good-paying jobs and ensure the clean energy economy benefits all Americans—especially workers and communities impacted by the energy transition and those historically underserved by the energy system and overburdened by pollution. There's no single technology and no single solution that will get us there; it will take us coordinating efforts on a wide variety of areas.

We also can't do it alone. We know that to execute our energy goals, EERE will need to coordinate closely with industry, including the oil and gas sector, as well as other DOE offices and our national labs and, federal and state agencies, tribal and local governments, and other partners.

Our five programmatic priorities remain as important as they were last year when we first established them to aid our transition to a clean energy economy. They are:

- Decarbonizing electricity
- Decarbonizing transportation
- Decarbonizing the industrial sector
- Reducing the carbon footprint of buildings and
- Decarbonizing the agricultural sector.

Each of these priorities focuses on a sector; these five are major contributors to our nation's greenhouse gas profile. And in the year since I last visited with you, we have acted on those priorities. But certainly, there's more to be done.

A new crucial element of helping ensure that we can get this work done is the recently passed Bipartisan Infrastructure Law. A key piece in President Biden's Build Back Better agenda, the infrastructure law includes more than \$62 billion for the Department of Energy to deliver a more equitable clean energy future for the American people by:

- Investing in American manufacturing and workers
- Expanding access to energy efficiency and clean energy for families, communities, and businesses
- Delivering reliable, clean, and affordable power to more Americans
- And building the technologies of tomorrow through clean energy demonstrations.

For the next five years, the Bipartisan Infrastructure Law will stand up 60 new DOE programs, including 16 demonstration and 32 deployment programs. It also expands funding for 12 existing research, development, demonstration, and deployment programs. Under this law, America's scientists and researchers will have the resources they need to demonstrate clean energy breakthroughs and prove them out at scale.

This includes investments that will help expand the impact of the Geothermal Technologies Office's innovation work. The law includes \$84 million for the office to stand up four enhanced geothermal system pilot demonstration sites over the next four years. These sites will be established in conjunction with our research partners, using a competitive awards process.

The new law focuses on projects that demonstrate enhanced geothermal technology in different geologic and geographic settings—including one in the eastern portion of the United States—using a variety of techniques and well completions. The goal is to identify potential locations for enhanced geothermal systems development.

Identifying the best ways to advance enhanced geothermal systems is essential to meeting our goal to deploy at least 60 GW of geothermal power capacity by 2050. This would provide at least 8% of national electricity generation and would be a 26-fold increase from today. Leaps like this are essential to move the country to a carbon-free electricity sector and net-zero economy.

As part of this work, we will be looking to you—the geothermal community—for help at every step. This includes asking you to provide input about the steps and outcomes we should pursue to ensure that our demonstration projects drive tangible technology advances that put enhanced geothermal on the path to widescale deployment.

Keep your eyes peeled for an upcoming request for information from the geothermal office on how we can best do this. As you can tell, it's an exciting time for geothermal energy! To add to the excitement, Sue and her team will tell you more today about our geothermal office's newly released Multi-Year Program Plan.

This plan lays out a roadmap for the office's research areas and priorities for the next five years, to help ensure exponential growth in U.S. geothermal deployment. But—again—we need all of you to get there. So thank you for attending this quarterly webinar. Your continued commitment to advancing geothermal energy and working with our Geothermal Technologies Office is essential.

We look forward to building the nation's energy future with you! Back to you, Sue.

Sue Hamm: Thanks again to Kelly for taking the time to share her thoughts about geothermal and its role in helping to meet EERE's goals. We are so pleased to support this Administration and its work to create a clean, equitable future for all Americans.

So let's get into the nuts and bolts of how we're going to get it done! First, I'll turn things back to Cullen for some office updates.

Budget and Office Updates (Slides 5-8)

Cullen Henderson

Thanks, Sue. I'd like to start by sharing some notes on GTO's budget. As all of you likely know by now, Congress passed a Continuing Resolution last week—its third since the October 1, 2021, start of the 2022 fiscal year. This means that federal agencies, including DOE, are still awaiting an actual FY22 appropriated budget—so our activities for FY22 are authorized, but we don't actually have the budget to do them all. That leaves us working with our FY21 budget for now, plus—as Kelly Speakes-Backman noted—\$84 million to support drilling demonstrations. We are carrying out our activities and budgets at these levels for now and look forward to hopefully getting an appropriated FY22 budget soon.

