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STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

In the matter of:

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IEPR COMMISSIONER TWO-DAY WORKSHOP ON
CALIFORNIA'S GEOTHERMAL ENERGY RESOURCES

REMOTE VIA ZOOM

FRIDAY, JUNE 19, 2026

10:00 A.M

Reported by:
Martha Nelson

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Darcie Houck, Commissioner, CPUC
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Jessica Eagle-Bluestone, Geothermal Rising

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MODERATOR - LOCAL AND COMMUNITY ENGAGEMENT

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P R O C E E D I N G S

10:00 a.m.

FRIDAY, JUNE 19, 2026

MS. NAKAGAWA: All right, thank you for joining today's Integrated Energy Policy Report, or IEPR, Commissioner Workshop on California's Geothermal Energy Resources. I'm Sandra Nakagawa, Director of the IEPR here at the California Energy Commission. Today, this is part of a two-day workshop. We'll be having a second one on Thursday, July 9th, from 10:00 a.m. to 5:00 p.m. Both workshops are being held as part of the CEC's proceeding on the 2026 IEPR Update.

Today's workshop is being held remotely using Zoom. It is being recorded, and the recording will be posted on the CEC website shortly after the workshop. To follow along, you can also find the schedule and slide decks on the CEC's IEPR webpage for today's workshop. Throughout the day, there will be some opportunities for the public to ask questions of presenters. We'll have a few minutes after each panel to take audience questions, but please be advised that we may not have the time to answer all questions submitted. If you are looking to submit some questions, you can use Zoom's Q&A feature. You can also take a look at what other folks have submitted and upvote a question by clicking on the thumbs-up icon. Questions that receive the most upvotes are moved to the top of the queue.

Attendees also have the opportunity to make public comment at the end of the day. Please note that we will not be able to respond to comments today, and those comments are limited to a maximum of three minutes per person, with one person per organization allowed to comment.

We are also accepting written comments, and instructions are included on the workshop notice on how to submit those, and the due date for that is Thursday, July 23rd, for written comments related to this workshop.

I'm going to turn it over now to Commissioner Noemi Gallardo to make opening remarks from the dais.
COMMISSIONER GALLARDO: Buenos dias. Good morning, and welcome, everyone. We are very excited to focus today on the power just beneath our feet, known as geothermal energy.

I'm Noemi Gallardo, as Sandra said. I'm one of the five commissioners for the California Energy Commission, and on behalf of the Energy Commission, I want to thank everyone who is joining us. We have about 70 people, and it's increasing in attendance here.

I'm also honored to be joined by my fellow Commissioner, Vice Chair Gunda, and leaders from two of our key partner entities advancing clean energy, Elliot Mainzer from the CalISO, he's the CEO there, and also Commissioner Darcy Houck from the California Public Utilities Commission.

So we look forward to hearing from all of the stellar panelists on the agenda. We're so grateful that they've made time for us today.

And I also want to thank Sandra and her team who set up this IEPR proceeding for us, and I want to thank my staff, Erik, Jimmy, Colleen, and Rosemary for all of their hard work to get us here. I also want to uplift our fellows for their tremendous support, Uno, Stephanie, and Matthew.

And before we dive into our agenda, I wanted to recognize that today is Juneteenth, and it is a federal and state holiday. It is a holiday that marks the final enforcement of the Emancipation Proclamation in the United States and the end of slavery. We decided to dedicate this workshop as a

celebration of Juneteenth because the main reason we are working to achieve a clean energy future here in California is to end the harms to the health and well-being of people living near fossil fuel facilities who are often Black and other people of color. So, again, thank you for spending this day with us, and in particular for spending Juneteenth with us and celebrating Juneteenth in this way.

My team and I have been on a geothermal journey, is what we call it. We oversee work, you know, from our commissioner's side on permitting, where geothermal is the only resource that is eligible for all of our state permitting programs. And we also have been experiencing geothermal through the Lithium Valley Vision, which is an effort to establish a lithium industry in the Salton Sea region in the southernmost part of California through the extraction of lithium from geothermal brine. So in both of these arenas of permitting and Lithium Valley, we noticed that geothermal faced struggles. And so my team and I decided we should look deeper into what the issues were, and here we are.

And around that time also, I want to acknowledge that several legislators were also promoting support for geothermal, and that, too, inspired us to seek having this chapter in the IEPR. We thought it would be essential to have experts providing input and also be able to do analysis on what was going on. So I want to give a shout out to those legislators for their inspiration. That's Senator Padilla and Assemblymembers Papan, Rogers, and Gonzalez. And I'll also confess that my team and I are on this journey. We're not necessarily experts yet in geothermal, but you really don't need to be an expert to realize how great geothermal is, just starting with the fact that it is clean firm, baseload power can run 24 hours. And I can say that my team and I are definitely enthusiasts and are becoming more knowledgeable by the day.

And I recently attended the World Geothermal Congress and the Indigenous Geothermal Symposium in Calgary, Canada. This was a couple of weeks ago. And the sentiment there was extremely positive and confident about geothermal energy. And so I wanted to share just a few takeaways.

The first is that geothermal is a global focus. There are many countries advancing their geothermal efforts, like New Zealand, Kenya, Taiwan, and Mexico. And these countries do look to the United States for more leadership in this area. And since we're in World Cup mode, I'll say that California is the best player for the United States team. We have the most geothermal capacity and installation in the world, but we need to do more to keep our high ranking.

And then the second thing is that geothermal is scaling. The industry leaders who attended the Congress have proven new technologies for geothermal extraction. They've shown it's working. They're improving the conventional ways of doing geothermal energy. And so now it's about scaling and replicating.

The third takeaway from that Congress was that geothermal is also about community. There are so many Indigenous communities sharing how they embrace geothermal as a life source and also want to take care of it in a way that helps geothermal take care of them. So doing geothermal, different types of geothermal efforts in a very sustainable way. So all of that was very exciting to hear and inspiring.

And the final thing that I learned there is that geothermal can be very funny. It lends itself well to puns. So let's dig deep today and get beneath the surface on this hot topic, all puns intended. And anyone who has a good geothermal pun out there, please share. You'll get extra points today from me.

All right, Sandra, I'll turn it back to you. And if we are going to start with the others on the dais, I'd like to begin with President Mainzer, if that's okay.

PRESIDENT MAINZER: Well, thank you very much, Commissioner Gallardo, to the staff, and to my fellow panelists on the dais. I really appreciate the opportunity to be here.

I wanted to start out by saying I really appreciate being part of your geothermal journey. I think that the timing for this resource exploration is absolutely perfect. Appreciate the comprehensiveness with which you've been casting the net.

And I think it's just such an important moment for us here in California when we continue to think about the future of our grid, when we're looking at the patterns of load growth, particularly the increasing demand in the wintertime, when we think about the electrification and industrial data center loads that are coming onto California, continuing to contribute to economic development here in the state, and the importance of just generally thinking about clean firm resources and getting ahead of the curve, as the state has wanted to do, so that we can incorporate our resource choices and make sure that the transmission planning and the operational coordination are there to make sure that, to the extent to which geothermal is ready to take off in the state, that we're ready to accommodate it efficiently and effectively.

So thank you so much for including me. All of us at the ISO really value the partnership that we have with the Energy Commission and the PUC to make sure that the state's planning and resource development keeps us on track for reliable and affordable and environmentally sustainable systems. So really looking forward to listening in here this morning and working with you to help unlock the future of geothermal energy. Thanks again for allowing me to be here.

COMMISSIONER GALLARDO: Thank you.

All right, Vice Chair Gunda, would you like to make any opening remarks?

VICE CHAIR GUNDA: Yeah. Thank you so much for those comments, Commissioner Gallardo, and thank you for kicking this important track of our work. And I really appreciate your leadership and really appreciated the way you framed the totality of the conversation. And, you know, as President Mainzer said, you know, casting a wide net on bringing in a lot of different aspects of the conversation, you know, both in terms of equity, opportunity for economic development, but also as a critical part of our resource development here in California.

I want to thank, you know, the introduction that Sandra provided at the top, you know, and I think, you know, again, reiterate my gratitude to the leadership, Commissioner

Gallardo, of your office, along with Erik Stokes in your office, and to the broader IEPR team, as always, Denise, Stephanie and Raquel. Thank you for all the great work you all do in kind of setting these conversations up.

I wanted to kind of share a couple of pieces in the intersection as we move towards resource planning, reliability, permitting, and then ultimately recognizing that the energy transition work that we are embarked in California is really a journey of economy and the intersection with the economy, intersection with the environmental planning, and also the intersection with the equity and the broader non-energy impacts.

So I think, you know, as we discuss specifically the opportunities such as geothermal, it's important for us to recognize the totality of the conversation that we have, and no better person than Commissioner Gallardo to set that stage here. And thanks for having given me the opportunity to say a couple of words on this.

You know, as we look at the resource planning side over and over, you know, whether it's CEC, PUC, you know, colleagues in the, you know, sectors such as Clean Air Task Force and other electric resource modeling, all continue to show the importance of clean firm resources. More recently in the SB 100 conversations we've had, we've had dedicated conversations, you know, from the perspective of geothermal developers. And I think it's really important for us to think about the benefits that geothermal offers and the critical role it plays in our conversation moving forward.

And I think the important part of this in developing any industry in California is having the durability of policies and the consistency and certainty for private investment to come in to make sure that those resources can happen, whether it's ability to interconnect, whether it's ability to ensure those resources can actually be a part of the grid on a timely basis, these are important pieces that we need to think through.

So as we continue our journey on the conversation of reliability, equity, safety and affordability, I think this is a very important technology for us to ensure we have a full and

complete understanding of, and really grateful for this conversation and looking forward to hearing the rest of the day.

Thank you so much, Commissioner Gallardo. Pass it back to you.

COMMISSIONER GALLARDO: Thank you, Vice Chair. So glad you're here with us.

And I think now Commissioner Houck, thank you for joining us.

COMMISSIONER HOUCK: Thank you for including me and thank you for all the work that you're doing in this area, Commissioner Gallardo and the CEC. The agenda looks great. I'm going to keep my comments short, but I did want to, you know, note two things.

One, as all of you have noted, this is an important clean firm power resource for California as we're moving forward towards our clean energy transition. And then just the second point, I want to recognize and appreciate your engagement with tribes across the state and now globally in the tribal panel that you have on here. I think California historically has not had tribal communities sufficiently at the table for this really critical issue that depending on the location, the technology and the circumstances could have devastating impacts to tribal cultural resources or could provide significant economic development opportunities. And that's going to depend on the tribe, the location, and all of the factors at play.

So including tribes in this discussion on this really important resource for California is absolutely critical. And I just really want to highlight your respect for the tribes and making sure that tribal governments are at the table. And I really look forward to hearing from all the panelists today.

COMMISSIONER GALLARDO: I couldn't agree more with you, especially on the notes of making sure the tribes are included and hearing their voice on all the things that we got to think about and the balancing we have to do. So thank you, Commissioner Houck.

MS. NAKAGAWA: All right, thank you, Commissioners. Thank you, President Mainzer.

We're now going to turn it over to Erik Stokes. Erik is Chief of Staff for Commissioner Gallardo and he'll be giving an overview of today's workshop.

MR. STOKES: Yeah, thanks, Sandra.

So before I turn it over to our first panel, I just want to provide a short overview on the geothermal portion of the IEPR and provide some background for why we felt the timing was right to focus on geothermal for the IEPR this year.

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So Commissioner Gallardo mentioned this in her opening remarks, but California has been and still is not just a national leader in geothermal, but really a global leader. Just within the U.S., we count for almost three quarters of all U.S. geothermal capacity. However, most of this capacity was built within a pretty narrow window starting in the mid-1970s and going through 1990. Since then, we've had relatively new geothermal capacity come online. Really, despite having a world-class geothermal resource and a supportive environment for renewables, we've only been able to bring almost about 140 megawatts online in the last 25 years.

And just more recently, we've seen some proposed geothermal projects face some challenges. A few years ago, the CEC received three applications that would have added over 350 megawatts of geothermal. However, the applicant, in this case Berkshire, suspended those applications citing market conditions, among a few other reasons.

So just given the challenging environment, we've been asking ourselves, what's it going to take to make geothermal successful in California? And I think that was really part of the inspiration for making sure we included in this year's IEPR.

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You know, despite these challenges, there has been a lot of momentum behind geothermal, especially in recent years. This is a topic that has a lot of bipartisan support in

Congress. It's also one of the few energy areas where there's alignment between California and the current federal administration. And we're seeing a lot of action and support behind geothermal, especially in the last couple of years. This isn't comprehensive, but I'll just kind of highlight a couple.

Last year, the Bureau of Land Management started mandating annual competitive leases for geothermal. And this has been critically important. They had one last August in California. There were 13 parcels of land that were fully subscribed. And this had been the first time BLM had had a lease in almost a decade.

At the state level, we have a couple of new permitting tools in our toolbox. One of those is the CEC's Opt-In Permitting Program, which can have a geothermal project of any size come through it, so it provides another pathway for permitting the facility side of geothermal. And then a couple of years ago, AB 1359 was passed, which allows local jurisdictions to be the lead agency for geothermal permitting.

And then the CEC's one gigawatt clean for mandate, which has been instrumental. This was analysis from the National Lab of the Rockies. In their most recent geothermal market assessment, they said this order has led to over 600 megawatts of geothermal PPAs. I'll just note that all those PPAs, I believe, are out of state.

On the funding and assistance side, we're seeing a lot of federal funding come out, especially from the Department of Energy, as well as assistance. One effort we're participating in and I'm really excited about is the US DOE's Geothermal Power Accelerator led by NASEO, which is the National Alliance for State Energy Officials. California is one of 13 states that is participating in this. And really the purpose of the accelerator is to support state efforts to expand geothermal development in their respective states.

This last year, DOE also released a large funding opportunity, over \$170 million. And the CEC is providing cost share for that to make sure that California projects and California applicants can be more competitive in trying to secure that funding for the state.

There's also a lot of support around tax incentives. Last year, the Big Beautiful Bill extended tax credits for geothermal through 2033. And then at the state level, we have a couple of programs that provide additional tax incentives. I just want to highlight the sales and use tax exclusion at CAFTA. This one actually has a preference for geothermal and lithium projects.

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So over the course of the two workshops, you know, we're going to dive really deep into the benefits of geothermal. One area where we're seeing -- you know, that's being recognized more around the benefits of geothermal is around energy security. You know, currently, a lot of our clean energy buildout has been and will continue to be based on two technologies, solar PV and BESS. However, these are two technologies where we're reliant on overseas supply chains, and with that, carry some risk. Geothermal, by contrast, has fairly minimal supply chain risk. It isn't subject to the types of kind of geopolitics that can affect some of these other resources.

Geothermal is also being seen as a possible solution for critical infrastructure, given its baseload generation, as well as its kind of lower profile. In 2023, the Department of Defense launched an initiative called Geothermal for Installations, and they've taken -- they're exploring how to deploy geothermal at about a dozen military bases, including four in California.

And then the other part of this is, which is kind of unique to California, which is the co-production of other minerals and materials. The Salton Sea, also called Lithium Valley, has an enormous amount of lithium in the geothermal brine, and that gets most of the attention. But in addition to the lithium, there's also other critical minerals. In fact, of the Department of Interior's list of critical minerals, 12 of those are in the brine of the salt, most of which we are reliant on foreign countries to import those minerals into the U.S.

And then in Sonoma-Lake County, there's potential for geologic hydrogen with the geothermal production,

given -- especially given the serpentine in the geology, creates a natural catalyst for geological hydrogen production. And some estimates from the Department of Energy shows that this can be produced for less than a dollar kilogram.

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So here's just an overview of kind of the Geothermal IEPR Workshop schedule. So we have three topics we're covering today, resource potential and planning, tribal engagement, and local and community engagement. The second workshop will be held July 9th. The topics we plan to cover on that one are around financing and bankability, permitting, and workforce development and training. And then written comments for the geothermal section are due July 23rd. But you don't have to wait till July 23rd to submit your comments. We welcome those comments at any point.

So that covers my presentation.

Before we start our first panel, we're going to do something a little bit different, something a little bit new to the IEPR process and do a Mentimeter poll. We've done that in a couple of our in-person workshops, and it's been really beneficial. I think the input we receive will help kind of guide the remainder of this IEPR process.

And so we ask everyone, either if you're on your computer or on your phone, you can pull up the Mentimeter poll. And we have four questions. We'd just like to get input from those attending today. We'll give people a few minutes to pull them. Let's see. So we have the -- we have the code on the screen, so maybe we can we can move to the first question. Hopefully people still have the login information for that.

So the first question we'd like to hear your input on is, you know, what do you see? How can geothermal really support California? So it's a little bit of a fill in the sentence. Geothermal could be a game changer for California because.

So I'm seeing a lot of -- a lot of comments on baseload and clean power. I think I see a few around local and economic development, especially in parts of the state where we

really need some of that, some of that economic development. We're seeing just the size of the geothermal resource potential, given new technologies such as enhanced geothermal systems. Increased production of resources in the north. Reduced constraints and congestion. Workforce transition, so that's one we're definitely going to cover on July 9th. Let's see. We have one around reduced land use for solar and storage. Thermal network potential, and I'm guessing that's going to be kind on the district heating and cooling side of the geothermal piece, yeah, geothermal heating and cooling.

We'll give folks another 30 seconds to submit their responses and then we'll move to the next question. Let's go to the next question.

One thing I forgot to mention, so all these responses are anonymous. We are planning to post the results to the docket, but this will be just kind of the aggregated responses.

Okay, so the second question, we, through a lot of our work, we've identified several challenges to geothermal. So we're asking you to rank how you see these challenges in terms of what's the most challenging and what's the least challenging. So, so far, we have permitting leading the pack. We'll see if that changes. Right now, it's neck and neck between permitting and transmission access interconnection. Exploration cost risk looks to be in a solid third place. So we'll take three more seconds for people to respond, but looks like the top two are permitting and then transmission, followed by exploration, cost and risk.

Let's move on to the next question. What actions should the state consider that will have the greatest impact on accelerating geothermal development in California? We're looking for, you know, what can the state do to help support geothermal? People are thinking about it. Early tribal engagement and partnership, and streamline permitting process, develop transmission.

Let's see. We have CEQA exemptions for exploration activities. Provide financing for exploration costs. Stigmatize geothermal KGRAs from planning grid expansion. This is one we've heard a lot about, provide incentives for

geothermal R&D, such as used by Utah FORGE. Public and tribal education and partnership. Establish a testbed in California. I see a lot on streamlining permitting. We have one on workforce and community development. Support small projects close to the 10 to 50 megawatt range. Map resources with three overlays, least conflict, high resource potential and good infrastructure proximity. Great pathway for transitioning oil and gas wells into geothermal wells. Publicize the high union - high-road union jobs made possible by geothermal. State tax incentives. CEQA exemption for temporary research projects. So we'll take another 30 seconds and then we'll get to our next question. A way to plan for large scale transmission first by choosing strategic regions for geothermal?

Let's move to our final question. The 2026 IEPR will move the needle on geothermal if it needs to fill in the sentence. What are you hoping to see come out of this effort and this report around the geothermal topic?

All right, first response, actionable items on transmission planning and permitting. Identify near-term legislative actions. Identify the key permitting bottlenecks and opportunities to overcome. Recognize tribal nations and potential conflicts. Help communities embrace and benefit from geothermal and critical mineral extraction. Create actions that result in permitting certainty and transmission lines being built to geothermal resources. Lay out clear steps to improve mapping of in-state geothermal capacity to inform transmission planning. Raise the profile of geothermal potential in the state rather than improving power from other states, or I'm guessing that meant importing power from other states. Procedures that empower geothermal resource testing and, ultimately, deployment. We have one, that's follows the footsteps of offshore wind and building momentum and identifying resource areas for priority transmission development. Signals to industry that California is open for investment and a committed partner. Support field testing of flexible EGS. Address and resolve issues that cause the three proposed projects to become suspended.

Good responses. All right, I think we're going to take another 30 seconds. Make sure we stay on time. Leverage

tribal resource knowledge when developing geothermal resources. Invest in geothermal workforce training. Highlights how environmental concerns can be mitigated.

I'm not seeing any new responses come in, so I think we're going to wrap up. No, here comes a few. Advance mineral extraction compliance technology. All right, so we'll give people 30 more seconds then we'll wrap up the poll.

Well, thank you everyone for those responses. Yeah, we'll conclude the Mentimeter poll and we'll begin our first panel session for today.

All right, with that, I'd like to welcome our first presenter for today for this first panel session. So I'll ask Wilson Ricks from the Clean Air Task Force to come online.

MR. RICKS: Thanks, Erik. And thank you to the Commission for inviting me to speak today.

Next slide, please.

So I'm Wilson Ricks. I'm a member of Clean Air Task Force. We are a global environmental nonprofit that focuses on mitigating the worst effects of climate change by catalyzing the development and deployment of clean energy and other climate friendly technologies.

I'm going to be leading off this panel by setting context and providing an overview of geothermal technologies, including next generation technologies. And then I'm going to jump into an overview of CATF's most recent report on the role of next-generation geothermal power in California's energy future.

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So to start with geothermal electricity generation, I'm going to give a very kind of ground up overview. That pun was actually not intended. So the basic components of this are subsurface heat, which is transported to the surface via some sort of fluid, typically water, to generate power via a turbine. In the subsurface, you also need some mechanism that allows the fluid, again, typically water, to pick up heat from that

subsurface heat reservoir efficiently so that it can be used for electricity generation.

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Now, geothermal electricity has been generated for over 100 years at this point. And for pretty much all of that time, this has been through conventional geothermal technologies. These technologies, which are present at large scale in California in particular, exploit what are essentially naturally occurring superheated aquifers, also known as hydrothermal reservoirs, where, if you can locate one of these resources, you can simply drill into it and pump up the fluid from it to generate power.

But these resources are fairly rare. And so there's a whole suite of next-generation geothermal technologies that are being actively developed and commercialized that aim to exploit the much larger resource potential of areas that have hot rock but don't host these naturally occurring pockets of water. So these technologies include enhanced geothermal systems, which use artificial fracture networks to transfer water between wells in a subsurface artificial reservoir. There are also closed-loop systems, which don't rely on direct contact with the rock but instead use the wells themselves as a heat transfer mechanism. And then you have hybrid systems that combine characteristics of both EGS and closed-loop geothermal.

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And one key kind of economic characteristic that is common to all geothermal technologies is the relationship between heat and depth and the overall economics. The hotter the resource you can exploit, the hotter the subsurface rock, the more energy you get out per well and the more efficiently you convert that energy to electricity. Also, the shallower that heat is, the less you have to drill to get to that temperature, you get cheaper wells overall. And so these two kind of trends, how shallow the heat is and how hot it is, are the key drivers of geothermal economics and part of the reason why California is such a promising location for next-generation geothermal technologies.

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So why geothermal in California specifically? The primary motivation is really that it provides a much needed source of clean firm power. Pretty much every major long-run modeling exercise that's looked at California's electricity system needs over the next two decades has concluded that California could really benefit from a large-scale commercialized source of clean firm electricity. That is something that can generate power whenever needed for as long as required, regardless of the weather.

The latest SB 100 Joint Agency Report draft specifically states that all scenarios demonstrate a need for large amounts of renewable and zero-carbon resources, and in particular clean firm resources by 2045. And when you look at the kind of pool of candidate clean firm generation technologies, next-generation geothermal is one of the most promising candidates, specifically in California because California's geothermal resource base is among the highest quality in both the country and arguably the world. It's one of the places where you can get to the highest temperatures at the shallowest depths and, therefore, generate geothermal power at least cost.

Next slide.

And this potential and California's own procurement actions through the one gigawatt procurement order that Erik noted earlier have led to a kind of explosion of next-generation geothermal development. There's over a gigawatt of next-generation geothermal technologies currently under commercial contract in the United States, about half of that currently under construction, and most of it being sold into California to meet California's needs. But as Erik also noted, every single one of these projects is being built out of state, which begs the question, what are the implications of that trend continuing over the long run as California progresses towards its 2045 goals?

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And this was the motivation for a report that CATF put out just this past month, where we conducted new electricity system modeling to assess a few questions. One, what role could

next-generation geothermal power play in California's energy future? And second, what would be the specific benefits of being able to deploy the technology in-state versus continuing to rely on out-of-state imports? And then finally, what actions and what policy initiatives specifically would be needed in California to enable scale-up of an in-state industry?

Next slide.

Now, this report used open-source electricity system modeling in a research-grade model known as GenX. And we essentially were aiming to assess what the impact of availability of enhanced geothermal systems specifically, which we used as a stand-in for kind of all next-generation geothermal technologies because they are the most commercially advanced right now with the best characterized costs. What would be the impact of availability of this technology on the achievability of California's 2045 clean energy targets, as well as reliability and affordability? We conducted this modeling within a representation of the entire Western U.S. grid, so taking into account both California and its neighbors, directly representing imports. And we designed the modeling to mirror California's own state planning in the SB 100 reports and the integrated resource plans as closely as possible.

Specifically, we used this setup to look at three scenarios. One, where no new clean firm resources are available to meet California's long-term goals. So this is essentially continuing the status quo of wind, solar, storage, and natural gas being really the only resources experiencing very large-scale deployment in the Western U.S. We then looked at a scenario where we added EGS to this mix, so we allowed EGS to be deployed at large scale, but only outside California, representing, again, the current trend of reliance on imports rather than in-state deployment. And then, finally, we looked at a scenario where we could also deploy enhanced geothermal within California, representing a scenario, again, where California takes a role in building an in-state industry.

Next slide.

I want to note that we considered future uncertainty in this modeling and looked at scenarios that involved both cost

assumptions for other technologies that were both much higher than and much lower than the assumptions used in the SB 100 modeling to understand how robust our results would be to future uncertainty.

Next slide.

We also used a very high-fidelity representation of enhanced geothermal resources, looking at supply curves built from assessments of project costs across thousands of individual candidate project sites. We also, again, looked at multiple cost scenarios for enhanced geothermal in the future, one of which, a high-cost scenario, assumed that 2045 costs would be relatively in line with near-term cost estimates for the technology, so very little advancement, and then a low-cost scenario that assumed significant cost reductions compared to near-term estimates by 2045. We also directly represented in-state versus out-of-state resources that were imported to California by including the costs and losses associated with transmission expansion in the cost of the out-of-state resources.

Next slide.

So now moving on to a brief overview of our results.

Next.

I want to start with impacts on system costs, which are arguably the most important result. Just to give a brief description of what you're looking at in this plot, the left pane shows results for a low-resource cost scenario where the costs of non-EGS resources are significantly lower than our baseline projections. So, essentially, wind, solar, and storage are very cheap. And then the right pane is a scenario where sort of the inverse is the case, and the costs of those resources are higher than expected, but actually still lower than they are today.

And we note that across these two scenarios and across all the combinations of different potential future EGS costs and availability, we see that the availability of EGS reduces California's electricity supply costs by \$10 billion to \$44 billion per year. You can see the scenarios where we have no

EGS available and no clean firm really available circled in red in both of these cases and compare those to the other scenarios. And these cost reductions are on the order of a quarter to a half of the cost of electricity supply, which I'll note doesn't include distribution and existing transmission.

We also find that the marginal cost of further carbon abatement in these scenarios, which is essentially the carbon price that would be needed to achieve this level of decarbonization, falls from more than \$1,000 a ton in cases with no new clean firm technologies available to less than \$10.00 a ton in cases where enhanced geothermal is available under any set of cost assumptions.

And lastly, I want to note that when we compare the costs of the electricity sector in cases where we allow EGS deployment in-state compared to cases where it's only allowed out of state, we find cost savings of \$3.5 billion to \$5.5 billion per year as a result of in-state availability. You can see the little green arrows that compare those pairs of scenarios.

Next slide.

The second major benefit that we find is a reduction in system expansion needs, and specifically infrastructure build-out rates. So we find that if you don't have clean firm resources available, hitting the 2045 targets requires, A, large amounts of reliance on low-quality in-state wind. California is blessed with very high-quality solar resources but, unfortunately, fairly low-quality onshore wind. And so we find that the state is forced to essentially rely on that low-quality resource to provide nighttime electricity.

At the same time, it also has to build out solar at a rate of more than 10 gigawatts per year, which is more than three times the currently average pace. To compare to this, when you have EGS available in the mix to help, again, shore up in particular that nighttime supply, the rate of required solar deployment is reduced to roughly three gigawatts per year or, again, roughly equivalent to the present pace.

Next slide.

And I think one of our most important results, especially when we're looking to compare the advantages of in-state versus out-of-state deployment, is the amount of interregional transmission required to achieve California's goals. We found that relying only on out-of-state EGS actually increases the amount of interregional transmission that the state needs to build to essentially import that power from other states by more than 10 gigawatts by 2045. Comparing this to the cases where you have EGS available but it can be built in-state, we found that this actually reduces interregional transmission build-out requirements, even compared to the base case, and cuts them by essentially more than half compared to a case where you can only build it out-of-state. We see this as a particularly important finding because long-distance cross-jurisdictional transmission deployment is one of the most difficult infrastructure challenges we face in decarbonization.

A good example is the SunZia Line, which just came online, thankfully, but took more than two decades of planning. If you compare the out-of-state EGS reliance versus in-state deployment scenarios, the difference in required interregional transmission build-out is essentially equivalent to five or more SunZias. So that's kind of the benefit that you get from deploying in-state is reduced reliance on and reduced dependence on being able to achieve that outcome on that timeframe.

Next slide.

So just to summarize these takeaways, the first is that incorporating any form of next-generation geothermal into California's supply mix can substantially reduce the cost and the infrastructure requirements of decarbonizing California's electricity supply by 2045 while maintaining reliability needs.

We also found that deploying in-state next-generation geothermal specifically reduces costs meaningfully, A, but also drastically reduces dependence on interregional transmission expansion and makes California much more self-sufficient, avoiding that potential bottleneck.

I do want to note that other emerging technologies could fill a similar role. There are other clean-firm technologies out there. There are also long-duration storage

technologies that could potentially do similar things. But this is a very limited pool of technologies, and geothermal is among the most promising candidates. And so we would encourage California to essentially take as many shots on goal as it can and do what it can to support scale-up of these technology options that will be very beneficial in the future.

We urge California to support local development of geothermal, specifically via a few mechanisms. The first and the biggest ask of this recent report is testbeds that de-risk local geology, similarly to the Utah FORGE Project that's led to potential multi-gigawatt development in Utah, as well as improved electricity system planning that better represents these resources, permitting and regulatory modernization that brings in-state development timelines down to parity with out-of-state development timelines, and proactive community engagement that ensures that these projects move forward with community support. So with that, I'll pass it on to our next panelist. And thank you to the Commission for the time.

MR. STOKES: Yeah, thanks, Wilson. So, our next presenter will be Dhurv Bhatnagar with the CEC's Energy Assessments Division.

So Dhurv, whenever you're ready.

MR. BHATNAGAR: Thanks, Erik. I think the slides are coming back up. Great. Thanks, Erik, and thanks, Wilson.

Hi, I'm Dhruv Bhatnagar with the California Energy Commission Supply Planning Unit in the Energy Assessments Division. I want to talk about some of our more recent long-term planning work and how geothermal and other firm resources appear in that planning work. It's likely to be similar to some of what Wilson just shared, but wanted to share a picture of what our modeling results are finding, and in some contrast to the CATF approach, that's just a bit more focused on sort of the cost side of things. We're looking a little bit more here at reliability.

That said, I'll go pretty quickly through my presentation, and it's just a highlight of some of our broader work. My colleague, Hannah Craig, presented the full deck, and there's a detailed sort of presentation of input assumptions and

sort of full results at the June 9th California Energy Resources and Reliability Workshop, and that recording is available on our website, and I'll also drop a link in the chat.

Next slide, please.

The California Energy Resource and Reliability Outlook brings together several of Energy Assessment Division's workstreams into a comprehensive report, including both our near-term and longer-term energy system analysis efforts. Some of this material is included in other venues, both presentations and reports, and the full report will be available later this year, the state EAD, Statewide Assessment of Electric, Fossil, and Petroleum Resource Planning and Reliability, focuses on the upcoming summer, but also concerns the midterm and longer term.

So here we're looking at a little bit of longer-term perspective. And with respect to the longer-term electric system modeling, the goal of this area was to support the state's efforts to meet climate goals, which requires reliability analysis of different scenarios of clean energy development.

So as part of this effort, we were looking at risks and uncertainties that could shape how the electric transition unfolds through 2045, through where some of our clean energy targets lie, the types of resources and the tradeoffs between them, how they impact the transition, including the risks of availability, and finally understanding how different assumptions impact system reliability, including policies, incentives, land use, and then, of course, resource availability.

Next slide.

A quick highlight of our modeling scenarios. We looked at permutations of emerging resource availability and costs, and the intent across scenarios was to paint a picture that I just spoke of, how to ensure reliability in the long term, and what are the tradeoffs between resources to do so. We have three sets of scenarios exploring these questions. I won't go into -- dive into them given time, but again, the full detailed presentation is available from our June 9th workshop.

Next slide.

A quick touch on demand assumptions. We used the 2025 IEPR planning forecast. We're seeing lower electrification than prior forecasts due to slower adoption following federal actions in the prior year. But we do see a 70 percent increase in total demand by 2045 and expect the system to be winter peaking by 2045. As you can see on the graph on the left, data centers will be a significant component driving demand, but of course, as will electrification.

Next slide.

A quick touch on build costs as part of our longer term modeling. Again, won't dive into this, but just highlight that we're looking for stakeholder and industry feedback and input here, both on costs, actually, on costs, availability, and resource characteristics. For this work, we're using the National Laboratory of the Rockies ATP annual technology baseline data across research types with some custom additions for carbon capture and storage and transmission -- added transmission costs for offshore wind.

Next slide, please.

We just touched on our modeling process. We do a first round of capacity expansion modeling where we're looking at resource build out from now through 2045. We put those, depending on -- across the scenarios, we put each of those scenarios -- oh, sorry. Oh, okay. We put each of the scenarios in a resource adequacy model to verify that they meet regional static requirements, and then iterate with a capacity expansion model if they need to, if we need to, and then run them through the system dispatch model to look at hourly operations, so emissions and operating costs in particular and what -- the interplay between different resources on an hourly basis.

Next slide.

It looks like we might have lost the slides. I'll just dive into a subset of the results, particularly

MS. NAKAGAWA: We do have screen --

MR. BHATNAGAR: -- on the next slide.

MS. NAKAGAWA: -- sharing back up. Sorry about that technical issue there, but we are getting it back in a second here.

MR. BHATNAGAR: Great. Thank you. Okay. Perfect.

So, again, just highlighting, I'll highlight some of our results in 2045 particularly as they relate to geothermal, both EGS and traditional resources. But again, the full presentation is available on the website.

So looking at capacity across the first three feasibility scenarios, one thing that is overarching, and Wilson touched on this too, is meeting demand long term is reliant on the availability of clean from resources.

Across our first set of scenarios, what we see is that even at high capital costs, there's a clear need for clean from capacity. We're seeing 10 gigawatts of carbon capture and storage retrofits in our base scenario, 10 gigawatts of enhanced geothermal in the no-carbon capture storage scenario, and there's the conventional and biomass and non-emerging resources scenario, which is -- which does not include CCS, EGS, offshore wind, or long duration storage.

I'll note that all of these meet clean energy and reliability targets. And so, basically, we're highlighting what we're seeing is different approaches towards meeting the same clean energy goal. But importantly, even at a higher cost than solar and storage, the model still prefers the geothermal resource for its attributes longer term. And I'll dive into what those are in a couple slides.

Next slide, please.

On the generation side, gas generation continues to be needed in outer years, particularly in winter months, but we still see significant contribution of those clean from resources, whether it's CCS retrofits, geothermal to 15 percent, depending on scenario. There's some clear seasonal trends, and we see that gas continues to be used in winter, which is within the 100 percent retail sales target as part of SB 400. But ultimately, it's about that incremental energy value, that clean

firm capacity that clean firm resource provides is clearly very valuable to the system long term.

Next slide.

Shifting to reliability, building on those seasonal trends, reliability requirements at summer peak and winter resource needs, those reliability needs primarily materialize in the summer overnights and winter late nights to early mornings, which you see on the graph on the left, which is unserved energy by time of day, gray in September, winter, December, January, and orange. Using carbon capture storage retrofits, we enable clean from energy, but we don't build new capacity as we're retrofitting existing plants. So accordingly, our base case is least reliable, although it still meets reliability requirements.

From a reliability perspective, as we look at the other scenarios, there's still a demand for significant clean capacity, which leads to an opportunity for resources here, like geothermal, to provide both not only clean energy megawatt hours of zero- or low-carbon emission energy, but also capacity to maintain long-term reliability.

Next slide.

And finally, we're looking here at some hourly data, representative of summer and winter days -- winter days, summer on the left, winter on the right, just to highlight that last point. So 24-hour dispatch, look at each of those representative days. On normal summer days in the winter, you see solar in the orange, covering the bulk of energy needs in the daytime, and energy storage able to make up the difference at night. But on low solar days in the winter, we see much less solar and less storage charged accordingly. And you need whatever gas you can use under the emissions limit. You also need your other clean from resources to meet energy needs.

This further emphasizes the risk associated and resource availability in future years and the need for resource diversity. Every single resource is needed in the hourly stack. But the more sort of firm clean resource you have, the easier it is to meet that demand.

Next slide. So just to wrap up, meeting greenhouse gas goals will require significant increase in demand and deployment of clean energy resources. In our work, we're seeing build rates of 7 to 10 gigawatts per year every year until 2045, the persistent challenge of critical summer peak and winter night capacity needs through that timeframe, and the winter night needs really, really start to show up in those later years when we start hitting our clean energy targets.

High demands and low renewable output in the winter means firm technologies resource diversity is strongly valued to meet reliability, even at current cost projections. We're using a \$7,000 per kilowatt from, I think it's the midline from the ATB, and we still see significant amounts of EGS built in this case.

I would like to highlight, again, the importance of better cost availability and performance assumptions and validated performance data to address the questions of risk. And we'd love to work with stakeholders on that. And we'll keep modeling and iterating on this modeling work. This is not, you know, this is, of course, not the end of it. We'll keep doing it as we get better data and better picture of moving forward.

Finally, also, with that said, modeling is showing a clear need for resource with the characteristics of geothermal, which again, not to say there's not work needed to bring down costs, improve performance, and address development risks and challenges.

And finally, I'll just say, here in this work we're only really looking at bulk energy and system reliability. There's still questions of transmission, reserves and flexibility, interface with the distribution system, and questions around power system stability and reliability, lots of grid needs that could be served by new resources such as geothermal.

So I'll leave it at that and pass it back to Erik and look forward to any questions.

MR. STOKES: Yeah, thanks, Dhruv.

So our next presenter is Dimitri Saad from Stanford. He recently worked on a study as part -- that Stanford published a couple months ago that showed California could potentially bring on 82 gigawatts of EGS by 2045 and some of the benefits of that.

So, Dimitri, I'll turn it over to you. I think we're pulling up the slides now.