I'd like to turn next to some upcoming GTO events. The first is our virtual project peer review, which will be held in multiple half-day sessions throughout May. The peer review will allow us to evaluate GTO-funded projects to assess their contribution to our mission and goals, track progress, and assess the office's overall management and performance. Peer reviews are an important part of our evaluation and planning activities—and a great way to learn about our portfolio. The review is open to the public and registration will be announced soon. To get the latest and make sure you don't miss registration, subscribe to GTO's newsletter, The Drill Down. And if you are a principal investigator being evaluated at the review, be sure to keep checking your email for due dates and information!

The other important upcoming event is one many of you probably know—Geothermal Rising's annual conference. The event is being planned for in person in Reno, Nevada, in August. GTO is planning to have a booth, and we will be hosting an event to highlight and discuss upcoming prize opportunities. We look forward to seeing many of you there!

Finally, I'd like to highlight many of the new GTO staff and contractors who have joined us in the past year. It's been a busy year—with more to come!—and we are glad to have so many great staffers be part of our already terrific team.

With that, I'd like to turn things over to our program managers to talk about open and upcoming activities. We'll start with Alexis McKittrick, program manager for our hydrothermal and low-temperature portfolios. Remember as you're listening to the program overviews that you can use the Q&A function in Zoom if you'd like to ask a question. Okay, Alexis, over to you!

**Hydrothermal and Low Temp (Slide 9-11)
Program Manager**

Alexis McKittrick, Hydrothermal/Low Temp.

Thanks, Cullen. As Cullen said, I'm Alexis McKittrick and I lead our hydrothermal and low-temperature portfolios. I'll cover updates for both, starting with hydrothermal. Work in this portfolio covers three primary strategic goals:

- Expanding geothermal energy opportunities throughout the United States
- Supporting research on drilling technologies that increase efficiency, lower costs, and lower risk related to hydrothermal reservoir development, and
- Accelerating oil & gas technology transfer to address geothermal's challenges.

We know that reducing the cost to find, access, and sustain energy production from geothermal resources will ultimately increase geothermal deployment. One of the steps to get there is to improve geothermal drilling and wellbore integrity—one of the key actions outlined in GTO's 2019 GeoVision analysis. New designs and approaches that enhance drilling efficiency and reduce well costs will lead to overall reductions in project costs and risks, as well as improved reliability in geothermal wells.

One key way we are working to find these solutions is through our drilling demos funding opportunity, which we announced on February 4th. As many of you know, drilling can exceed 50% of a geothermal project's total costs. Lowering that cost is critical, and the drilling demos initiative will provide up to \$20 million to help get us there. The opportunity builds on advancements from our 2018 Efficient Drilling for Geothermal Energy—or EDGE—FOA, which developed geothermal drilling technologies that streamline

drilling time and improve penetration rates in the laboratory. Now we are looking for experts in drilling and well services to help us find real-world approaches that increase average daily drilling penetration rates by at least 25% out of the laboratory. This is crucial work in the pathway to reduce geothermal project costs, and we hope you will go to our funding opportunities page for more information.

Before I move on, I want to draw your attention to the teaming list we are compiling for the drilling demos FOA, to facilitate well-rounded and inclusive teams. Organizations who are interested in participating in the funding opportunity but unable to be prime applicants can go to the funding opportunities page on GTO's website and find the teaming list link on the drilling demos information page.

Two other hydrothermal projects that I wanted to highlight are GeoFlight and our lithium resource work in the Imperial Valley.

GeoFlight is a partnership between GTO and the Interior Department's U.S. Geological Survey, or USGS. In the project, researchers from the USGS Earth Mapping Resource Initiative will use specially equipped, low-flying aircraft to survey the Salton Trough area in California. The team's tools capture data that help identify unique surface and near-surface characteristics to create more accurate geologic maps. New data from the area will allow us to identify potential geothermal resources—and to monitor earthquake and flood hazards, groundwater, mineral deposits, and conservation areas. GeoFlight builds on another GTO-USGS partnership known as GeoDAWN, which collected data in a section of Nevada located within the Basin and Range to find undiscovered geothermal resources and identify critical mineral deposits.

In another hydrothermal project, we are supporting Lawrence Berkeley National Lab to study lithium in geothermal brines in the Salton Sea. We already know that the Salton Sea geothermal field taps brines with elevated lithium concentrations, but the sources and amounts of lithium in the region are not well quantified. Understanding how much lithium is present, how much of what's present is recoverable, and what might cause variability or declines in lithium concentrations will help us better identify opportunities to combine lithium extraction with geothermal production in the region. The goal is to add a value stream for geothermal production—ultimately encouraging the use of untapped geothermal resources in the area—and to hopefully identify Salton Sea as a cost-effective domestic source of lithium.