MR. SAAD: Thank you, Erik, for the introduction. Hello, everyone. And today I will be walking you through what we've been doing at Stanford when we've been looking at different pathways that geothermal can provide in supplying low-carbon firm energy for the electric power sector, in addition to, perhaps, heat for the industrial sector.

Next slide, please.

So, yeah, so geothermal can play a role in multiple economic sectors.

Next slide, please.

One of them is the electric power sector where, again, we can supply this low-carbon baseload energy to the grid.

Next slide, please.

But also there is a potential, which I will talk about a bit, where we can, perhaps, use this hot water that geothermal energy can provide to perhaps supply industrial process heat, too, at industrial facilities, which some of which are shown in this plot.

Next slide, please.

For now, I'll be focusing on the electric power sector, and I will be echoing a bit of what Dhruv and Wilson talked about, but using a more multi-sector approach to decarbonizing the different sectors in the economy.

Next slide, please.

Yes, so California is home to a lot of geothermal resources. And here I'm showing a plot of the temperature distribution at four kilometer drilling depth across the U.S. And this is based on the work of Mohamed Algubran and Roland

Horne, who are collaborators on the project that Erik just mentioned.

And if we look at California, their physics-based model shows that, again, it has the hottest potential for water that we can extract from geothermal energy in the subsurface. There's a lot of red, which means it's hot, so that's great.

But if we look at the next slide, where we look at the seven kilometer drilling depth, which is a bit more advanced, we see that, again, it shares a similar pattern to the four kilometer, showing that there's the highest resource potential. And this one, at least, it's much more unanimous and spread out also across the state, which enables us to have much more potential to deploy the geothermal systems.

So this is from the technical feasibility side. There is just -- we estimate, at least they estimated, that there is a lot of potential for geothermal to be deployed. But if we look at the next slide, where we have certain cost estimates.

I cannot see if there's -- it looks like a blank slide. Maybe, can we go again to the next slide? Yes. No. Can we go before? Yes. Perfect. Thank you so much.

So in terms of the costs that we project, what I'm showing here is the overnight capital cost for geothermal systems from different sources as a function of the commutative capacity for California. So I'm going

to -- I'd like to spotlight the red solid line, which is what we estimated to be for California. And we see the overnight capital cost to be roughly in the range of \$5,000 per kilowatt electric up to commutative capacity of tens of thousands of gigawatts for geothermal. So we have a lot of available capacity that is within good, like, capital costs that can be maybe more easily deployed compared to other higher costs.

So this is what we have on the cost side. Again, there's projections that we estimate, as well, for different years. But if we combine this technical feasibility in addition to the costs, we've used this data in the next slide where I would like to show that we've used this for designing a pathway for a net-zero California.

And the goal of ours is to -- we have this capacity expansion model that governs investment and -- that models investment and operation decisions, but not only for the electric power grid, but also for the gas systems. And that includes gas storage sites in addition to pipelines and whatnot. And we have this using the BRIDGES Energy Systems model that we've developed at Adam Brand's group. And below, you can find different papers that look at the energy transition for California using different lenses. So the goal, again, is to minimize these costs over different years. But we also have a lot of constraints that we need to respect.

Next slide, please.

The first one is -- oh, I also don't see anything anymore. Could you please fix that? Yes. Thank you.

So we need to respect the physics, and that includes transmission flow, generation, capacity factors. And in the next slide, there's also the -- I see. Oh, yes. We also need to supply the energy end-use demand. And this includes not only for the electricity that we require in different homes and buildings, there's industrial energy demand in addition to buildings energy demand. And this includes heat. So what the model can also do is choose to electrify the heat or continue to use gas. And if you choose to electrify the heat in buildings and for the industry, you end up increasing the amount of electricity demand endogenously.

And finally, next slide, please, we look at reducing emissions.

Next slide, again, please. And this is where we look at adhering -- oh, next slide, again, please.

Yes, we look at adhering to California's climate goals, which govern net-zero emissions by 2045. And this is the assumed net-zero target that we go for.

Next slide, please.

So first, I would like to show some of the results that we have. And here, we're showing the generation capacity on the x-axis in terms of gigawatt electric for the grid. And we take different scenarios. And this is for the year 2045.

Next slide, please.

I'd like to show the first emphasis on a scenario where we do not allow any EGS to be modeled. And we can see that in this blue-shaded region, we see that the grid capacity in terms of nameplate capacity is very close to 300 gigawatts. A lot of it is being served by solar PV. And, again, there's no geothermal. The only other option that we give it for a low-carbon firm ends up being natural gas plus CCS systems.

But if we look at enabling EGS -- next slide, please - - particularly for the seven-kilometer drilling depth, we see that the grid capacity, effectively, is half, down to close to 150 gigawatts. And this makes the grid size much more tractable and perhaps easier to maintain. And as a result, we can also benefit from what we're showing here of this 82 gigawatts of geothermal system capacity that is being deployed. This is, again, low-carbon firm. And as a result, it has large potential in increasing the system reliability too.

Next slide, please.

So we, again, show this for the electric power sector.

Next slide.

I would like to also focus a bit on the benefits that geothermal can provide for the industrial sector.

Next slide, please. Yeah, perfect.

So typically, at industrial facilities, we have this process heat demand -- next slide, and maybe another next slide as well, please -- which is typically met using fossil fuels. Now, one way EGS can provide and geothermal systems can provide heat in maybe decarbonized fashion is through -- next slide -- converting this hot geothermal water into electricity effectively and dumping it into the electric power grid.

Next slide, twice, please.

And then you can use that electricity to supply low-carbon electricity to the electrified heating technologies -- next slide -- which include perhaps heat pumps, resistance heaters, and heat batteries. Now, that is one way you can provide, basically, low-carbon heat.

Next slide.

Another one is where you perhaps use this electricity directly to provide - to produce renewable gas. One moment. I still see blank. Yes, perfect. Thank you.

So, yeah, so another way would be to provide like a low-carbon electricity to power the gas system that produces a renewable fuel. Now, as a result, you also can produce renewable heat.

But what I find particularly interesting in geothermal is you don't have to go through all of this electrified processes. You can directly, in some cases, when there is proximity, use this hot geothermal water directly to supply heat demand in the form of either hot water or steam when you do the conversion. So this eventually shows a lot of potential to bypassing a lot of like grid interconnections and queues that currently a lot of different new loads are facing. So you just simply directly use the heat stored in the water for industrial purposes.

Next slide. Can I get that twice as well, please?

So, yeah, so in California, we have all these industrial facilities. What I'm showing here on the left is the distribution of by location of different industrial, large industrial facilities, and these are color-coded by the different industrial sector.

So next slide, please.

What we developed here in this work with Adam Brandt and Ines Acevedo, we developed this heat demand profile as a function of different process temperatures. This is for these facilities in California. And, again, they are color-coded by the industrial subsector that they pertain to.

Next slide, please.

What we find particularly useful here is that if geothermal hot water can effectively go up to 400 degrees C, or even 300 degrees C, there's a large portion of the emissions that we can reduce and over 50 percent of the industrial process heat that can be decarbonized using this effectively zero-carbon

process. And as you can see, a lot of it is, in fact, using this hatch, which means that it is requiring steam or hot water directly. So we haven't conducted this study where we do look at the -- where we examine and evaluate the exact economics of this. But there is, at least from this work, that we've done a large potential in supplying industrial process heat using geothermal energy.

Next slide, please. And another one as well, please.

So, yeah, so in terms of just key findings and policy recommendations, I'd like to highlight that geothermal system deployment can not only reduce the total cost of the system when being deployed, but also make the power sector smaller in size and much more tractable, in addition to enhancing the system's reliability due to its firm nature.

Next slide, please. Okay, yes.

So, yeah, and a lot of the data that we showed is, again, based on these physics-based models that show a lot of promise in California's energy resources in the subsurface. And, again, we know that all models are wrong. Some are useful. We believe that it would be very imperative that some state-supported exploration and testbeds be deployed to really confirm whether these resources are, in fact, reflect the same as those reflected by the model. And that will very much accelerate geothermal deployment.

And, finally, next slide.

We highlighted a bit of the potential of geothermal systems in decarbonizing low-temperature process heat. We believe that this would be very useful, particularly in clusters of different industrial facilities so that, again, there's not much of a transfer of the hot water and, as a result, loss of its energy. But, yeah, there is, I'd say, quite some potential in decarbonizing this low-temperature heat, anything up to 300 or 400 degrees C.

And with that, I will conclude. Thank you for listening, and thank you for whoever is moving the slides.

MR. STOKES: Great. Thanks, Dimitri.

So our last presenter is Ryan Tracy from Sonoma Clean Power. And Sonoma Clean Power has been really one of the thought leaders on geothermal, especially from kind of the LSC side of things.

MR. TRACEY: Yeah, thank you, Erik, and I really appreciate the opportunity to speak today.

So, as Erik mentioned, I represent Sonoma Clean Power. We are the community choice aggregation serving Sonoma and Mendocino counties. The geysers, which is still the world's largest single geothermal operating installation, is right in our backyard in Sonoma and Lake counties.

And my role at Sonoma Clean Power is looking long-term, looking at our resource planning needs and identifying strategic barriers and opportunities to overcome those. And we've been working on trying to figure out clean firm resources for our own portfolio since 2021. And one of the outputs of that exercise is our Geothermal Opportunity Zone, which has led to a lot of deep digging with industry and thinking about constraints and opportunities for development that touches a lot of the topics that are flagged in the IEPR that we're really excited to see.

Today, I'm going to specifically talk about our perspective on geothermal as a resource meeting load-serving entity needs, and also how there's a lot of different touch points with transmission planning.

Next slide.

So, you know, the first point I really wanted to drive home and make here is that the need for geothermal is not just a projected modeling need. We're actually seeing this now in real time. When load-serving entities are looking at what they need from their resource portfolios, there's a need today.

And I think, you know, one of the best demonstrations of this is, you know, December 2022, we had an issue where natural gas prices in California, you know, really, really, really accelerated and spiraled in cost. And we had a whole month where the round-the-clock average for cost of power was \$250. And that just kind of, you know, gave everyone a wake-up

call that, you know, this is a reality and there is definitely a susceptibility if we don't start building clean resources to help meet this winter need.

And, of course, you know, as we saw from Dhruv's presentation, you know, long-term, we are looking at a system-wide winter peak. But even when load-serving entities today are looking at their resource portfolios and looking at their capacity stacks, you know, we're really getting good at filling out the summer months with battery storage and solar, but it's really the winter months where we're relying on the gas capacity that we really want to be able to unwind. And geothermal perfectly fits the need for that.

And that's reinforced, also, in the way the Public Utilities Commission has currently designed their resource adequacy process, which is how load-serving entities show that they're procuring the capacity needed to maintain grid reliability. The Slice of Day framework that's now used for battery storage to serve as a capacity resource, you need to be able to show that you have charging energy. And that's, you know, that's something that's easy to do in the summertime, but increasingly difficult to do in the winter.

So clean firm is -- provides a really good value proposition for load-serving entities trying to fill their resource adequacy needs. And then that's been reinforced by the procurement orders that the Public Utilities Commission has issued. You know, Erik mentioned at the very kickoff of this workshop, you know, the gigawatt procurement order for clean firm capacity, you can't understate how transformational that has been in driving investment in geothermal. And load-serving entities are now procuring to meet that need. And now we have another gigawatt the Public Utilities Commission has flagged for geothermal and long-duration energy storage that's going to drive additional interest in procuring.

The other thing I do want to highlight, and, you know, Wilson touched on this, is I think, you know, geothermal, you know, compares favorably to some of the other clean firm technologies that we could see meeting this need. You know, California still has a nuclear moratorium. From the, you know,

from the CCS perspective, there's a lot of regulatory complexity that hasn't been proven to be overcome.

And I think one of the important things, too, I think that, you know, conventionally, I think folks think of, you know, geothermal as a complex and long project cycle-type development and not necessarily a speed to power play. But, you know, what Fervo Energy is doing in Utah, I think, proves that wrong. You know, we've seen they drilled their first well campaign in 2023. And, you know, they're going to start delivering power end of this year, you know, and approaching, you know, 500 megawatts plus scalability in the next couple years. So I think geothermal is proving that it can be something that can really respond quickly to needs.

The role of geothermal is being recognized now, too, in the PUC's own integrated resource planning process. So I have -- this is what this bar chart here is showing. These purple lines are showing the evolution of the amount of geothermal capacity that's included in the Public Utilities Commission portfolios. And this latest update that just came out that the CAISO is now using for transmission planning, we see the geothermal fleet growing to 7.2 gigawatts. And most of that comes online by 2036. And I will say this is even with what I think we view as pretty conservative assumptions for resource cost. I think the LCOE, you know, or the PPA kind of equivalent cost assumptions were like \$140 per megawatt hour for conventional geothermal. And we still see a need for that much growth.

And I think important, too, is they've stressed, you know, what happens if we don't have wind show up at the level because of federal policy headwinds and because of what's happening with offshore wind, and they see that need grow to 11.3 gigawatts. So we're definitely seeing that, you know, not just show up, you know, in the modeling, the type of modeling that Wilson and other folks are doing, but we're seeing the Public Utilities Commission actually see this need in their own modeling that drives transmission planning and resource build-outs.

Next slide.

So I did want to spend a little bit of time talking about geographic considerations for buyers. And I think, you know, Wilson's research, you know, I think was really valuable in demonstrating that, you know, if we

can -- if we can develop in-state geothermal resources, that could lead really to an opportunity for significant cost savings because of the higher resource quality and ability to limit transmission investments.

But even in, you know, the real time and thinking about procurement decisions that load-serving entities are looking at today, there's definitely a preference for resources, specifically inside CAISO, to be able to meet our needs. So, you know, CAISO with the extended day-ahead market and a lot of the, you know, efforts to be able to create more access to out-of-state resources, you know, that's done a lot to be able to improve the operational availability of resources outside the state, be able to improve the market efficiency. But those impacts do not have a direct through line to resource adequacy and the capacity that load-serving entities need to procure.

For resource adequacy purposes, load-serving entities still need to procure what's called import capability. And that's important. I'm going to kind of talk about two examples of why that's important.

One is that that import capability is limited by different interties. And most of the interties to other states linking California are through Southern California and Southern Nevada. But a lot of the geothermal potential is in Northern Nevada. So you run into an issue where there might be import capability, you know, through Southern Nevada, but we have to be able to get the resources from Northern Nevada to Southern Nevada. And that relies on transmission that's outside the control of, you know, CAISO and the PUC to be able to control. So it creates a lot of risk and potential complexity when you're looking at carrying those types of resources.

The other important thing is that every load-serving entity only has a fixed amount of import capability that they can use each year. And a lot of load-serving entities, like Sonoma Clean Power, for example, Sonoma Clean Power has around

100 megawatts of import capability, we're using it for things like SunZia and some other resources that are needed to meet our resource diversity needs. So if we're looking at procuring out of state or out of the CAISO, you know, it's an opportunity cost issue. So, that really drives an interest in trying to create opportunities to be able to procure inside CAISO.

One of the other things we're increasingly running into as a load-serving entity in the market is we're seeing a lot more competition from hyperscalers in Nevada, Utah and, you know, other states. You know, I think in the past, you know, California's, you know, very forward-leaning climate policies, you know, created a great market signal to be able to develop resources and then bring those in state. But now, we're seeing these hyperscalers, you know, put together portfolio contracts that really give them a preferential treatment for procuring resources out of state, which is going to have cost implications and availability implications for trying to get those resources to meet our own state needs.

I'll also state that, you know, a lot of CCAs, including Sonoma Clean Power, have a preference for in-state resources just from an economic benefit and from our board policy. So I think that's always driving our decision-making.

And then, the last thing I wanted to share here on this slide is, You know, Northern California load-serving entities are struggling with an increasing divergence in the power price in Southern California and Northern California. So a lot of these out-of-state resources I mentioned are coming through Southern California. There's been a lot of solar development, other renewable energy development that's happening in Imperial and in the Mojave Desert. It's led to this issue where power prices are higher in Northern California, and a lot of the reliability challenges are really targeted at Northern California. So we really want to figure out ways to be able to get resources to deliver, you know, not just to California but to where we're seeing resource needs in Northern California.

Next slide.

So I want to talk a little bit about transmission planning. You know, I think, you know, Wilson earlier, he did a

great job teeing up that, you know, there's a direct dependency on -- a direct correlation between, you know, heat and depth and cost. And I think a lot of us are really excited about some of the technologies, the super hot rock technologies that get us to a spot where there's this geothermal anywhere concept where you can do geothermal anywhere, but that's a long ways out. And I think the reality is that near-term geothermal opportunities, you know, the next generation technology suite allows us to be more flexible about where we site geothermal. But the best opportunities are still going to be locationally constrained.

And I have this map here. This is actually using data from modeling that Wilson has previously done and applying some filters on, you know, the projected LCOE and the depth and the temperature based on the availability of current technologies. And you can see that we get clusters of opportunities that are likely to be, you know, where there is the most interest up front.

And it's really important to understand, you know, what that means being a locationally constrained resource in the context of transmission planning. What it really -- what it really reinforces is that you need to be proactive about building transmission to areas that have this resource potential, because they're not going to have the flexibility, like solar or battery storage, to necessarily relocate and follow where there is grid capacity. So I want to drive home and reinforce that it's very important that we plan transmission to where there's potential.

And I think there is some issues with alignment with the current state's process for thinking about how we do resource planning. So the Public Utilities Commission, as part of their process, their integrated resource planning process in developing the portfolios they send to CAISO, they do a process called busbar mapping. An essential component of busbar mapping, which makes a lot of sense for these solar storage resources, is to try to fit them where there is existing grid capacity and try to minimize the transmission upgrades that CAISO ultimately has to build. There's issues with that when you have a locationally constrained resource and when you map

capacity at a certain substation, you know, that is not close to where there is project viability.

So I see it as a big opportunity, you know, trying to figure out, you know, not necessarily using this busbar mapping exercise to figure out where, you know, the least amount of transmission needs are concentrated, but actually think about how do we align this where there's actually strategic opportunities.

The other important thing I want to highlight when we're thinking about transmission planning for geothermal is the kind of existing currency for thinking about transmission capacity is something called deliverability. So deliverability is a measure of a resource's ability to be able to show up during peak grid stress conditions. And right now, deliverability is something that every resource needs to be able to get RA credit and also to be able to be eligible for these things, like the procurement orders that the Public Utilities Commission developed.

That deliverability test right now is very focused on summer peak conditions. And an issue we're running into is that, you know, although geothermal can provide some reliability benefits, their real long-term contribution to the grid is solving this winter year-long reliability challenge.

And I think another issue with deliverability is right now the way that the interconnection process works at CAISO is that projects are only allowed to be able to enter the queue if there's existing deliverability on the grid. And I have this map. This is from the CAISO, you know, heat map showing deliverability. Orange are areas that do not have any deliverability. And you can see the areas that have existing deliverability that would be open for interconnection applications are pretty geographically limited and not necessarily well correlated with geothermal opportunities.

So one thing Sonoma Clean Power has been really thinking about, and I'm happy to expand on this in the Q&A if there's more interest, is are there alternative pathways to think about how do we value a geothermal resource? Does it necessarily need to be deliverable to be valuable for IRP or RA?

Do we want to create a pathway for what's called energy-only resources, which are resources that don't have that summer peak deliverability to be able to enter the queue and provide a role in meeting grid needs? And I think the last thing I want to highlight on this slide is there's been a couple -- you know, we've heard from a couple of folks that there's really important need for these test beds, subsurface exploration to be able to de-risk and figure out these different geologies. And that is really important to be able to de-risk project investment.

But I think a corollary need that's not talked often enough about is that these can also provide really important information for grid infrastructure planning. You know, if we know which one of these polygons is going to be more viable, if we're able to invest in that sooner, that will provide us more time to be able to build the infrastructure to be able to attack the opportunities that are most viable. So I think, you know, the moment is now for that sort of work.

Next slide.

I want to share real quickly, too, one other thing that we've realized in thinking about geothermal is that the conventional role of waiting for a project to get its interconnection application, you know, be permitted, and then respond to an RFO from load-serving entities for PPAs is challenging. And we're not seeing enough resources pop up through that sort of -- that sort of mechanism.

So there's really a need for new commercial approaches. And, you know, we've done that with Sonoma Clean Power, with our Geothermal Opportunity Zone, by creating industry partnerships. That's been expanded on by California Community Power, which is a group of nine CCAs, recently released, you know, three what they call GEODE Agreements with industry, where they're working closely with industry on figuring out how do we make these projects commercial? How do we overcome some of these barriers? How do we make sure we work with the Public Utilities Commission to get transmission built? And I really think that's the right approach to thinking about how do we mature these types of projects.

I also think that bringing more, you know, load-serving entities in, using things like portfolio PPAs to spread out risk because these projects are more -- do contain more risk than your standard, you know, solar or battery storage project makes a lot of sense and increases the universe of opportunities.

Next slide. Oh, or next slide. Oh, never mind.

I think the last slide I had was just kind of revisiting our recommendations. So, you know, one is, you know, we really think there's a need to strategically plan for geothermal transmission. You know, this is something. I think we can't follow the status quo of, you know, trying to mold geothermal opportunities into where there's existing grid capacity. So I really, really think it's important that we highlight that as an opportunity.

The other thing is, you know, I mentioned this idea of creating a mechanism where geothermal that's energy only, that does not have the summer deliverability reliability benefit, we figure out a way, how do we -- how do we signal to load-serving entities that resources are valuable and provide that as a pathway for development given interconnection constraints.

We need to invest now in subsurface exploration to help us guide our infrastructure priorities and, you know, catalyze, you know, industry investments, similar to what's happening in Utah FORGE.

And then we also need to enable, you know, new commercial strategies that really are made for the moment.

But, yeah, wrap it up there. Thank you.

MR. STOKES: Great. Thanks, Ryan.

So we're going to transition to the Q&A part of the session, so I'm going to ask all our four panelists to come up on the video.

And with that, I'm going to turn it over to Commissioner Gallardo.

COMMISSIONER GALLARDO: And thank you so much. Each of you provided such great information for us to consider. And,

you know, Wilson, Dhruv, Dimitri, Ryan, I was having a little brief conversation with President Mainzer who had to depart. But, you know, I asked him if he wanted to have any additional briefings or conversations with you all given the, you know, the vast information you provided, and he said he does. So stay tuned for a follow-up with us.

But I do want to let you know what he said. He said, "This has been very informative. The findings have major implications for the state's resource portfolio. And we should move forward with alacrity so that transmission planning and interconnection processes can accommodate growth in geothermal resources. We look forward to working with the state agencies on next steps."

So President Mainzer from the CAISO is definitely committed here, and as am I.

And I will note that in the Mentimeter, we got called out, I felt like, for permitting and transmission being some of the issues that we need to address, you know, quickly and that are most important, so we take that very seriously as well. And overall, what I heard is that in-state generation is a smart pathway with geothermal. And there's that bonus, also, that was mentioned about direct heat applications, which I think are very fascinating, so interested to look more into that.

But let me go to Commissioner Houck, who's still on. I forgot to mention, Vice Chair Gunda also had to drop off.

But, Commissioner Houck, did you have any initial comments or questions you wanted to make to the panelists?

COMMISSIONER HOUCK: Just really appreciate the presentations and all of the information. I learned a lot. And I don't have specific questions at this time. But, again, this is a really important area and really appreciate all of the information.

COMMISSIONER GALLARDO: Okay, thank you, Commissioner Houck.

One question I have, and I think this might be a quick one. And I think this is particularly for Wilson, Dimitri, Dhruv. What are -- it sounds like there might be some data gaps. And I'm curious if there's anything in particular that you would say we need to get or, you know, modeling we need to change. Or, you know, what's the key thing in terms of the data needed to help geothermal succeed in California? And it can be brief.

Wilson, we can start with you.

MR. RICKS: Sure. Thank you. I think data is certainly a key requirement. We do have fairly high-quality maps of temperature at depth, which is really the way that we can identify what are kind of priority areas for geothermal exploration.

But I'll note that this isn't something like wind or solar where we can just look at satellite maps and say exactly what the cost of a resource is in a given place. We have to actually drill and confirm. And that can be done on sort of a regional basis. You get a sense for how accurate the maps are in a given area. But it does need to be done before we can accurately assess exactly where we want to deploy geothermal.

So that's -- getting kind of better state-specific and regional-specific data on geothermal conditions is, I think, key, as is de-risking the state's actual geology because it's not trivial to take a technology that's been demonstrated in one place. For example, Fervo Energy has a large project happening in Utah right now near the Utah FORGE site, and then just go and do the same thing in a totally different location.

I think there's a lot of transfer that happens there, but there's also a lot of kind of learning that has to happen when you go into a new geology. And that's not something that can just be kind of committed to up front without very high risk and financed unless there's been that kind of demonstration beforehand. And so that's part of why we're recommending a program to go and do actual next-generation exploration at a few

key sites to unlock certain regions of California for development.

COMMISSIONER GALLARDO: Great. Thank you. And would you want to -- which key sites?

MR. RICKS: So I think that's part of -- that's kind of step one to get a better sense for the state's, you know, highest potential regions, to get a sense for where there's community interest, transmission access, et cetera, and then go and actually kind of fund demonstration projects and potentially partner with commercial entities to do that.

That can then, you know, if that goes well, a single geothermal demonstration site or next-generation geothermal demonstration site can likely be expanded to multi-gigawatt scale. So getting over that hump, I think, is the kind of critical point here.

COMMISSIONER GALLARDO: Got it. All right. Thank you.

Dimitri, what about you, what comments?

MR. SAAD: I echo a bit, a bit what Wilson said in terms of like we have great simulation data and forecasts, but we may need a bit more like experimental data to support and confirm these findings. So that is one thing I would highlight.

The other thing that I believe that will play a major role is, let's say, forecasts of availability and whether these -- the temperature we're extracting today, like how much drop-off will it be in the future based on also -- because that is something that's very much dependent on how you use the resources available today. And while we did account for that in our modeling, I would say there still remains quite some uncertainty that would need to be investigated, again, whether through experimental research or also still on the simulation side. So, yeah, just these two.

COMMISSIONER GALLARDO: Thank you. Fantastic.

Dhruv, do you have anything?

MR. BHATNAGAR: Yeah, I can just add on the sort of the connection with the electric system side and the electric

system modeling side. I think we had validated data just on performance of resource, so coming out of Fervo and what you can -- you know, we can have some simulated or theoretical expectations of resource performance on the grid. But validated data on what, you know, you can actually do with the resource would be really helpful sort of addressing the sort of perceived risk of, you know, whether the resource will show up and what it can do in sort of the long-term. And then we can really highlight. You know, it's better to highlight the value, and that kind of pushes you, pushes development, yeah.

COMMISSIONER GALLARDO: Absolutely. Okay, thank you.

And then, Ryan, you mentioned the geysers and that being the largest geothermal field. So impressive. I visited there. And had we done an in-person workshop, I would have recommended we do it up there where we could go do a site visit and whatnot. So just thank you for highlighting the geysers.

Also wanted to ask you a quick question, because I'm hoping we can go to the public for a Q&A. You mentioned valuing geothermal in a different or maybe better way, especially for deliverability. Did you want to speak to that a little bit more? I am curious of what you had to say on that front.

MR. TRACEY: Yeah. No, no, really appreciate that question. So, yeah, I think what we're running into is kind of this chicken-and-the-egg problem where we really are going to need to be able -- I think one of the key things, and Vice Chair Gunda made a good point of this like in his opening remarks, that like we need to be able to create an environment where, you know, investors can have confidence that things like transmission, you know, permitting, everything is going to be responsive to facilitating development.

And on the -- I think we've done a great job from the side of creating procurement orders, you know, creating a market for geothermal. You know, we've done a great job of doing that. So I think from a market signal point, we're in good shape there.

But you run into this issue where right now with the way that the interconnection queue is administered and the way that, you know, the PUC handles accrediting resources is the

first thing, that is kind of a -- it's a binary yes or no is, is a resource deliverable or not? And right now, that deliverability test is about summer peak conditions. And, you know, the problem is, as that map I shared in my presentation showed, is there's not a whole lot of areas with deliverability. And this is a key bottleneck, specifically in our region, thinking about how to accommodate projects.

The good news is the CAISO has a different interconnection pathway called Energy-Only, which is if you're not seeking deliverability. And that pathway is actually very responsive, something that developers could use today to be able to get their projects interconnected very quickly. And there actually is a lot of grid capacity in certain areas that are just not during those summer peak hours.

So what we'd really like to see is like could we come to a -- could we get to a future where, you know, load-serving entities are told, hey, if you procure energy-only geothermal, you know, that can help meet these 2040 needs, you know, we're not going to hold you to this test of if you're deliverable or not, because that would give -- that would give these projects confidence to be able to enter the interconnection queue and move along. So that's the really big opportunity we're trying to highlight and explore.

COMMISSIONER GALLARDO: Excellent. Thank you.

All right, Erik, I'll turn it back over to you.

MR. STOKES: Great. Now we're going to turn to the public Q&A. So I'm going to hand it over to my colleague, Justin, who's going to help us do the public Q&A part.

MR. SZASZ: Thanks very much, Erik, and good morning to all of you. I am another staff person at the Energy Commission and I'm going to be running the Q&A session, fielding questions from the public.

If you are a member of the public, questions may still be submitted through the Q&A feature, and we will answer as many of them as time allows. So I'm going to start with a few of the questions that have already been answered by our panelists, but there's sort of a lengthy discussion, so I thought it might be

good just to highlight these one more time. And these are two different questions that relate to EGS, sort of the current facts on the ground in terms of EGS projects and EGS cost.

So the first question was,

"Wilson and Dimitri both show EGS cost projections of \$3,000 to \$5,000 per kilowatt, which result in large EGS deployment in California. However, the CEC model and previous CPUC models use NREL 2024 cost projections of \$7,000 to \$9,000 per kilowatt, which results in no EGS buildout. How can we align on EGS cost assumptions across the state?"

And I'll just go ahead and read the other question about EGS here as well, which is,

"Are there any prototypes of large EGS technologies currently in operation and being evaluated in California, or are these theoretical assessments from available research?"

So Wilson, would you like to start?

MR. RICKS: Sure. I can tackle both of those briefly. And I also have some written responses that people can see in the comments there.

But as far as cost assumptions, this is definitely a gap because we don't have large-scale commercial facilities operating today. I think it's a gap that's going to be filled quickly with more empirical data, particularly as Fervo's site in Utah is scheduled to come online later this year and then scale up to 500 megawatts by 2028 or 2029, I believe.

I'll note that -- so the cost assumptions I was using were ones that I built for a research paper last year based on the latest empirical data. There have been, to answer the other commenter's question, there have been demonstrations to date. There's currently a 3-megawatt project operating in Nevada that was sort of demonstration scale. And then, again, this 100-megawatt project coming online in Utah starting later this year.

Fervo's projected cost for that, the next phase of that site, the next 400 megawatts, is \$5,500 a kilowatt, which is pretty much exactly in line with the cost projections that I was referencing in the model. But, of course, we need to see whether that number pans out and whether the performance of that project is as expected. So this is something that's still definitely a point of uncertainty, but it's becoming quickly constrained as we start to see more empirical data.

I would personally probably call the \$7,000 to \$9,000-kilowatt numbers an upper bound, but that's, of course, just a sort of professional opinion at this point, and we do really need that hard data to, I think, include this confidently in near-term electricity system planning.

I'll also note that we do, in our out-of-state-only scenario, we do effectively have EGS for California starting at \$7,000 a kilowatt, including the transmission access to out-of-state resources, and we still saw a very large role for it. So I think part of this has to do with the assumptions around other technologies. Like some of the CEC modeling does include other emerging technologies that will come in and fill gaps if geothermal is too expensive, whereas if we look at just kind of currently commercialized technologies or currently established technologies, that comparison becomes much more stark, and the need for something to fill that gap becomes much more stark, especially when we consider that we no longer can rely on Inflation Reduction Act tax credits to make a lot of those currently established resources much cheaper up through 2045.

MR. SZASZ: Dhruv or Dimitri or Ryan, would any of you like to weigh in on these questions about EGS as well?

MR. SAAD: I can add a few sentences. I mean, Wilson addressed this really well, but the thing that I've noticed, at least when it comes to looking at like these data sets from the National Labs where they've looked at cost projections, it seems that those tend to rely on like, again, a single EGS system that perhaps is more reflective of an average across different locations, whereas when it comes to really looking at deployment, we need to look at very geospatially, like high-resolution data, because then, yeah, that would unlock a lot of

the potential when it comes to reducing these costs of deploying EGS.

So, yeah, in that case, I wouldn't -- it's much more important to look at these geospatially resolved data when it comes to including models of EGS in our modeling work.

MR. BHATNAGAR: I'll just add real quick that I think we're open to looking beyond sort of the NLR dataset. And we'll plan to reach out to Wilson and Dimitri and maybe other stakeholders, developers who are interested in engaging and thinking about cost sensitivities. I think that would be really great.

MR. SZASZ: All right. Another question we got, and this is for Dimitri, was, "Is there any analysis on how geothermal may be used as baseload energy for data centers?" And I would also be curious what our other panelists think about that question.

MR. SAAD: Yeah. No, I mean, that's an excellent question. Again, the data centers boom has been a more recent thing. So I personally have not seen a paper or some study that particularly targets looking at EGS supplying electricity to data centers, though there are a lot that have looked at a combination of data center siting using different technologies, whether it's like wind and solar and batteries, or nuclear is one that I saw as well. And of course, natural gas and CCS.

So those are there. I know some from my advisor, Ines Acevedo, there is work there in progress. But also there, I believe there's a preprint led by the lab of Costa Samaras at CMU. So there are -- there is work looking into that.

I don't think in EGS yet, or at least I have not seen anything, but I would say it is a very promising thing to look at, particularly if, to echo a statement someone, another panelist said, like, if we can build it anywhere, then that -- build EGS anywhere, that is much more -- it gives much more potential to align with the, again, access to infrastructure and transmission and whatnot. So, yeah, not yet, but hopefully soon.

COMMISSIONER GALLARDO: And on this point, Ryan, I think you had mentioned something about, you know, the competition with hyperscalers for energy, also, you know, making it even more valuable for us to do geothermal in state. Did you want to comment?

MR. TRACEY: Yeah, no, appreciate that, that follow-up. Yeah, no, I think, yeah, there's this new world we live in now where I think there's just a lot of projected load growth in, you know, both, you know, Nevada and Utah in particular. You know, I think we're obviously also in California trying to plan for data center load growth.

Actually, I'll quickly make the point that I think the value of geothermal serving data center load growth is bearing itself out in the Public Utilities Commission's own modeling, because this latest model they just did that flagged the large increase in geothermal interest was a model that is incorporating this new in-state data center load.

But in the short term, we're running into this barrier where, you know, we're seeing, you know, data centers that are seeing what Fervo is, you know, accomplishing and seeing geothermal as a speed to power initiative and creating these, you know, commercial frameworks in these other states that do make it more difficult for, you know, California load-serving entities to procure these resources.

And I think, you know, that both risks their availability, so I think there's issues if, you know, we're planning on meeting our state climate targets with out-of-state resources, but also has cost implications. You know, I think a lot of the cost assumptions we're just talking about are bottoms up. You know, they're looking at, you know, how much does it cost to drill these wells? It doesn't, you know, it doesn't assume that there's a competitive marketplace where someone's trying to outbid you.

So I think that those are all things to consider. And I think that's why we really like in-state, you know, development focus to be able to avoid those sorts of risks.

MR. SZASZ: All right, for our next question, we've had the question,

"Could the panel comment on the potential grid value for flexible EGS? Fervo has tested that at their Project Red site in Nevada with promising results, and Wilson co-authored an important paper at Princeton on that topic."

Maybe we should start with you on this, Wilson.

MR. RICKS: Sure. Yeah, I wrote my dissertation on that. It's certainly a high potential additional capability for EGS.

For reference, this is essentially the idea that with EGS, you have essentially, and this could be extended to other next-generation geothermal technologies as well, they're different modes, but with EGS, you have sort of a confined artificial reservoir that you've created in hot, dry, impermeable rock. And the idea is that if you can -- that reservoir can hold excess water at a given time under -- with just slight pressurization. And you can use that to essentially, you know, run your injection pumps, which require power during times when power is very cheap, for example, during the midday when there's lots of solar, and then you can turn off your pumps or reduce the pumping power during times when power prices are spiking, like late at night, say, in a deeply decarbonized system. And that can increase your geothermal generation higher than it would otherwise be able to.

And you can also prioritize when you extract the heat resource itself, because these reservoirs are likely to be limited in lifetime by how much -- how quickly you extract that heat. And so by operating flexibly, you can essentially prioritize using that heat resource during times when the power is most valuable.

And so I did a lot of modeling work on this and found that this could increase the value of geothermal plants by greater than 40 percent in a lot of cases. And effectively allows them to act as a form of long-duration storage on top of generating power.

This is actually something I didn't model in our most recent report, largely because it requires a lot of computational power. But it is something that is certainly, I

think, a large advantage that EGS could offer. That needs to be more fully explored, I think. It's a sort of earlier stage thing that has been demonstrated in principle, but not at commercial scale.

MR. SZASZ: Would anyone else like to speak on the flexible EGS question of our panelists?

MR. BHATNAGAR: Maybe I'll just add real briefly that we are kind of seeing that need out to sort of those winter, I was talking about those winter hours in 2045, where your batteries aren't charged and you need a resource to sort of fill that. So, that could be -- that could potentially be very valuable.

So maybe, actually, Wilson, we'd love to connect and maybe we can think about how to incorporate that on our end as well in future modeling.

MR. STOKES: I just want to note, we're out of time for our lunch break. And I'm going to turn it back over to Sandra.

MS. NAKAGAWA: All right. Thank you so much, panelists, Commissioners. We are going to take a one-hour break and we'll reconvene here at 1:00 p.m. on the same Zoom. You're welcome to stay on. The recording will be -- the Zoom room will be open.

And I also do see that there is someone with a raised hand. We will be taking public comment at the end of today's workshop. We will not be using the raised-hand feature until then, though. So if you do have questions for future panels, use the Q&A feature on Zoom.

Well, thank you, everyone. We'll be back at 1:00 p.m. Have a great one.

(Off the record at 11:58 a.m.)

(On the record at 1:00 p.m.)

MS. NAKAGAWA: All right, everyone, it is now 1:00 p.m., so we are going to start our afternoon session for today's

2026 IEPR Update Commissioner Workshop on California Geothermal Energy Resources.

We're going to start by turning it to the dais to see, Commissioner Gallardo, if you'd like to make any remarks before we dig into the afternoon session.

COMMISSIONER GALLARDO: Just quickly, thank you, everybody, for joining us. We had over 130 people in attendance for the first part of this workshop. We're really excited for everyone who can join us. We realize it's an impacted day, it's Juneteenth, which we're dedicating this workshop in celebration of Juneteenth. And then also it's World Cup, and the USA is playing as we speak against Australia. USA is ahead 2-0, as far as I know, unless there's a goal scored just as I was settling in here. But anyway, all that going on, and really appreciate folks joining us, and I think we can get started.