I'll shift now to our low-temperature and coproduced resources work. In this portfolio, we support research on:

- Technologies for geothermal resources below a temperature of 300°F
- Geothermal resources, like hybrid power designs, that can be co-developed with existing well-field infrastructure and other clean energy technologies; and
- R&D for the direct use of thermal resources for process and space-heating applications.

Our goals in this area include improving the efficiency of low-temperature geothermal systems and expanding their utility through value-added applications.

The projects highlighted on this slide are part of our plans for the low-temperature and coproduced resources portfolio in FY22. As Cullen explained earlier, we are still waiting on Congress to pass the FY22 budget, so these projects are pending appropriations. We're excited to get to work on them as soon as that budget passes!

In our Federal Partnerships initiative, GTO will partner with the Federal Energy Management Program to make it possible for Federal agencies to consider geothermal energy to heat, cool, and—in some limited cases—possibly power their installations. Work will focus on the Departments of Defense and State, as well as the National Park Service, NASA, and the General Services Administration. Pending the FY22 budget, our plans are to fund research and characterization activities in FY 2022, which will help us select sites for demonstration and deployment of on-site geothermal projects. GTO will fund feasibility studies on shovel-ready sites and then develop on-site geothermal projects on Federal sites using FEMP's performance contracting mechanisms.

We also have plans to launch technical assistance for community-scale geothermal heating and cooling—again, pending FY22 appropriations. This initiative would fund competitively selected geographic coalitions, especially in the Northeast Corridor, to implement geothermal district energy systems through installation of geothermal heat pumps or direct-use applications. Through this work, we hope to develop a set of proven test cases that can be duplicated by communities throughout the United States. The funded coalitions would provide technical and economic data back to DOE and develop case studies that can be used to demonstrate applicability to other communities.

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

EGS (Slides 12-13)

Lauren Boyd, EGS Program Manager

Thanks, Alexis. Sounds like there's a lot going on in hydrothermal and low-temp! As many of you know, our EGS program focuses on addressing challenges surrounding long-term subsurface heat flow, permeability enhancement, and stress evolution so we can enable development of sustainable engineered reservoirs. Meeting these goals is so important to literally tap the national potential of geothermal on an exponential scale.

You already heard from Kelly Speakes-Backman about our EGS demonstration projects under the Bipartisan Infrastructure Law—we're excited about those and working on our plans. Before we launch those projects, we plan to release a request for information to solicit feedback from all of you—our stakeholders—to get your insights on issues related to EGS systems and the outcomes most likely to lead to future EGS deployment. We also want to understand how DOE's investments might be most impactful and how DOE can ensure increased diversity on demonstration teams.

We are also working on an upcoming Geophone Prize. The prize will offer funding and other incentives to help selected participants develop high-temperature-capable seismic monitoring for EGS.

Stay tuned and be sure to subscribe to The Drill Down to get updates on both of these upcoming activities!

In some other EGS updates, we are excited to announce that the Frontier Observatory in Research in Geothermal Energy—which many of you may know as FORGE—drilled the first-ever highly deviated geothermal well at a rate twice the industry standard—and 60 days ahead of schedule! The well was deviated at a 65° angle from vertical after reaching a depth of 6,000 feet and maintained that angle the remainder of the well's trajectory. The well ultimately reached a true vertical depth of 8,559 feet, and a total measured depth of 10,987 feet. This well will be used for a series of tests to facilitate the development of the EGS resource.

We also just announced four selections for our ReAmplify project. Under these awards, research partners will receive up to \$8.4 million to assess ways to harvest geothermal energy at existing oil and gas well sites in California, Colorado, Oklahoma, and Texas. ReAmplify is part of our Wells of Opportunity initiative, which solicits the partnership of well owners or operators to help cost-effectively bring more geothermal power online using their existing wells.

For our final set of program updates, I'll turn things over to Jeff Winick, technology manager in our data, modeling, and analysis program. Over to you, Jeff.