So Sandra, thank you for letting me speak here.

Oh, I should also note, apologies, we had Vice Chair Gunda on earlier today. He had to hop off. We also had President Mainzer, or CEO Mainzer from the CAISO, he also had to drop off. And then Commissioner Houck was on earlier. She will be in and out for the rest of the workshop. But I just wanted to give folks a heads up about that. But I'll be here the entire time. Thank you so much.

MS. NAKAGAWA: All right, and I'm going to reintroduce Erik Stokes, Chief of Staff for Commissioner Gallardo.

Erik, if you want to go ahead and introduce our next panel, that would be great.

MR. STOKES: Yeah, thanks for that, Sandra. So I just want to introduce our next panel. So our next panel will focus around Triangle Engagement. We have four great panelists and a moderator, so I'd like to invite them to turn on their cameras. Jessica Eagle-Bluestone from Geothermal Rising will be moderating this panel session. So Jessica, if you're on, I can turn it over to you.

MS. EAGLE-BLUESTONE: Fantastic. Thank you. My name is Jessica Eagle-Bluestone. We have a fantastic panel for this afternoon. We're going to discuss tribal engagement in

geothermal resource development and what responsible development looks like from a tribal and Indigenous perspective.

Geothermal resources are very place-based, and quite often those areas overlap with areas that are historically significant, spiritually significant, culturally significant to tribes and Indigenous people across the world. And even though they're not currently on tribal lands, it really raises the need for how developers can navigate tribal engagement. So I'm going to turn it over to our panelists right away and let them introduce themselves.

Let's start with Maranda.

MS. COMPTON: Good afternoon, everyone. (Speaking Native language.) My name is Maranda Compton. I'm the President of Lepwe. We are a consulting boutique that works with tribes and non-tribal entities on economic development, largely in the energy and tech spaces.

I'm also a recovering lawyer, so I practiced federal Indian law for about 15 years, specializing in environmental permitting and policy.

I am Lenape, a citizen of the Delaware Tribe of Indians. I'm really honored to be here today to speak with my fellow panelists who are all bringing incredible knowledge and excited to learn more from them.

Thank you, Jessica.

MS. EAGLE-BLUESTONE: Thank you, Maranda.

Chairman Simon?

CHAIRMAN SIMON: Thank you. (Speaking a Native language.) Moke Simon. I'm the Tribal Chairman of the Middletown Rancheria of Pomo Indians of California. We are located in the south end of Lake County with the geothermal -- one of the largest geothermal plants in Northern California, not on the reservation, but in our backyard. We are also close to seven other nations here in Lake County around Clear Lake, one of the oldest natural lakes. The Middletown Rancheria is a small tribe consisting of 270 tribal members. We have 353 acres in trust.

I have been the chairman since 1997. I am a former NFL football player, played in the NFL, played in the World Football League and other things, and then became a leader. I've been a leader for almost 30 years. I'm also served as the first Native American elected in Lake County's history as District 1's supervisor. I've also been appointed by the governor of the State Board of Fire Services.

But today, I bring hopefully some knowledge into energy sovereignty and geothermal conversations as we move forward as a tribal nation. Many things that I have done here have been culminating throughout over the years. And today, hopefully I can bring a perspective that talks about energy sovereignty.

I heard a comment earlier, I'm not on tribal lands, but if you do a project in California, it's all tribal land. And as we move through our history and we talk about geothermal, tribes for thousands of years have been using geothermal to survive. And so we have been in the geothermal business, not just in the fundamental, the way it's ran today.

So hopefully I can bring some information to the table that helps us create those partnerships for long-term success and allows tribes to really become sovereigns in the energy space. Thank you very much.

MS. EAGLE-BLUESTONE: Thank you, Chairman Simon.

Next, let's go to Andy.

MS. BLAIR: (Speaking Native language.) Hello, everybody. I'm Andy Blair and I am in the deep south of Aotearoa, New Zealand. I am the co-founder of a company called Upflow, and we work with Indigenous communities and Indigenous groups to develop geothermal projects around the world. So I have a bunch of nerds, 18 engineers and scientists, and I help them to look at the world through an Indigenous lens.

I'm the immediate past president of the International Geothermal Association by Southern Netherlands. And I also am a co-founder of a group called WING, Women in Geothermal, WING, that's looking to empower women in this sector. I am very passionate about this space because I believe that having an

Indigenous lens across managing reservoirs and geothermal projects mean greater sustainable outcomes. So I'm looking forward to the kōrero today.

MS. EAGLE-BLUESTONE: Thanks, Jessica. Thank you, Andy. And last but not least, the amazing Aroha Campbell.

02:05:39

MS. CAMPBELL: (Speaking Native language.) Like Andy, I come from the deep south in New Zealand. I have lived all my life in and around geothermal. But the last 35 years is in the development and commercialization of geothermal. So I'm lucky enough to have been in a position of building four geothermal power stations in New Zealand. The last few years, I have been actively in governance and commercial space and working with Andy and her team around the world. I was fortunate enough, also, to travel to Kenya in 2017-2018 to support the Maasai through USEA. That was a great experience as well. And certainly looking forward to contribute whatever I can in the session. Kia ora.

MS. EAGLE-BLUESTONE: Thank you, Aroha.

So our first question is for the entire panel here. And it's, we often hear a lot about tribal community engagement. What does tribal community engagement look like to you guys? What does meaningful engagement actually look like?

So I'd like to start with Aroha.

MS. CAMPBELL: Okay, meaningful engagement from a tribal perspective, so we -- our land is in the rohe, the tribal area of Ngāti Tahu-Ngāti Whaoa. And so we are small landowners and we're registered through the Māori Land Court.

And so the communications has been really important from our owners, our shareholders perspective, and then building relationships with the wider tribal authority, but also the other tribes as well. And communicating to those tribes as well in terms of what we're doing. Because when we first started, which was in the early 1990s, there was no communications. Even though we had a shareholders list, there was no communications with those shareholders as well.

So with the creation of our trust, Tauhara North No.2 Trust, we set about to building those bridges and the communication and transparency of information has been growing ever since. And so it was -- it's more of a watch the space now for our owners, descendants, and the wider community and tribes of what we are doing. And so currently we are communicating in regards to what does the next 100 to 150 years looks like and what do we need to do now to make that happen.

MS. EAGLE-BLUESTONE: Thank you.

Chairman Simon?

CHAIRMAN SIMON: Thank you very much. Engagement from Middletown Rancheria's standpoint is, at this point with the state or any other agencies, is direct communication with our tribal government, ourselves as elected officials, whether it's through consultation, both for cultural resources, or just development opportunities in the area. We don't have anything currently. We are looking to get into this space.

We are in one of the largest geothermal producing areas in North America. We have ancestral burial grounds and other villages in the area. So we currently use that for consultation and engagement as far as cultural resource, both mapping, communication, and other things. But now what we look like now is partnering, looking at opportunities for land back, exploration, support, and then continuing communications both through the state or federal governments as engaged, and then also individual partnerships with economic development organizations looking to get into this. There is a large -- Calpine, is what we've known it as here in Lake County, but I think they were just purchased by another group called Catalyst, but they are in the backyard and on our ancestral land. So that continual communication, which is happening right now in California, as I said on this webinar, as we move forward to the actual opportunities that will come in the future.

And just as was said earlier by the previous panelist, I want to thank you for those words of wisdom as we move forward is looking at those next three generations to seven generations of how we move into a new space for both resource opportunities through energy, building our governments as business

opportunities, and our own sovereign utility authorities throughout California to help all, not just our tribal nations here, the seven local and all the others, but the communications on how we take care of all Californians as we move forward in these new times as climate changes and what we're looking at for fires, hurricanes, floods, and other things that are happening in our area.

So appreciate the opportunity to communicate. And I am, from what I hear on this panel, kind of the rookie on these things, but it's been a long-term vision and it's starting to happen right now as we move forward. So appreciate the time today to address that question as a tribal leader and be sitting here to see the times changing right now as we speak.

MS. EAGLE-BLUESTONE: Thank you, Chairman Simon. Yeah, I'm a bit of a rookie compared to Aroha and Andy, who have been kind of prolific in helping support other Indigenous groups across the world in starting up like their geothermal journey. So they're a fantastic resource. So next I'll go over to Andy.

CHAIRMAN SIMON: Just like to make a comment on that. That is not lost on myself. I'm honored to sit on this panel with the knowledge that is here. And that is how, obviously, all of our Indigenous communities do. We learn from our elders, pass from the ancestors, and move through that process to pass it to the next generation. You're seeing that right now. And I feel that and I want to acknowledge that. Thank you.

MS. BLAIR: Yeah. Thank you, Chairman Simon and your comments, and you, too, Jessica. I think just want you to all know that we're still on a journey too. And there's no professionals in this space because it is a new space where we see Indigenous leadership in our geothermal sector. And we've got a long way to go to remind the incumbents of what good could look like in this space. So we're on a journey with you.

I think meaningful sort of engagement is when you take Indigenous groups seriously and you recognize their value to projects. You don't have to -- you know, Indigenous groups don't have to remind developers that they have value and taking them seriously, meaning really meaningfully have conversations

and listen rather than checking boxes and ticking things for a communications requirement or some sort of permitting.

I think real -- what the outcomes look like for meaningful engagement is better economic benefits from projects, better environmental benefits, but also that the community wins when the project wins. So you can't have this disparate sort of they win and we lose all the time because Indigenous people will be on the land forever and will clean up the mistakes. So they should also benefit from the wins. And so meaningfully engagement to me means taking Indigenous groups seriously and that they are at the table rather than being talked at.

MS. EAGLE-BLUESTONE: Thank you, Andy.

Let's head over to Maranda.

MS. COMPTON: Yeah, Andy, I agree at the table rather than on the menu. That's always what we like to be. You know, I don't think tribal engagement in the geothermal space is that different than in any other situation, which is to say that meaningful tribal engagement is, I think of it in kind of two terms, in terms of scope and in terms of timing.

Timing. I think there's a hesitancy, at least in the United States and another panel, I'd be interested to know what that compares to internationally, but I think there's a hesitancy for private entities to reach out to tribal nations. I think there is a very strong, especially in California, history and responsibility for consultation, which is government to government. But tribal engagement includes coordination, as well, which is private parties to tribes. And so often if you leave things to consultation, it is kind of too late for tribes to come in and have a meaningful impact on a project.

So to me, meaningful engagement means coordination and consultation. It means working with governments and private parties. It means not just talking about impacts or a risk management strategy around tribes, but talking about opportunities and the value. I think all of the other panelists spoke to how tribes can actually bring a lot of opportunity and value. Tribal nations are governments. They're businesses. They're keepers of resources and land.

And then in terms of scope, you know, just to identify the geographic significance of land and resources to tribal nations is that most companies have a layer that identifies tribal reservations on a map, but they don't necessarily have a layer, for example, in California where that identifies treaties, that identifies ancestral lands. And both from a legal and cultural framework, those other areas are very important to tribal nations.

So when I think of meaningful tribal engagement, I think of it as being robust early on and encompassing geographic areas that are beyond reservations.

MS. EAGLE-BLUESTONE: Thank you, Maranda.

We're going to move on to our next question. And it's for Chairman Simon. So Chairman Simon, you have been the chairman of Middletown Rancheria since 2007; correct?

CHAIRMAN SIMON: 1997.

MS. EAGLE-BLUESTONE: 1997. That is -- yes. Okay. So you kind of have somewhat of an unrivaled institutional knowledge in tribal governments. What do you wish that state agencies and developers better understood about working with tribal governments on geothermal development?

CHAIRMAN SIMON: I think it's what I already said earlier, you know, the respect of what the resource the tribe can bring to the table and throughout the agencies, you know, here. I'll just speak specifically to California.

The current governor we have now, Governor Newsom, obviously made an apology to all the tribal nations, which I was at that ceremony sitting next to him. And my comment to the governor was a thank you, thank you for my elders, the folks for acknowledgement. But the next step would be action and how we work together to put us at the table, as it was said earlier, to have those opportunities open. And today is proof that we're moving in the right direction. We've got a long ways to go. So those are things that need to happen.

And then taking it down through each agency and understanding, number one, we're a sovereign nation. And looking at the documents and communications that happen,

removing sovereign waiver and immunities immediately out of things, because it means distrust from most tribal nations. If we don't trust you, this is what we're going to ask for.

So as we move forward in our engagement in this space, it is going to be engagement with the respect that the nation deserves when being spoken to them, as you would look at it as governor or president, just like any other country that you're dealing with, just in a more unique space. And so making sure that state agencies understand that, that we're working with, that we're here to work together and to help grow and to take care of everybody in the state of California, not just tribal and its communities. So I think that's some of the very first steps, and you're seeing those happening right now.

As far as support, it would be direct set-asides from the state budgets for tribes to continue this mission along together. And then to look how we partner with the California Energy Commission, other agencies, and private philanthropy as we move through the process of becoming our own sovereign energy providers for the folks that are nearest.

So there's a lot to that, but it really is that education part, which we're always on that journey. As we sit at a table talking with, whether it's private developers, county agencies, city agencies, any other agency, it's that education on what and how we're governed, which we were governments before this country was formed. As we celebrate the 250-year celebration of the United States, our governments have been in action for here, locally can be tracked for 18,000 years. When we talk about conversation across the table, we need to come from a perspective of we come from the earth. Each and every one of our tribal nations has a creation story, and those have happened here on lands that are currently being used.

So that constant engagement, education, and understanding that the tribes are ready to help this world move together in the right direction of taking care of it, but also using economic development as an opportunity to take care of those folks around us.

MS. EAGLE-BLUESTONE: Thank you.

So that leads into a question for Maranda, who is an expert in tribal community engagement. Sorry about that sound. I'll figure out what it is in a minute.

Maranda, where do you see engagement processes fall short, and what practical changes can developers make to work with tribes?

MS. COMPTON: Yeah, I think that's a great question, and I think the chairman hit the nail on the head, which is a lot of people, well-intentioned, show up to tribal nations and say, we have this great project for you, and we're here, what do you think? And I don't think we do that under any other circumstances. If you were going to develop a geothermal project in California, you wouldn't, you know, write a letter to the governor and say, hey, gov, we're going to, you know, develop this project. If you don't like it, let us know. If we don't hear from you, we're going to assume you love it. Thanks. Bye. Which is a lot of times how folks engage with tribal nations.

So what's the alternative to that? Well, do your research. Understand who this tribal nation is. Understand the history. Understand what's important to that tribal nation. What? Do they have a strategic energy plan? Are they themselves looking to develop geothermal? I mean, Chairman Simon has made it pretty easy today to say, Middletown Rancheria is looking to work in this space, and there are other tribal nations like that.

So I don't think you can assume that tribal nations will be opposed to geothermal. I don't think you can assume that tribal nations won't want to talk to you. I think what you should do is develop some capacity within your own companies, within your own state agencies, too, to work with tribes and do some of that initial research on your own. That will make the conversations once you get in front of tribal governments, which, like any other government, is focused on elder care and language reimmersion and youth development and food security and all of the things that governments are interested in. And so if you want those conversations to be as effective and efficient as possible, you can do your research from the beginning.

I also just really want to underline and highlight what Chairman Simon mentioned about set-asides and funding. We, in Indian country, are in a very particular and unique circumstance when it comes to capitalization of our projects due to the fact that our lands are, under federal Indian law, held in trust for us by the federal government. So we often don't have access to the same kind of capital infrastructure or collateralization.

And so my other piece of encouragement for both states and private entities are, let's be -- let's have as minimal restrictions as possible for tribal development. I think a lot of times, again, very well-intentioned, we develop programs on behalf of tribes that end up creating a lot of red tape for tribes to access. And so the more that we can say, here is some money, let's say for energy sovereignty or more general funds, and use them as you wish, or if we are, you know, a developer and we're trying to work with a tribal nation, let's make sure we can be flexible with our capital stack and look for investors and attorneys and consultants that are knowledgeable so that we can be creative in our funding and capital structures.

All of those things, I think, are really valuable. And all of those things can be done before you even go talk to a tribe, right, before you even take up that time. Because I will tell you that in Indian country, deal flow is not our issue. We have people knocking at our door every day about this great idea, this great project that's going to, you know, be really wonderful for you. What is harder to come by is great partners who are willing to stay in it for the long run, respect our view of project development and our relationship to the land, and support us in creative approaches to funding.

I think Andy said it in her opening comments, which was that we bring value for better long-term projects. And so if you can keep that in mind right from the beginning, I think that's the start to a really great partnership.

MS. EAGLE-BLUESTONE: Thank you, Maranda. Definitely, early engagement and research definitely leads to better outcomes for projects on the whole. And it's --

CHAIRMAN SIMON: Can I add --

MS. EAGLE-BLUESTONE: Yeah.

CHAIRMAN SIMON: -- can I add another comment on that? Because really, and I was looking for the word in my mind as I was speaking, usually when it comes to developers or even state agencies, they come to it with a paternalistic, you know, the tribe needs to help to do that. We don't need that. I think it was proven during the world pandemic, direct funding opportunities, no one knows our people better and knows how we move through our government better. We're prepared to move, but to do it the right way.

So also breaking that paternalistic, we don't need our hands held. We don't need to tell us how to spend our money, how to build our communities, how to grow our nations. We are prepared to do that. We need a partner, as said, for long-term growth and listen to the Indigenous people as we move through this.

So I just wanted to add that. It's still a barrier we're trying to break.

MS. EAGLE-BLUESTONE: Thank you for adding that, Chairman Simon.

So our next question is for Andy and Aroha. From the Māori geothermal experience, what lessons can you share for building long-term relationships around geothermal resources, especially when the resource has cultural, economic and community significance?

MS. BLAIR: Yeah, I'll let Aroha start because she's got -- she's the king hitter here, so she's got way more stories and lessons to share.

MS. CAMPBELL: Thanks, Andy. I think certainly early engagement, but I also think it's, from an Indigenous perspective, is understanding what type of relationship that you're looking for. Ultimately, from a developer's perspective, it's always around a commercial side of things.

So I'm currently working, or I currently have two hats. One is from a relationship perspective, and that is in regards to a generator who has impacted on our land, our whenua, and so therefore -- and also our marae. So our marae is where

all of our whānau come to the place, to a place where we acknowledge our ancestors and our tupuna, and also we hold our funerals, celebrations, all of those things, and it's been impacted.

Then on the other side, there's another hat that I wear is from a commercial perspective, but it is an ownership of land, and we own that land. So therefore, we automatically own the resource. We own everything from the sky, universe, down to the core. And so you have different forms of thinking as well. And it is about, for us, and certainly for myself, is understanding the value, the value of our whenua, of our resource, understanding the history in that.

So we look at ourselves as being the teachers for anyone that comes to traverse over our lands and come to talk to us, that we are the teachers, because they will come and go. They will come and go. And to hold those values strong so that when you are talking to new people, and through my journey, we've also had developers coming in and says, hey, have we got a deal for you. And so it was like, yeah, okay, righto. That's a nice one. What is it, you know? And having the courage to say no, courage to say no and go away, and that because we are not ready.

For us, in Ngāti Tahu - Ngāti Whaoa, we are ready. We are ready in terms of that we are looking to the future in terms of what is the makeup and of our resource. Where could that take us in terms of research and development?

In regards to the geothermal in New Zealand, we have conventional development. We're also looking at what does deep super hot look like? And we're lucky enough to that our whenua, our land, has been identified for that first exploration. But just like, I guess, with governments and that, you know, because they're having an input into it, and having the courage to say, well, that's really great, but you need us at that table. We know what it's like for success. We have done it. And if you want this super hot to be successful, we need to be at that governance table. And we need to participate at every level, every level of your project.