Data, Modeling, and Analysis (Slide 14-15)

Jeff Winick, DMA Technology Manager

Thanks, Lauren. I'm pleased to be here today representing the data, modeling, and analysis—or DMA—team, which is led by Sean Porse. The DMA portfolio conducts work to identify and address barriers to geothermal adoption in the United States, and to validate and assess technical progress across the geothermal sector. Our work applies across GTO's technology portfolio and helps direct and prioritize early-stage R&D. Efforts in the DMA area include evaluating trends, conducting impact analyses, conducting geothermal resource assessments, identifying best practices, and outlining key investments needed to refine the geothermal R&D portfolio.

The DMA team has many projects underway, including a geothermal heat pump impacts study from Oak Ridge National Lab and the National Renewable Energy Lab. But the area of research I really want to highlight today is geothermal permitting. As many of you probably know, developing a geothermal power plant currently takes a long time—typically 7–10 years—and that long timeline increases developer risks and costs. While technical barriers like the need for better exploration and characterization affect that timeline, a large chunk of it relates to non-technical barriers, including permitting and regulatory timelines. The GeoVision analysis concluded that reducing permitting timelines alone—even in the absence of technology advances—could cut geothermal development timelines in half and increase rates of geothermal exploration and resource discovery. To help geothermal overcome this barrier, we are investing in a number of national lab projects that will further analyze the impact of permitting timelines on geothermal development and propose best practices to improve those timelines. These projects include lab-led Task Force made up of federal and state agency geothermal regulators. The Task Force is designed to identify pathways to accelerate permitting and associated geothermal deployment on public lands. The Task Force will prepare key stakeholder and agency recommendations directed at federal agency regulators, California and Nevada state agency regulators, the National Renewable Coordination Office, and U.S. Congressional Committees specified in the Energy Act of 2020.

I'd also like to just mention that the National Renewable Energy Lab will host a webinar on March 29 at 1 pm ET for an update to its Geothermal Resource Portfolio Optimization and Reporting Technique, or GeoRePORT, Protocol. The webinar will highlight updates to the system, including a resource size tool to allow users to estimate the size of a geothermal reservoir using three different methods. You can get more information and a link to register in the events section of GTO's website.

Finally, I wanted to share a little info about GTO's Geothermal Collegiate Competition. Through this competition, college and university teams develop proposals to heat and cool buildings, campuses, districts, or entire communities. Cash prizes are awarded to first, second, and third place, as well as to the team with the best pitch. The competition is a great way for students to gain real-world renewable

energy industry experience by developing, designing, and testing technologies alongside community stakeholders—and it helps raise the visibility of geothermal as well. If you or someone you know is interested in learning more, please check out the link on GTO's website.

With that, I'll turn things back to Sue to discuss GTO's recently released multi-year program plan.

MYPP Overview (Slide 16-18)

Sue Hamm

Thank you, Jeff. Now, as Jeff mentioned, I'd like to turn everyone's attention to our multi-year program plan, which we released on February 17th. Known as an MYPP, the plan outlines GTO's vision and mission and presents a high-level technology plan for key areas of GTO research starting in fiscal year 2022 and running through the end of fiscal year 2026. We use the MYPP to set our course and ensure we're aiming at the right targets—as well as to show how the office's overarching goals and priorities align with DOE and Administration objectives. Basically, it keeps us very honest with how we are tracking our goals and the work cut out for us!

The MYPP centers on the three strategic goals highlighted on this slide:

- Drive toward a carbon-free electricity grid by supplying 60 GW of EGS and hydrothermal resource deployment by 2050.
- Decarbonize building heating and cooling loads by capturing the economic potential for 17,500 GDH installations and by installing GHPs in 28 million households nationwide by 2050.
- Deliver economic, environmental, and social justice advancements through increased geothermal technology development.

The MYPP is organized based on six Research Areas—which include one technology-agnostic area, Geothermal Integration and Awareness, and five technical areas. We lined the three strategic goals I just mentioned up against these research areas and asked, "What technical objectives do we need to hit to get to those strategic goals?" The chart you see here illustrates where we landed and is the backbone of the MYPP—basically, everything we do in each of these research areas is intended to funnel up to these technical objectives. And, of course, all of this supports our goal to boost geothermal deployment overall, which is on the pathway to the Administration's clean energy goals!

To share more about why the plan is important and how we will get the work done, I'd like to invite our team to join me for a virtual round robin Q&A. You already met Alexis, Lauren, and Jeff during program updates, and our stakeholder engagement lead, Elisabet Metcalf will also join us.