And so that has been accepted. That has been accepted because, at the end of the day, the access to the resource and the access on our land, we give that permission. No one else. So it's understanding what your leverages are so that you can put them on the table and you can have those honest conversations because it's those honest conversations and finding solutions together. And you reap in the benefits of those solutions, as well as what are the risks and understanding what those risks are. So communications at all levels, transparency at all levels is a must. It is a must. Kia Ora.

MS. BLAIR: And I just want to add on to the back of that, that, you know, Māori, just like any Indigenous group, are trying to find their way through philosophical and cultural thinking about the world and development and thinking about how that aligns. What does development mean? What are our sacrifices? Because there's sacrifices with any development. But if we do, how do we influence that in a way that can help align that cultural view and that cultural lens, so we get to still be who we are?

And I think that's a real tough thing for Indigenous groups to truly understand what sacrifices are required and what, you know, what could they give away. And it makes this a sort of uncertainty that makes it hard to be confident in this space.

I also think, you know, if you say no to something, you're actually saying yes to something else. I mean, if you -- you know, and we think about, you know, solar and wind. But what if by saying no, does that mean more oil and gas? How does that bode for future generations? You know, so it's a really tough dilemma that Indigenous groups are put upon them because they have to think in hundred-year terms.

I think one thing we've learned in Aotearoa is that relationships between Māori and developers are relational and not transactional. And it's really hard because, you know, Māori and Indigenous people are there forever on the land. They will never leave. But corporate faces come and go and it's really hard to have a relationship with an entity and not a person, and so thinking about how to bake into your thinking as

a developer, how you're engaging with Indigenous and how to have relations, relationships, not just transactions.

And I think one of the key things that I've learned along the way, and not just in Aotearoa, but in other countries, is Indigenous groups are looking for self-determination more than they're looking for money. And what that means is they want to have a say in what happens to them and what happens on their land and what is their future. And how do you create commercial models and processes and systems that allow them to have levels of control that they get to influence outcomes? And, you know, ten more million dollars doesn't mean much more than being the ability to say stop doing this bad stuff here.

So thinking about how to bake in those controls and levers, I think, is important. And also normalizing models where Indigenous groups have equity and real meaningful participation in commercial outcomes of projects, finding ways to do that, finding ways to think about, you know, how much does stakeholder engagement and social license, how important is that? Put a dollar number on it, then give it to them to manage, you know, and allow them to capitalize that into projects.

So thinking about commercial systems and structures that allow meaningful participation, I think we've seen that in Aotearoa and the outcomes are our reservoirs are better managed, they're managed more sustainably. Because if you're on the land for 100 years, you want it to keep going. And that's good for geothermal projects because they're 50-, 60-year projects.

And I also think, you know, to Indigenous groups, you know, they may or may not be ready for that engagement with developers. You know, there's a lot to get ready to sit at a table and be able to wrestle a developer. And that means legal structures, mandates from people, deciding what the aspirations truly are and what are the non-negotiables. Walking into a negotiation table without that means that, you know, you aren't potentially ready for that conversation. And I think some support around that is important. And I think those are a few lessons we've learned here.

I also think, you know, Māori in New Zealand are the innovators. So the corporates and developers just look at geothermal and electricity with a quite blanket view. But Māori in New Zealand are the leaders of innovation around that. Like, you know, what is direct use? What is economic development? Because they are never going to leave that piece of land. And so there's leadership in Indigenous thinking in our space, in our industry that I think we could embrace a bit more.

But, yeah, those are a few things perhaps to add to the kōrero.

MS. EAGLE-BLUESTONE: Thank you. So that is a pretty good segue into our next question where what does a successful geothermal project look like from an Indigenous and tribal perspective beyond the commercial definition? What part of that -- or as part of that, how should equity ownership, revenue sharing, co-development, workforce development, community benefits or other long term participation models be considered early in the process? That's kind of a long question.

Let's start with Maranda.

MS. COMPTON: Yeah, I mean, that's the million dollar question, right, is how do we do this right?

I want to -- I mean, I think there's already been so many whelming points here. And I just want to highlight that doing it right is a sentiment that then must be followed by actions; right? So what are those actions that you can take to follow up on a sentiment to do it right?

I would commend an article that I actually co-wrote with Tallgrass Institute last year on tribal benefit agreements. That paper identifies a number of the things that you were just talking about, Jessica. When it comes to doing right, doing right typically means thinking about this holistically.

I mean, I think tribal nations think about things holistically all the time. I don't necessarily think developers, or even the environmental review process does, the permitting process does. So that holistic view of, okay, what can we do from a workforce development standpoint? What can we

do to increase opportunities for our youth to participate? What kind

of -- is there a cultural monitoring or, you know, even a resource monitoring approach that we can take that aligns with our cultural views and our cultural practices? So this is a spot where you can kind of get creative in terms of what it looks like to me right.

The other thing I will just say is that just because you've done it right once or you worked with one tribe doesn't mean you can copy/paste that. I see that a lot in both amongst tribes and in different locations. People will take something that worked in a different geographic area of the world and then just kind of paste it into the United States or California. And there are great differences.

So I think really getting to know the specific location, the specific tribal nation is really important. And just doing that, I know I already said it, but doing your research, helping those tribal nations come to that table with as much information as possible.

And here's the last thing I'll say on this. Tribal nations are governments. They're not geothermal companies. So some of them have tremendous capacity in the geothermal space. Some of them do not. But if you are a geothermal company, something that you can offer to tribal nations is that, in fact, information. And so I think respecting the fact that tribal nations are bringing knowledge base to that project that is maybe not necessarily technical or engineering, but is very valuable, and then sharing that information, I think that's the closest you can get to kind of relationships with a corporate entity is where there's like very good information sharing. I think it comes down to the people. But yeah, taking that approach, I think will really help geothermal projects succeed.

MS. EAGLE-BLUESTONE: Thank you.

Let's go to Aroha.

MS. CAMPBELL: Certainly, early engagement helps in that. But I think that for us in our journey was actually talking to our old people, to our kuia and kaumatua, and getting

their guidance as to what they wanted, how they wanted to see. And basically it was only two things; make sure to look after the land, the whenua, and make sure to look after and use the resource.

So just taking those two concepts in it then broadens it out to the discussions for us is around what are those non-negotiables before we even go into talking to anyone, and in identifying those non-negotiables, because then those are the things that have stuck with us way back when to now. And that will be also into the future. But that then determines how we interact with anyone, whether that is with government or with developers or with regional council, district council.

And so sharing those values and the stories that go with it, I think is really helpful for those that are sitting around the table, because then it identifies and the conversation changes where they are actually offering up in terms of education, job opportunities, and how can they work with us in terms of that sharing of resources. And you haven't even got into the equity side of things. So it's actually showing that from that they are, first of all, that they are listening, which is a good thing. And making sure that when there are changes in their commercial structures, that we, we wanted to know who those people changes were. We wanted to meet them, because those would be the decision makers at those different levels. And so it's worked out very well for us.

But what's happened in New Zealand is that there is three Māori organizations in geothermal, and that's Tauhara North No.2 Trust, which is where I belong, Taupopaki Trust, which I'm actually an owner in, and then you have Te Whare Toki Kawerau, where they owned the whenua, the land, and they owned the resource, but they don't own the commercial operations. That's a relationship with each of those developers in there.

And so whilst we've all been working in our own silos, it's only in the last year that we have started to come together, having those conversations from those different, because we're all in different tribal areas, and coming together and having conversations, which is, I think, is really important for those other Māori landowners that are wanting to realize their geothermal capability.

What it has done, though, unfortunately, is because you've got three organizations that are doing so well, really, really well, that they have set us up on a pedestal. So that is where their thinking is going, that is where they want to head to. And for me, I'm communicating to them and saying, I think that's really great, but what you need to understand is that you need to listen, you need to understand the resource, because the resource is going to tell you what you can and can't do.

And so I can't, you know, I can't say that enough, in terms of from our perspective, how -- because then that brings down their level of expectation, but also the expectation of their people, as well, and because there's still a lot more that they can do, and Andy explained that, in regards to direct heat opportunities and job opportunities.

But there's also the upstream, and the upstream, I look at that in regards to what is the chemistry makeup of the fluid that is coming out? What can you actually -- what can be done with it? And for one of the trusts, Tauranga North No.2 Trust, we are also looking at research and development in that space as well. So yes, there's a lot to consider. Kia ora.

MS. EAGLE-BLUESTONE: Thank you, Aroha.

Let's go to Chairman Simon.

CHAIRMAN SIMON: Thank you. I'm just going to try and be very precise on this one.

Obviously, as I said, we are in geothermal land here with our ancestral properties, but we are not in that space yet, but we will be. So for Middletown standpoint here, it's tribally led and tribally driven. No minimum than 51-49 percent ownership, so the tribe is in a driver's seat as we move through putting together cultural needs, but also economic development needs. And then understanding from a developer standpoint, if that's just what we're talking about, is there will be an end of life or partnership with the agreement with us to learn the industry, help it move forward through it, and then take over ownership and be in complete sovereign control.

And then once that happens, it only needs to be done once. At least the vision that I've had is, and then we can continue to reach out to our tribal partners, whether it's here

locally or across the world, and really keep this thing moving in the right direction. But it is ownership, as it was talked earlier, complete, sovereign, and abilities to continue on with what we need to do. It really is that simple to understand what's coming together. We -- and I speak from a point of a very small tribe, but we're building those resources. When I was elected in '97, I can proudly say we started education programs, other things for the next generation, because we don't know what's coming in this world for survival. I can proudly say we have two of our young tribal youth, one in UCLA, one in Cal Berkeley, studying engineering. These are all things to build that next generation. And this is the most education -- educated generation we've had as a tribal nation. And so to continue that on with these opportunities we want to leave them, they'll have that opportunity to make sure that the next generation is more educated in building these things.

And it all comes from life is water. You do not have life, you cannot survive. And that's a part of this conversation. And it was said earlier, we live in two worlds, one to keep our cultural knowledge passed from generation to generation, so we do not disappear on the face of this earth, and the next would be how we thrive in the other world, the economy world that has been forced upon us, where you need money to survive, not just natural resources, which we all come from.

So it is a challenge to walk in both worlds. But we're prepared to do that, and we'll need support from all the agencies to recognize, when you're sitting a cross from a tribal leader or organization, you're sitting a cross from a nation that is ready to work together. And you look at it as a sovereign, just as done all across the world. So those are education things.

I just want to keep it kind of down and simple. And I speak from a point of we have both positive and negative here in our ancestral territory. We have the largest North American geothermal plant up on the mountain, but we also have a Superfund site that will be here forever that is part of this. That was done in the early '80s, long before our tribe was anywhere with economic development or having that voice at the table.

And we will be looking at that, not just from a point of, you know, getting into the business of geothermal, but understanding what it could do to the environment as it moves forward, and hopefully being the answer of the current Superfund site that's here to work together to mitigate that for not only our next seven generations, but the other generations that live here in this area on our ancestral lands.

MS. EAGLE-BLUESTONE: Thank you, Chairman Simon. That was a fantastic answer. I'm really excited to see what you guys are working on there in Middletown.

Next, let's go to Andy.

MS. BLAIR: Yeah, I mean, I don't know if you're all listening, can hear what is being communicated to you, which is when you invest a dollar in an Indigenous group, the outcomes are much greater because they take everyone with them. So it doesn't just go into making fat cat is fat, fatter, fat cats fatter, it goes into creating prosperity and healthy communities.

So that investment is significant. And when you invest in Indigenous people, they take everyone with them. They lift them up. And see how, you know, Aroha was talking about how they're talking to other tribes. Chairman Simon was talking about future generations. That isn't a poster trying to sell you on something. That is their drive in their life. And they will do that with every dollar that's given to them.

And I think that's really important because I think government plays a role in, you know, supporting. You know, there's non-commercial support that government needs to step in and help. And tribes will do that anyway with dollars that you give them from commercial things. And so here's a way to support non-economic benefits in communities with supporting commercial developments.

I also, you know, want to acknowledge, you know, Maranda said, you know, that knowledge may not be valuable to science and engineering, but I tell you what, it is deeply valuable to science and engineering because what it does, and I see that in my own team, it creates; scientists and engineers are forced to then look at longer-term horizons. So instead of

in that, we've got 12 months, there's a balance sheet. We need to have these answers. What are we going to do next year? We're going to put that well, all that sort of thing.

It forces them to look longer term and makes them think there's greater sustainable thinking inside the science and engineering space because you've got to look after those engines and those engines are the reservoir. If you look after that engine, they will perform longer. And so listening to that reservoir, using science and engineering techniques, it will tell you how healthy it is and what you need to maintain it. So that forced lens or that Indigenous lens really does help to have really good outcomes.

I also just want to say, you know, ownership and Chairman Simon was saying, you know, ownership is, you know, deeply important for control. And I think, you know, everyone focuses on the pots and pans on the surface, because they are the big ticket items. They're the 100 million, 200 million, you know, they're the big ticket items. But the actual control comes with the reservoir, because the reservoir is the engine. And none of those pots and pans work without the reservoir powering them.

So in Aotearoa, Māori are focused on the reservoir and having royalties and commercial structures based around those, that thing, rather than always looking at, you know, 50 percent or greater ownership in the pots and pans. Because those pots and pans will come and go, you have multiples on your land, but the reservoir is the engine and the valuable thing. And so thinking about that and how to structure that, I think is really important. And then also, geothermal isn't just electricity that, you know, if you structure deals or commercial outputs where, you know, post-geothermal electricity generation, that fluid, you know, Indigenous groups have direct access or first right of refusal or free access to those fluids, there's still heat left, there's still minerals in it, there's gases in it that create new or support existing industry. And, you know, baking that sort of option into commercial models is really important. Also, I just want to say that every successful geothermal industry in every country had government funding to catalyze it. And this Indigenous wave of leadership in our

industry is going to need actual funding and government support. And I just want you as government, those of you in a position where you look after finance and support, is that I often see additional burdens added to monies or funds given to Indigenous people. It feels like brown money costs them more. There are additional burdens such as you have to have this many people in the project you have to do. It's not like you're trying to force them to do what they naturally do in their lives anyway. And that actually creates a burden on the project that other groups don't have.

And so I would suggest taking a real long look at why you are adding those sort of burdens and whether or not they're needed. And, you know, there's long-term support needed from government. There's no opportunity to step away and just watch it go. It's a hard but rewarding space and governments need to lean in but be thoughtful about how they do it.

Yeah. Thanks, Jessica.

MS. EAGLE-BLUESTONE: Thank you.

Is there anything else anyone would like to add since it was kind of a longer question and I wanted to circle back?

CHAIRMAN SIMON: I'll just add from state and federal governments that we talked about right there, the funding thing. Mandatory, not discretionary. You can't start a long term geothermal project when it's funded discretionary year by year. Mandatory funding over decades because that is how we think and generations from tribal nations when you're thinking about that.

So it was said, anyone able to drive that conversation? We're here to support that with letters of political advocating through that manner, but that is big.

MS. EAGLE-BLUESTONE: Thank you.

So our next question is for Chairman Simon and Maranda. If California wants to support responsible geothermal development, what should the state be thinking about when it comes to tribal engagement, capacity, consultation, and early coordination?

We'll start with you Chairman Simon.

CHAIRMAN SIMON: Just one erm: Mandatory funding for long decades. The capacity in that conversation to happen needs to be funded through that. It won't always be needed by every nation. Once one gets in, we help each other. And that's proven throughout every Indigenous community. But it really is that funding conversation. And then the next one, the sovereign immunity. Sovereign immunity can only be given away, not taken. And every conversation with state and federal agencies needs to be removed. We can move quickly as governments to work together in an honest and open -- we're not asking a waiver of sovereign immunity from the backside, back from any state or federal agencies. But that is the first thing we're hit with as nations, at least in all the conversations I've had, whether it's solar, battery, other things, as we work to get that removed from agencies.

And it was said earlier about us living in two worlds. Every time a tribe, let's just say, would say no to geothermal, now we're looking at other resources that need to be extracted out of Mother Earth for solar panels, batteries, others. And when we make those decisions, it doesn't just affect the entire nation, it usually affects, here in the United States, our central, you know, our plains tribes, other ones. That's where all these materials are being taken from, some of their most, you know, sacred places affecting each and one of us all the time. It was spoken about earlier, but it's happening every day. And so a simple decision by a California tribe affects Arizona and all the Midwest tribes because of the difference of land and areas and resources there.

So it's a big conversation. Geothermal is water in the ground, and that just needs to be, you know, always remembered as we're doing these things.

So once again, back to that walking in two worlds and tribally driven and all the other things that I've already said at this point, and it is partnership. Even as we move on as tribal elected officials, once you're done and retire, now you're an elder of the tribe. So the next leaders, as said earlier, will talk to their elders, you know, pray on what needs to be done for the long-term vision. And it's just completely different than when someone retires from a for-profit or non-

native, you know, that institutional knowledge is gone. Ours is not gone. Hopefully it's passed down inside the family, generation to generation, until we're back in the earth.

MS. EAGLE-BLUESTONE: Thank you, Chairman Simon.

Maranda?

MS. COMPTON: Obviously, co-sign everything the chairman said. And I think long-term stability, as tribal nations, we are dealing with vast fluctuations in state and federal policy that have direct implications on what we can and cannot do. And I often see people -- you know, tribal nation governments have been governing and self-determining for thousands of years. The tricky part is for the last 250, we've done that within a context that has been imposed upon us. And it's really only been since the 1970s and the self-determination era, post-termination era, that we've been able to, as governments, increase that self-determination, increase, you know, spending on our own governments, increase our own capacity.

So by focusing on long-term programs, long-term stable funding, something that can be provided for many years, decades, that is completely necessary in this case, particularly when we're talking about a resource that will take a long time to develop, and then will be operating for a long time. It meets the scale of the resource. And to highlight something that Andy said earlier, I think those are some of the places where Native knowledge or Indigenous knowledge can help inform these systems a lot better; right? We work on a different timeframe, and sometimes that timeframe is really necessary for these kind of long-term developments.

The other two points I would just make is that this has to be a private and public endeavor. It can't just be public governments. It has to be private entities stepping up and taking on some of this as well, and leading in this space. And then the third thing I would say is capacity. And we hear a lot about tribal capacity. And, yes, that is something that we are increasing. And I think I heard Chairman's excellent remarks about, you know, getting our students into engineering,

so they can themselves marry our traditional perspective with that engineering perspective and walk in those two worlds.

But I want to really highlight governmental capacity and industry capacity as well. You all don't have tremendous capacity when it comes to the land. You all don't have tremendous capacity when it comes to working with tribes. And I think it's really important that you increase that capacity as well. And to use Chairman Simon's term from before, paternalistic, you know, the heart of that paternalism is thinking that your perspective, your goals, your knowledge, your education allows you to know what's best in that situation. And so that is not always true. I think being open, being flexible, and increasing your knowledge and capacity of tribal nations is really helpful.

You know, when a project is going in any other space to work with any other government, at least in the United States, there's a whole industry that has developed to work between entities and governments. They're lobbyists. And they hire lobbyists to go work with governments and to understand, to really understand what that government's goals are. And, you know, that kind of capacity needs to be developed in Indian country. Not that we need a bunch of lobbyists. That is not the answer. But we need folks to help navigate that space.

And so I hope that government and industry increase their capacity for working with tribal nations. And I hope that a lot of the policy decisions we're making today are durable, because it does not help anyone on a five-year development timeframe and a 50-year project if we fund something for two years.

MS. EAGLE-BLUESTONE: Thank you, Maranda.

So we're at our final question here. What do you hope that state agencies, developers, and policymakers take away from this conversation? There's definitely been a lot of impactful, I feel like somewhat heavy, items that we covered.

And I'll start with Andy.

MS. BLAIR: Kia ora. Thanks, Jess. Yeah, great conversation. I'm sure we could be here for hours going through this stuff.

I think, you know, what I want to leave with you all is that just to say that Indigenous participation creates greater economic, social, environmental outcomes from geothermal projects. Pots and pans come and go, but Indigenous people will never leave. They will be there to manage the mistakes. And if you want to ensure sustainability, support Indigenous groups to meaningfully participate in these projects. Kia oro.

MS. EAGLE-BLUESTONE: Thank you.

Aroha?

MS. CAMPBELL: Okay. Finally, I guess the one thing that I say is, to developers and to government officials, is you need us. You need us for success. Whatever you are doing, and you need us to support and to walk alongside you. So I say that to government officials, and I also say that to the chairs of companies as well, you need us if you want to develop. If you want to further your aspirations within Aotearoa, you need us. Kia ora.

THE COURT: Thank you.

Maranda?

MS. COMPTON: I like giving the last word to Chairman Simon.

Yeah, I mean, I think we've made the key points in terms of identification of where tribal nations fit into this space. And I do think that's right. We need tribal nations. The pilgrims didn't show up on these lands with lands behind their boat. They didn't drag it here. These lands have always been here and our people have always been here. And we will continue to be here. How that fits into different timeframes for capital development, I think we're handling right now. But I think there's real opportunities for that.

And so my last hope is that folks don't view tribal nations as impacted entities. We are implementing entities. We are implementing policies for our future. We are implementing

practices to maintain our lands and our connections to our resources. We are implementing governments and implementing economies. And I think really taking that view switches the conversation.

And I just want to thank the panelists here. I learned so much from you all today. And I think everyone in the audience did. So thank you for having me on one each day. (Speaking Native language.)

MS. EAGLE-BLUESTONE: Thank you.

Chairman Simon?

CHAIRMAN SIMON: Yeah, I appreciate it. This is a big one, but I think I can come down, and which I speak this as often as possible. I think in the generation that we're in right now on this world and the time that we're here for this generation, tribes are the answer. State and federal agencies and people around the world need to continue to look to the Indigenous people for the long-term survival. If anything, when you talk about resilience, you talk about nations that were slaughtered, tried to erase language, culture, everything, and we're still here. If that's not a testament to where we can help move things forward in any industry partnership with state and federal agencies, I don't know what else it is.

But it's also building that trust as we go forward. Right now, they're taking steps in California to make these small steps. Give us the funds, allow us to do the projects and partner in an honest and trustworthy building way, and we'll prove to you that we're the answer as we move forward in all these industries. So partnership, belief, and trust are going to be big for this generation.

As you can see, the success and, you know, right here on this panel of all nations, we are the answer. It really comes down to that simple. And one of these generations, hopefully this one, all state, federal agencies, and non-indigenous people on this land will come to realize that.

MS. EAGLE-BLUESTONE: Thank you, Chairman Simon. I'd like to thank you all for joining the panel. I believe we're going to turn it over for some questions. But I definitely

wanted to just kind of reiterate a couple of the common themes. And like Chairman Simon said, we're still here. We're active. We're taking -- bringing our own seat to the table, oftentimes and really working on building out our communities and our economic development in ways that haven't been seen in generations. And it's an exciting time.

So with that, I'd like to turn it over to our organizers for questions.

MR. STOKES: Yeah, thank you, Jessica. And thank you to all our panelists.

We're going to transition to the Q&A part of the panel session. And we'll start with our guest members and Commissioner Gallardo first.

COMMISSIONER GALLARDO: So I'll start by saying buenas tardes. Good afternoon. I loved hearing all the, you know, different languages that we bring here. And I think that's how we should be talking about this, geothermal and other things. So I'm really moved by so much of what was shared today. I wanted to connect the dots a little bit here too, similar to what Jessica did. So we have over 100 attendees right now listening. And that means they're taking you seriously as leaders. And Chairman Simon, I know you said you're a rookie. But you're always sharing such deep knowledge, and pun intended, with the deep and geothermal, and I appreciate that. And you're candid with us. And I think we learn more when we can have that candor as partners. And I don't disagree with you on tribes being the answer for long-term survival of, you know, all of us, all of us here.

And I want to say to all of you here that whenever I set up a table, you all are always welcome to have a seat. And I'm so grateful that you took a seat today here to be able to share your insight.

And I was just at the Indigenous Geothermal Symposium at the World Geothermal Congress in Calgary, Canada, with Jessica, Aroha, Andy, And I learned a lot there as well. And something that dawned on me while I was in the symposium especially is that there's something about geothermal that seems to have more sentiment with it. And there's a tribal elder who

I'm close with who has told me that geothermal is at the heart of the earth. And we all are of the earth, as Chairman Simon explained.

And so I think there's that connection that just feels there's something special about it. And when we see some of the features like mud pots, right, it's like the pulse of the earth letting us know that she's here, she's alive. And I think a lot of what you all talked about, about balancing cultural, philosophical with technical and other types of thinking, all relates there.

And I think that's why when it comes to sustainability, the tribes have it right because the land is so special. You're not leaving the land. It's your home. You're taking care of it. You want it to endure, not just for one generation, but for seven, if not more. And so I just think that is something that we can definitely learn from. We have to take more seriously. And I really value that you are reminding us of that because there are those of us who need those reminders. And then in terms of the engagement, I think we do need to take you seriously as partners, as humans, not as checkboxes. And doing that communication and engagement that's early, often, meaningful, and continuous, even beyond a project, right, that might last a year or a few years, we need to continue working together. So really appreciate that.

And Maranda, you said something about viewing tribes and Indigenous communities as implementers, not just as impacted entities. I think that's right. And so, I mean, I think that's a lot of the value add that tribes and Indigenous communities can bring. And so it might be a switching to a mentality of like, yes, if, and being able to talk about that, or no, because, as Aroha mentioned, there might be times when we need to have the courage to say no. And having that understanding of why, and that's okay. So really respect that.

And then in terms of the funding, heard you loud and clear on that as well. Andy, when you mentioned investing a dollar with tribes creates more prosperous and healthy communities because tribes take everyone with them, I think that's true. And that's obvious value add right there as well.

And Maranda, I think said something about how Indigenous communities and tribes think longer term. So the knowledge that you bring is that value add as well. And I think that's right. And especially with geothermal, it runs 24 hours, but it might not run forever if we don't take care of it correctly, and so I think that's important to have.

And talking about the investments, the Energy Commission has invested over \$165 million into projects throughout California for projects that are tribally led or tribally directed, tribally co-developed, et cetera, and that has meant a lot for us. And we've been able to do even more and achieve more of our goals because of that partnership we've had with the tribes and being able to do those investments. And I think we do need to be smarter and, you know, consider removing some of those restrictions that will enable us to move faster and more smoothly and to be more successful.

So we'll take that into account, all of the, you know, funding that you mentioned. And Energy Commission also thinks that it'd be wonderful if we could have a line item in the budget for the state that's for tribal energy sovereignty and enables us to have more flexibility to do the things that we want to do and be more creative and be able to listen better to tribes and Indigenous communities. So thank you for sharing. Those are some of the things I gathered. Again, it's just that there's so much that you shared. And it's really wonderful that we have this large audience to be able to listen, to learn, and to really receive that in a good way, so appreciate it.

And I'll stop there so that we can go to other questions. I see Kelsey, as well, and I know Sierra, our Director of Tribal Affairs, is on, so she might also want to ask a question.

Sierra, did you want to go first and then we'll go to others?

MS. GRAVES: That sounds great. Thank you, Commissioner. I appreciate it.

I want to start with gratitude for everyone on this panel. This was a great panel and just want to appreciate all of you for spending your time here.

My first question was for Chairman Simon in particular. Chairman, the first time we met, and this stuck with me, and I know we talk about it a lot, you said, let's build stuff instead of talking about building stuff. And so you're such an action-oriented leader in the tribal energy sovereignty space, and you really uplifted the need for funding today, mentioning things like the tribal set-asides for geothermal development, generational monies for projects, and removing barriers like limited waivers of sovereign immunity.

I'm wondering if, in the interim, while we're trying to get that gold standard tribal energy sovereignty pot of money that Maranda proposed and Commissioner Gallardo just uplifted, what are some near-term activities that Middletown Rancheria could benefit from to be able to move forward with the Middletown Rancheria's vision for geothermal development?

CHAIRMAN SIMON: Well, funding. Funding in partnership, bottom line, that's what we need. We have a vision, not always written down in the way that folks are likely to see it, that have gone through the college's education point there, but a vision of a tribe and a leader of where we need to go. There's a vision that needs to be done and needs to be funded and in partnership.

I do want, too, as we always have a chance to educate, when we talk about projects, we're speaking in language of non-Native communities. When there are dollars invested for a project, we look at it as just a first step in nation-building and then the next seven generations. And so, yes, in your eyes, it's a project. We have it on paper. You've got 18 months to perform. You're going to be paying for 12 years. I'm just going down in those terms. That isn't what we do. We have a vision, and this is only a step in that with our nation taking another step to be here forever.

And, you know, so I just always want to take a chance to educate that, but it's that partnership and that funding, and it's that first project belief. You know, it might be a small

step or just, like I said, another project. For a nation, it's that trust building of, we told you, give it to us and we'll make you see it, and we'll stand together as we celebrate the success.

MS. GRAVES: Thank you, Chairman. That was really powerful.

Commissioner, is it okay if I ask another question? Do we have time?

COMMISSIONER GALLARDO: I think so. Go ahead, Sierra.

MS. GRAVES: Okay. Great.

So my next question was rooted in something that Chairman mentioned today, walking in both worlds. And I'm wondering if Andy and Aroha can speak to some of the projects that bridged culture and geothermal Western science, and then if Maranda can speak to how you communicate this connection to developers a little bit. MS. BLAIR: Aroha, do you want to start with it? MS. CAMPBELL: I think something that comes to mind is the GNG project that Andy and I were on, and this is around superhot, and that was a five-year project. And one of things that, the questions that was asked, that I asked was, how many of the scientists that were there, including their management, and also the Board of Governors, how many of them had actually attended a treaty workshop?

So the Treaty workshop is a document that all Māori -- well, not all Māori, acknowledge, and that's the Treaty of Waitangi. And I was so surprised that none of them. And I went, oh, we need to do something about that. And so the funding was provided, it was put on from a budget perspective, and we set about putting together a two-day workshop. It was really, really good, really, really good. It was also good for me to hear, because you had in the room all different nationalities of scientists in the room, as well as management, as well. And to hear their story as well gave me that sense of when they finally come to our marae, I know them. I need to provide and our people need to provide a safe place for them to come so that they can share their stories, they can understand where we're coming from as well. That was so, so

huge. And so, therefore, I still have connections with them as well, which is great.

The second one is in regards to the scientists that do come in from a consultation perspective. They're very -- they talk about the science and they're using big words and all that type of stuff and whatnot. And so within the project, we said we need to have a -- we need to have a -- those scientific words translated into Māori so that those scientists can take that away. And it wasn't for us as Māori. It was for the scientists to help them. So when they come to our marae and they get up to do a presentation, the kupu and the words, the Māori words that they are using, we will understand what those are and the essence of those words. And that will bring closer together the scientists and our people overall.

What I will say is that there's not all scientists that will say, yes, I want to do that, you know? But for those that do, have taken it up, for those companies also that have taken it up as well, and they are also using the new kupu, as well, in their day-to-day conversations, which is really great. So when they come to talk to us, they're using those kupu and we understand what those are. It makes the conversations that much easier. MS. BLAIR: Yeah. Yeah, so to support what Aroha is saying is we basically took hostage our stakeholder engagement piece of work in a research program. And instead of the stakeholder engagement, we turned around and said, well, Brown people don't need to be educated. Our scientists and engineers need to be educated about a different world lens and a different world view.

And so we sort of turned it around and said, their brains need shaping and they need to think in a different way. And they need to think about how -- who they are when they step into an Indigenous -- at an Indigenous table. They represent the Crown, the government, everything that has happened in the past to these Indigenous groups. They're not just Joe Bloggs wanting to do some geophysics. You know, there's questions you're asking of people that you don't understand.

And so we turned around a whole program of work and made our nerds do this sort of work around treaty and understanding the history and understanding the past, which

Maranda spoke to, like how important that is. And I think there's opportunity inside science projects and research projects to turn it around and say, Western knowledge systems aren't the only knowledge systems. And that if you open your brain, your science gets better if you try and look at a different knowledge system. And I think that sort of baking that into fundamental ways of thinking for scientists and engineers will help that engagement and discussion and capacity building for future outcomes. Yeah.

Did that even answer your question, Sierra? We just like totally went off in a direction.

MS. GRAVES: Yeah. Oh, that was perfect. Thank you. Appreciate it.

MS. COMPTON: Yeah. And I think my tail end was like, how do you work with developers? I mean, I think Aroha and Andy have spoken to a big part of that already. You know, the translation component and the education components are so central. And they're central not in, I really cannot overstate this, they're central not in the way of like, oh, well, we need to check the box or even because this is the right thing to do or because we are a good company with a good -- it literally makes projects better.

And the whole development is hard; right? Developing any kind of large scale project is difficult. And in that development process, you're learning a lot of different things. You're learning about the environmental area for CEQA and NEPA. You're learning about the engineering component for how to make that resource become developed. You're learning about all these things. And if you can also invest and budget for learning about the tribal nations and native people or Indigenous people of that area, that will also make your project better.

Just like the investment in engineering, just like the investment in understanding the environmental impacts will make your permitting process better, investing in that knowledge and making space for that knowledge in your project development, I think is essential. And not because, again, not because it's like out of kindness of your heart, but because it's mission critical, because you will actually get a better product, a

better project, something that's more sustainable within the actual geographic and cultural context.

So, you know, California has a really bad history with tribes, like a very bad history. The State of California, the governor signed 18 treaties, kept them secret, hired military personnel to literally go out and murder tribal nations. And while this project that you're creating in 2026 seems very, from a linear perspective, distant from that, that time, those policies haven't really been reconciled.

And so I think the least we can do is lay truth to that, understand that history, and recognize that history so that we can eventually pivot and move forward beyond it. But all of that, all of that knowledge, all of that learning is an essential part of project development, just like these other pieces.

MS. GRAVES: Thank you. Appreciate that.

COMMISSIONER GALLARDO: Let me just check, Kelsey, are there any public questions? I wasn't sure if you're going to ask for raised hands or if you're handling it?

MS. FREEMAN: Yeah, we do have a couple of public questions in the Q&A, so I'll go to those if you all don't mind.

Thank you all so much for being here. My name is Kelsey Freeman. I'm on the Tribal Affairs Team.

The first question we have is, I know you all touched on state approach broadly, but we have a question that asks,

"How should California approach geothermal development

if/when the resource areas connected to tribal cultural resources or sacred land?"

COMMISSIONER GALLARDO: So I think that's for anyone who's willing.

MS. FREEMAN: Yeah, anyone's welcome to weigh in. Chairman?

CHAIRMAN SIMON: Chairman Simon, Middletown Rancheria.

It's direct communication with the tribal leadership in the area. Here in Lake County, let's just take for a spec, there's seven tribal nations, each and every one of us being independent. So direct communication, direct contact with our tribal nations, with the leadership down, to talk about the projects that may be happening in the ancestral land, but also look and talk about those opportunities as you move forward with your project, how to be engaged. We said, once again, having a seat at the table and helping to move the project forward.

It's really simple from my aspect. You know, we sit here for the Middletown Rancheria on 80 acres we put in trust in 1906 for the landless Miwok Indians. Now, we're also known under the CFR as the Middletown Rancheria of Pomo Indians of California because there are three different tribes on this nation.

And so that direct communication, how we move forward, we own 80 acres up to 353 altogether, you know, now, but we accessed over 900,000 acres between counties, communities, before any of these things were here. And just direct engagement. What's going on? It isn't what's happening potentially in your area, ancestral area. Anytime you put a shovel or a hole in the ground in California, you're affecting something that we have walked over.

MS. COMPTON: Yeah, and I'll just second that and say, I think a lot of people, you know, I've spoken to some developers who are like, okay, well, where can we develop that's not -- that doesn't -- that won't impact tribal lands, to which I say, nowhere. Not in the United States and certainly not in California.

And I think the first step in that is identifying a look back, right, at the history, whose ancestral lands are you on? It won't be one tribe, as the Chairman just mentioned, it will be, particularly in California, a cultural group, a historical tribe that will be tied to a contemporary tribal nation.

So I think step one is identifying who you should be talking to. And step two is going and talking to those contemporary tribal nations and seeking their input. And not

just their input in a superficial way, but seeking a dialogue about that. As you heard Aroha and the Chairman and Andy mentioned, it's a balancing; right? It's like, not all tribes are anti-development. Not all tribes are anti-development in all spaces, but they are -- tribal nations do want to understand those impacts and make some choices. That, in fact, is self-determination, the ability to make that choice.

So you will develop, I like the if/when, you will develop on ancestral tribal lands if you are developing geothermal in California. So the question is not like, how do we avoid that, but how do we do that appropriately?

CHAIRMAN SIMON: I just want to add, too, from a cultural standpoint, I'm sorry to jump back in, most of the geothermal that is done is in, usually, here in California, a mountainous range, other places. Most of these places are in ceremonial areas, as we were doing throughout our cultures.

And to understand, I think, an example here on one of our buildings -- I mean, one of our mountains, which is called Mount Konocti, which is Onukatai (phonetic) and Donukatai (phonetic). There are different tribal words throughout this. A prime example of my own experience, there is a fire lookout on top of Mount Konocti for, you know, protecting us throughout these fire disasters that have happened. I was able to train and take a tour on that with a non-Native group. A question was asked, as always is, hey, do you think tribes were here? Absolutely, tribes were here.

In that same conversation, all I had to do was look down from the stairs of the lookout tower and there were three well-defined arrowheads laying there looking at me. You see these things, they come to us as tribal people as we walk our lands. And, you know, the guide who'd been doing this for 40 years had never seen any of it. I simply picked it up, showed him the three, put it back exactly where it was and said, answered your question, were tribes here?

MS. FREEMAN: Well, I think ending with Chairman Simon is a perfect way to close this out. So thank you all so much for being here and for all your insights.

MS. EAGLE-BLUESTONE: Thank you.

COMMISSIONER GALLARDO: Thank you.

MR. STOKES: Thank you, everybody. And I'll just to bring up, we had a suggestion in the chat for a California Indigenous Geothermal Symposium. So, yeah, I'm taking consideration of that. So thank you for those suggestions.

COMMISSIONER GALLARDO: Jessica, this is for you.

CHAIRMAN SIMON: We'll be a panelist. We'll put it out there right now.

MR. STOKES: Oh, yeah.

CHAIRMAN SIMON: Show up so we can be together.

And, you know, I also want to say every step we take forward together is the best. And, you know, I have a vision one day that New Zealand and Northern California tribal are working together on geothermal, and we're growing from here. So let's work together as tribal nation, as Indigenous people.

And I want to thank the State of California and this panel to even happen. Because if you don't even know it, Indigenous people are going to work together. And we'll take the next steps and hopefully you'll follow.

MS. CAMPBELL: Thank you, everybody.

COMMISSIONER GALLARDO: Wonderful.

MR. STOKES: Thanks, everyone.

All right, so I think we're going to transition to the last panel session of the day. This one is on local and community engagement.

And I think one of the successes we see towards geothermal being successful in California is on engagement, which is why we devoted two-thirds of our first workshop today on this.