MYPP Panel Discussion (Slide 19)

GTO Staff

Sue Hamm: Okay, let's dig into the MYPP! As I already mentioned and we can see on this slide, the MYPP sets our course for the next five years by research area and the related technical objectives. But it also outlines the primary challenges we need to tackle to achieve our strategic goals. So let's talk a little about that first. Can each of you give us a 30,000-foot view of some of the key concerns your programs aim to address in the next five years?

Let's start with Alexis.

Alexis McKittrick: Sure, happy to walk through that. There are a few challenges facing the hydrothermal program, mostly related to exploration and characterization. Right now, data collection is costly and publicly available data are scarce, making it hard for prospective explorers, developers, and operators to aggressively increase rates of resource discovery and deployment. Some data also have pretty low spatial resolution, which limits the ability to understand subsurface conditions without drilling test wells. In the low-temperature and co-produced resources, one key issue is that the U.S. lacks design, installation, commissioning, and inspection standards for geothermal heating and cooling applications. This can limit community interest and limit market potential. It also hinders the ability to value these systems, because there's not enough consistency across the market. We also need to better identify and research value-added opportunities for low-temperature systems.

Sue: Thanks, Alexis. Let's go to Lauren.

Lauren: Okay, thanks Sue. Enhanced geothermal systems are a solution to tap geothermal energy where there's heat but limited permeability or fluid for extraction. Because of this, we need to basically manmade reservoirs to enable EGS systems—which means we need some innovative subsurface engineering and transformation. Some of our challenges align with hydrothermal—for instance, both EGS and hydrothermal reservoir rock have high compressive strengths, which means lower drilling rates and increased costs, and both require characterizing the resource. EGS used for electricity generation also requires specialized materials and tools that can withstand high temperatures and corrosive environments. And, overall, we need to find tools and methods that reduce limitations in manipulating the subsurface. Overcoming these barriers is important—not just for electricity production, but also to support nationwide expansion for district-heating and geothermal heat pump applications.

Sue Hamm: Great overview, Lauren—thanks. Jeff?

Jeff Winick: Thanks, Sue. In terms of data, modeling, and analysis, there are a few key problems we want to solve. The first is really just that there isn't enough data—we need to get more publicly available data that can help potential developers better estimate performance and cost. Geothermal also suffers from a lack of representation in modeling tools—right now, even when geothermal might be the best renewable option, the most commonly used models don't assess it accurately and sometimes just ignore it altogether. We also need better data and analysis that can help us calculate the value of geothermal to the grid and provide decision makers with information about things like permitting requirements and building codes affect geothermal projects.

Sue Hamm: Alright, thanks. And last but not least: Elisabet, what are some of the concerns for you in terms of stakeholder engagement?

Elisabet Metcalfe: Well, first, there's not really enough stakeholder engagement to create broad awareness and understanding of geothermal energy. The heat beneath our feet suffers from just that attribute—it's beneath our feet. Wind turbines, solar panels, and hydroelectric dams are large, familiar structures that provide people can see and recognize. But the public is generally unaware that geothermal resources exist and could be used in their homes. Even where geothermal resources are visible, like in a geyser, most people don't see them and think of a source of energy. So we really need to reach a broader stakeholder base and engage with them more consistently to expand their knowledge and share how geothermal can fit into and benefit their communities. We also need to think about creating workforce development programs so we have trained workers who can support more

geothermal deployment. And our engagement needs to integrate principles of energy and environmental justice, so that we know we're reaching all stakeholders.

Sue Hamm: Okay, so we've laid the groundwork on why we're doing the work. Now let's talk about how. The MYPP helps roadmap GTO activities over the next five years, all with the goal to increase geothermal deployment. What goals do you hope the MYPP will help your program reach between now and FY 2026, and what key activities does the MYPP help you plan to get there? Alexis?

Alexis McKittrick: For hydrothermal, we focus on improving geothermal exploration, subsurface characterization, and drilling to reduce overall geothermal deployment costs. The MYPP provides us with a tremendous opportunity to think about how we'll get to those goals over the next five years. In particular, we'll be concentrating on overcoming the exploration challenges I mentioned earlier. We're working on tools and technologies to capture the resource potential of undiscovered—or "hidden"—resources; assessing applications in machine learning for power plant operations; and advancing research in subsurface research, development, and deployment. Success in these areas will help us overcome exploration and characterization challenges and really advance hydrothermal resources, which are well positioned to contribute to a carbon-free electric grid by 2035.

In terms of low-temperature and co-produced resources, the MYPP helps us align on activities like improving the efficiency of low-temperature geothermal systems and expanding their utility through value-added commercial opportunities. We're working to increase direct use of thermal resources for energy storage as well as process and space-heating applications. We're also looking at valuable critical materials extraction from geothermal brines, which could be a key factor in providing domestic supplies of these materials. We want to use the MYPP to map out ways to provide cost-effective, renewable thermal energy in large portions of the United States. We also want to maximize geothermal resources through value-added activities and by validating the grid value of hybrid systems and geothermal heating and cooling.

Sue Hamm: That all sounds great, Alexis. How about you and the EGS team, Lauren?

Lauren Boyd: Thanks, Sue. There's so much that applies to EGS in the MYPP—it's hard to know where to start! To make EGS work, we need to continue to expand our knowledge of the challenges surrounding long-term subsurface heat flow, permeability enhancement, and stress evolution. We can use tools from the MYPP to help us plan research, development, and deployment activities that will strengthen that knowledge base—in turn, enabling industry to deploy the EGS levels calculated in the GeoVision analysis. While all of the MYPP research areas apply to EGS, we'll be working particularly hard in three areas. The first is exploration and characterization, where some of our most important work will be in defining site conditions needed to engineer an EGS reservoir. We'll also be working on subsurface accessibility—better ways to drill, with lower costs and risks—and in subsurface enhancement and sustainability, where we'll be developing technologies that can enable commercial EGS and withstand harsh environments.

We know EGS can play huge role in reaching the goal of a net-zero emission economy by 2050, and we're excited to be part of it!

Sue Hamm: Great—thanks, Lauren! Jeff, what does the MYPP have in store for data, modeling, and analysis?

Jeff Winick: Well, the DMA team has a cross-cutting role that really bridges GTO's technology spaces, so there's a lot to talk about. As I said earlier, part of our role is examining nontechnical barriers like permitting. Our portfolio also assesses the economics of geothermal technologies, collects and disseminates data, measures environmental and economic effects of geothermal, and works on geothermal modeling tools. The MYPP aligns us to do key work in several areas, such as supporting the work Alexis mentioned earlier to validate the grid value of geothermal, including power generation, as well as additive value, like what might be realized from lithium extraction and hybrid systems. We're also ready to do some high-resolution resource assessments to help improve access to geothermal resources. And we'll continue to support and improve tools like the Geothermal Data Repository, which is celebrating its 10th year this year! DMA will also work across areas to use data to ensure that geothermal is contributing economic, environmental, and social justice advancements in line with the Administration's goals. So we have a lot to do.

Sue Hamm: You do! And it's all vital to the technical teams, so thank you. Okay Elisabet—how about your team?

Elisabet Metcalfe: Well, as I said earlier, one of the main issues with geothermal is limited public awareness and understanding. And we have our work cut out for us a little, given that—other than the fact that geothermal is a subsurface resource—we aren't sure why it's been plagued by a lack of awareness for so long. So, for the stakeholder engagement team, we're focused on a multi-pronged approach that will let us engage with the community and stakeholders in numerous ways. The MYPP sets us up to work with communities and stakeholders to better understand how geothermal energy and infrastructure can provide meaningful community benefits. We can then use those lessons to improve our messaging and help support both communities and the geothermal industry to develop best practices for projects that achieve those benefits. Relationship building is core to what we're planning for the next five years—we want to bring geothermal knowledge to new stakeholders and hopefully build a core network that can help raise visibility. We're also really focused on ensuring that priorities like energy equity, environmental justice, state and local collaboration, workforce development, and diversity in STEM are embedded in GTO's portfolio and its communication assets.

We are definitely all going to be busy! I hope that gives everyone a clear overview of how our multi-year program plan lays out the next five years for GTO research. If you have questions, enter them in the Q&A now. We also encourage you to download and read the plan at the link on the screen.

With that, I'll turn things back to Elisabet so we can start the Q&A portion of the webinar.

Q&A (Slide 20) **GTO staff**

Closing (Slide 21) **Sue Hamm**

Okay, that's a wrap! I know I speak for everyone when I say it's been a pleasure to update you on GTO's activities and give you an overview of the MYPP. We hope you enjoyed this webinar and please remember we want to hear from you! Whatever questions or ideas you have, we welcome them at DOE.Geothermal@ee.doe.gov. 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 share the future of geothermal energy with us. Thank you all for your time today!