So I'm going to ask Ann Garth to come up virtually, of course. Ann is going to be doing double duty for us. She's going to present some of her work on community engagement around geothermal. And then she's going to moderate our last panel for the day.

So Ann, are you online?

MS. GARTH: I am. Thank you so much. Wonderful. I will let every panelist introduce themselves as they speak. So maybe if we can just get the slides going? Wonderful.

Thank you so much, everyone, for your attention. I know it's been a long day and really excited to share a little bit in this last panel on that public and community engagement piece. So my name is Ann Garth. I am Policy Manager for the Geothermal Team at Clean Air Task Force. And if you go to the next slide, I'll just take a brief moment to share our mission as an organization and a little bit about who we are and what we do.

We are a nonprofit working in the U.S. and around the world on numerous technologies and energy sources, including geothermal. Our goal is zero emissions, high energy planet at an affordable cost. And in the Geothermal Team, in addition to leading our policy work, I also lead our work on the social science of geothermal.

So if you go to the next slide?

We have done some research, and our goal with this work was really to understand, how does the public think about next-generation geothermal energy. And so we partnered with a leading research firm that did focus groups and surveys with representative samples of U.S. voters. This was not just folks in California, but it did include folks in California. And we used both quantitative and qualitative approaches to understand their perceptions of geothermal, specifically focusing on next-generation geothermal.

So on the next slide is our research findings. And I want to start, actually, with sort of the overall context for geothermal, so if you'll go to the next slide?

The very first question we asked at the start of our survey was about general support or opposition related to geothermal. And what you can see is that we got very strong support for geothermal, very low levels of opposition.

However, on the next slide, you can see when we asked folks who said that they support geothermal what they would

prefer most across different energy sources, only 10 percent of them said geothermal. So while there was strong support, we also see that geothermal is not a preferred technology for most of the voters who responded to our survey.

And on the next slide, we've got some quotes. These are actually from a survey that we did way back in 2023, but I think they provide some important context, indicating and kind of illustrating the anxiety, fear, uncertainty, and hesitation that many members of the general public have about geothermal. And this is not something that was just found in our research. There's been other academic work on this as well, which is really landscaped, that for a lot of folks who are not necessarily geoscience experts, geothermal is something that they have concerns about, or that they have a sort of intuitive skepticism about. It's a really complicated context of kind of public knowledge, public perception, public feeling.

And in addition to that, there's very low knowledge of geothermal. So I don't have a slide for this, but there's been a lot of research from both CATF and others, showing that most people are not familiar with geothermal energy.

So that creates a really interesting situation for understanding and thinking about public perceptions. You have an initial support for geothermal, paired with a lack of knowledge, some concerns, some of these sort of anxieties that we see, you know, illustrated here, and created a really interesting space for us to do some research.

So starting on the next slide, most of our survey work focused on concerns people have about geothermal and how to respond to them. So, as you can see, this was the first question that we asked, very straightforward, you know, here are some concerns people may have. Please tell us, you know, rate how concerning each one is to you.

And what we see is that groundwater contamination, followed by seismicity, are the concerns that really rise to the top for people. And after that, we have water use and fracking. So people are really thinking about some of these risks to the environment and to public health.

And we found that really interesting, and we wanted to understand was, and if you go to the next slide, what are the responses to a concern that will help people feel better? Essentially, what has to be true for members of the public to be reassured about geothermal development? And so we use seismicity as a case study, although I think the results are applicable more broadly, and we tested different ways you could respond to concerns about seismicity. So we have these sort of different groupings. You know, we have messages related to scientific and technical approaches to reducing risk.

We also have messages that put geothermal into a larger context, so a context of past development or context of other things in people's lives. We have messages that focus on sort of outside monitoring of geothermal projects from, you know, someone who isn't the project developer, some sort of external party. And we have a message around developer incentives. And so we wanted to see kind of which of these types of messages would be most reassuring or would help people feel less anxious about geothermal.

And so on the next slide, you can see the results. What we found is that the messages related to technical risk reduction and outside monitoring were the most reassuring, pretty notably so. They had a clean sweep of the top five. You can see the rankings on the right there.

And what I especially want to highlight is that very first message that performed the best, which mentions an automatic shutoff if shaking goes above safe levels. I think that message, while we had sort of labeled it as a technical risk reduction message, really does imply some amount of outside monitoring, right, that automatic kind of external shutoff process.

And that, along with a whole bunch of other data from elsewhere in our survey and from other people's research that I don't have time to dive into right now in depth, kind of together points to the concept that a synthesis of these two messages, the technical risk and the outside monitoring messages, is what would be most effective at addressing public concern. And I think we have seen a lot of other experimental research about seismicity, which has found very similar results.

Whether seismic risk can be controlled, policy, regulation, these are a really important factor in how people feel about seismicity and the level of concern that they have.

And so overall, if you'll go to the next slide, kind of my key takeaway from this research, and I do think that this finding applies beyond just seismicity, is that, ultimately, people want to know that geothermal is safe, very understandably. And the way that we can help make them feel that it is safe is by emphasizing data-informed safety precautions; right?

So the key message is something along the lines of there are safeguards in place, you know, from some external accountability that will minimize risk and they are informed by scientific and technical knowledge. And, of course, that message is not always accurate. And so in places where there are not safeguards in place or the safeguards have not been, you know, fully updated based on the most recent scientific and technical knowledge, there is definitely room for policymakers to kind of take action. But to the extent that this message is true, I think that is what our research indicates is most effective to convey to people.

So finally, my last slide, I want to just briefly share a little bit about who is trusted, so not just what to say, but who should be kind of doing the talking and who communities want to hear from. And this shows net trust, so people who say they do trust minus people who say they don't trust for each of these different groups or people. And we asked again in the context of seismicity, but I do think it's relevant more broadly.

It probably would not be surprising to many folks that scientists and engineers are very high on the list. Geothermal residents near geothermal energy plants, so kind of neighbors of existing projects, are also trusted quite highly. And then much lower on the list we see governments, in this case we asked about DOE, so kind of a federal government piece, as well as private companies, oil and gas companies, less trusted.

And other research aligns with these findings quite strongly. Consistently, private companies, as well as

government agencies, are lower on the trust spectrum, whereas folks in the respondents' local community tend to be ranked higher, as well as that kind of scientific expertise.

So I think it's just really important to highlight when we're speaking with communities, it matters quite a bit, actually, who's doing the speaking and who can be trusted by community members to give them accurate and unbiased information that can help them as they're kind of learning about geothermal energy.

So thank you so much. Those are my slides and I will turn it over to the next presenter.

I think the next presenter is Eddie Ahn. So Eddie is the Executive Director for Brightline Defense.

MR. AHN: Thanks, Erik. And I really enjoyed your presentation. In fact, I'll try to key off in a bit as I go through these slides.

And so for people in the room who are not familiar, Brightline Defense is an environmental justice nonprofit based in San Francisco. We've done a considerable amount of work in both state policy and direct services as it relates to the Bay Area and communities. And this slide that you see before you kind of exhibits a bit of both.

On the left-hand side is, you know, what I'll, in that top left corner, is what I'll cheerfully term as direct services. And that photo is actually based in the North Coast around looking at offshore wind, how it can potentially benefit local communities, and even trying to honestly hash out the differences that may exist around something like utility-scale clean energy.

But you'll see, you know, the contrast between the left and right is always what amuses me. On the right-hand side is me doing more of the policy work of Brightline. That's me testifying in a congressional field hearing in Morro Bay, talking about potentially what offshore wind can bring to the Central Coast.

And on the left-hand side is me sweating it out in, you know, quite literally, you know, a sweatshirt, as you can

see, trying to serve a community on its own terms. This is a barbecue that was hosted up there, where, you know, over 100 different kind of interested individuals came out. And they ranged from offshore wind developers, tribal leaders, community groups, and environmental advocates, all trying to essentially set this table to make some of these discussions move forward.

And with all that, of course, comes with investigations, coalition building, and some of the work that Brightline does. So in the bottom left, you'll see, you know, a transmission -- parts of a transmission grid. And this was next to the Morro Bay Fossil Fuel Power Plant, which is now a retired power plant, in the middle, that you can see with the three smokestacks -- I mean the foreground heating (indiscernible).

But the gist is, like what I found hardest about kind of the policy work that Brightline does and the kind of stitching together of the larger vision of equity that exists is that, as Ann mentioned, like the context setting can be quite difficult sometimes in reaching communities. So you can talk about offshore wind on a broader sense, like, oh, it will help retired peaker power plants in another part of the state, or it may help create jobs statewide.

But often with local communities where these projects are cited, it's very hard for local communities to even grasp the idea of generosity toward a community that's outside their own. And so trying to grapple with that in terms of context setting is hard, especially in an era where we consume a lot of our information through things like social media. So the way environmental misinformation, for instance, or disinformation has spread around offshore wind has been really fascinating to see. And, you know, the projects of these times, you know, the timeline of creating these projects is quite long. So even getting at kind of the right table setting and hopefully the idea that communities can come together well enough to at least accept the project, if not support it, is part of the challenge as all this information filters out.

So this first slide really gets at two components, direct services and the policy work. And then the next slide is really, you know, maybe speaking to Ann's presentation again

about the outside monitoring, the technical even risk reduction that can occur.

So this shows a bit of Brightline's work in the world of air quality monitoring, where a lot of the communities we work with tend to be low-income communities and/or communities of color that often don't interact with environmental issues on a day-to-day basis. I think that's why, you know, I've personally been attracted to environmental justice for so long, is that it's often that confluence of the environment, the economy, and identity issues.

And so the organizing and coalition and building around it has always been essential. And it's working often with diverse communities, you know, diverse in terms of race, income, even language abilities. A lot of the communities that Brightline directly serves through its service programs are in monolingual communities. So that's why you see Spanish posters and Chinese language media and something like this.

But also recognizing that you need to bring in outside trusted groups, too. And they range, you know, in and around California. It could be your community college. We worked with even a student group in Stanford, for instance, related to Bay Area air quality monitoring. But part of it is like just trying to work with diverse communities means often you have to use a wide variety of tools at your disposal and create, you know, materials that are often tailored to the local communities.

And, you know, you can see myself. These are the early days of the pandemic where we were holding up like air quality monitoring booklet that we had created around like 101 concerns. And then, you know, it can be tied to, you know, free outreach merchandise, too, whether it's like a T-shirt or tote bag or whatnot.

So a lot of it is just pounding the pavement, working with different groups, and then trying to figure out like how can we get at communities that often don't talk with each other and then ideally stitch together a broader coalition that can support something.

The third slide really speaks to like the diversity of geography that Brightline can work with, and this tends to be

showing both the urban, rural, and suburban work that, you know, often in environmental justice, like it needs to come from a sense of place and where you're actually operating.

And the communities that Brightline works with in San Francisco tend to be the hardest hit in terms of environmental injustice. So single-room occupancy buildings, if you happen to know that building stock, SRO buildings, some of the densest urban living conditions still available in America. San Francisco, for better or for worse, has chosen to maintain its SRO building housing stock as a form of low-income and very low-income housing. And then the conditions of these buildings are quite poor. But trying to get into the communities, again, talk about the environment, which is not a daily concern often in the lives of SRO tenants, and then build up community leadership accordingly has been an ongoing challenge.

Which leads me to the fourth and final slide, this notion of community empowerment and what -- how you set up, you know, these programs on a day-to-day basis and how you can tie it into these broader policy visionings or developmental conflicts that may arise from something like geothermal is -- you know, it does require ongoing engagement. It needs to be often, early, you know, and very consistent at the end of the day.

And so getting at, you know, workshops that can explain some of these conditions, ideally with the right interest groups, you can often reach communities on their own terms in ways that are surprising and actually make them into advocates, too, which is also another pleasant surprise I've come across while trying to build up something like offshore wind in California.

Of course, there's the larger concerns about how the federal administration grapples with clean energy. And, you know, I think some of those questions are quite existential at the end of the day. But I'd like to believe that the state of California is an exciting place to do this work and will continue to be a really great place to innovate and create new, you know, exciting projects like geothermal, you know, as long as we do the community outreach and coalition building portions of it right.

So with that, I'll conclude my remarks.

MR. STOKES: All right. Thanks, Eddie.

So next slide, please.

So next presenter is Melissa Kuehne from the Institute of Local Governments, who's working on an initiative called the Imperial Valley Civic Ecosystem.

Melissa, we'll turn it over to you.

MS. KUEHNE: Great. Thank you so much, Erik.

I'm Melissa Kuhn. I'm the Director of Enterprise Programs and Special Projects here at the Institute for Local Government. And I'm going to speak a little bit more broadly about not only engagement with the community, but also engagement with your local agencies on the ground and how all of those pieces are interconnected and important to move these complex infrastructure projects forward.

So I'm going to share a little bit about ILG just for context, and then I'm going to spotlight the project that Erik just mentioned down in Imperial Valley, and then more broadly speak to some of the lessons learned and things we're seeing in the field across the state.

So you can go to the next slide.

The Institute for Local Government is a statewide nonprofit. We are nonpartisan and assist local governments across the state. We were founded by the League of California Cities 70 years ago. And in those intervening years, we also now work with counties and special districts. And our mission is to really deliver practical training, easy to use resources, so that agencies can effectively implement policies on the ground.

On the next slide, you'll see what that looks like. So we have a number of issue areas we focus on that you see on the left-hand side of the screen, including leadership and governance, which is just baseline city, county, special district operations. We have a program focused on workforce, a program focused on community engagement, which is obviously connected to the conversation we're having today, as well as

sustainable communities, which is also related to the conversation today.

And so, again, we go into communities, we provide education and training, technical assistance, capacity building, to really help with that implementation piece on the ground. So we don't do the -- we don't do lobbying, like some of our other presenters at the state or federal level, but we really work with agencies to do the implementation piece, to do that outreach piece, to do that engagement piece with their community as they have to move forward with mandates that come down from the state or federal government or projects that they know that they need to move forward to help meet their community vision. On the next slide.

So as I mentioned, I'm going to hopefully connect some of these dots between the local government piece and the community resilience and community engagement piece. And our piece of the project that Erik mentioned is called BOOST.

And if you go to the next slide, just some high-level data about what we're doing down in Imperial Valley. But this iteration of the program is our third round of BOOST. And so we've worked with communities all across the state to do in-depth, flexible technical assistance and capacity building, Initially in just a sustainability space, but as we've gotten into some of these really low-capacity communities, we've built our support system around that.

So, yes, we're helping with grant writing. Yes, we're helping with infrastructure. Yes, we're helping with some energy efficiency, resiliency projects, et cetera. But we've also been able to help with some of these community engagement components, some of these really governance components to help set these communities up for success.

So about 18 months ago, two years ago, we were approached by the Energy Commission, the Strategic Growth Council and the Governor's Office about a project that they were envisioning down in Imperial Valley and adapting our model and pulling in some other components to really help support the residents and the agencies down in Imperial Valley to get them ready for this opportunity if it takes off down in the valley.

And so since that time, we have, as an ILG team, committed over 2,500 hours of technical assistance for the local governments on the ground. We've helped them apply for over \$30 million in grant funding and have been able to secure about \$6.5 million to date, with a lot more in the pipeline.

In addition to the grant writing assistance, again, as I mentioned, we've also been doing a lot of training. We've helped train some of their elected officials in governance, community engagement, grant writing. We're doing strategic planning. We're doing a number of other things, again, to help connect the dots between the community and the government so that they can move these large scale projects forward.

On the next slide, so in our experience, in our opinion, the community priorities and government capacity are interdependent. So community-based organizations, the residents obviously play a critical role in shaping priorities for the community. They're the ones setting the vision of the communities that they want to live in, that they want to work in. And the local governments on the other side are responsible for the implementation and delivery of services to meet those needs that the community has set for themselves and the community expects.

And so the outcomes are really dependent on the alignment between that community voice and the local, state, federal infrastructure and public systems that are in place in those communities as well. And when there's gaps between those two, it can really be challenging to move forward with that implementation, or at least move forward as quickly as everybody would like to see and have that meaningful impact.

So on the next slide, this is why we think we've seen success in our model and how that works on the ground. And so on the left-hand side of the screen, you'll see, we really see this as kind of a three-legged stool.

So we have the state at the table. They're setting state-level priorities. They have funding available for community and local jurisdiction. They have that connection with other levels of government. And they, again, set that stage, set those policy-level priorities in some ways. The

community-based organizations, the community obviously help elevate that community voice, help with that engagement, help highlight and elevate that community vision. And then the local governments, again, set up that implementation space. They're implementing infrastructure. They're paving the way for housing. They're thinking about resilience and climate projects and extreme heat projects, et cetera.

And so we look at all of these pieces of this conversation as critical to move, again, these projects like geothermal, forward in some of these particularly more under-resourced communities.

So this model that we're talking about in Imperial brings all of those folks to the table. And we're really working to facilitate shared learning, create regional alignment, cross-jurisdictional coordination, and really elevating underrepresented voices in the community. And ideally, since this is our third round, we're hoping this is a replicable model for capacity-building partnerships, and particularly, again, in underserved regions where folks just don't have the capacity to do all of this on their own.

So the next slide, so we also just conducted a survey, although much less scientific than the one that Ann shared. But we did a survey of our local government partners across the state. And what we're hearing and what really rose to the top were these four things in terms of needs and constraints for our local government partners. So your local agencies are prioritizing what is feasible, not what is needed, so if you're thinking about the broader context of where we're sitting right now, limited budgets, challenging hiring environments, retirement waves, uncertainty on what executive orders are going to be coming down for the federal government, uncertainty around, you know, when is the next natural disaster going to hit, all of these things. And so agencies are really prioritizing what is feasible and what they can do with their limited staff and finance capacity, as opposed to what might be really needed to meet the growing needs in our communities.

Engagement and trust challenges are compounding delivery efforts. And so you also saw on one of Ann's slides that government is not the most trusted source of information or

the most trusted partner right now. And so we work with governments on the ground to work to build that trust and rebuild that trust in some cases. But that engagement or lack thereof, whether that's because it's not being strategically implemented correctly on the local government side or the community just doesn't have the capacity to engage on the other side, obviously compounds the challenges across the board.

Limited staff capacity is slowing implementation across priorities. We're seeing, especially in Imperial that we're talking about here, some agencies have one planner in there on their staff, or none, or they can't hire engineers or they have gaps at the executive level. And so all of that's really going to slow and be a challenge for implementation, especially on large scale expensive projects.

And even, again, well-funded initiatives struggle without more internal capacity. So there are a couple of cities, one I can think of down in Imperial that had a significant amount of grant funding that they couldn't get out the door because they didn't have the staff in-house to be able to move some of those grant funded projects forward. So the capacity piece is just a huge challenge across the board, as well as the trust and just ongoing uncertainty.

And then I've got a couple of final slides, just to put a point on why capacity building is critical for local government and critical for this conversation around local and community engagement. So capacity building and focusing there can help strengthen leadership and decision making. So it really equips the local officials with the tools, the knowledge and confidence to govern effectively, whether that's training for the elected themselves, increased staff capacity so that they have the information that they need to move forward, et cetera.

It promotes equity and community trust, so ensuring more inclusive engagement and responsive services. So the more capacity on the agency side, the more they will be able to go out and do their piece of the community engagement and be more responsive to what they're hearing from community, both from a more visioning perspective, but also from a day to day service implementation perspective.

It can build long-term resilience. It helps agencies adapt to the evolving economic, environmental and social challenges. So I just mentioned that on the last slide in terms of this just era of uncertainty that we're all living in. And so making sure that they have that capacity can help to move that forward.

Finally, it can advance climate readiness. They're more prepared to address climate impacts and build sustainable communities. It supports infrastructure investment so governments can plan, fund, and maintain critical infrastructure and new infrastructure to meet growing and changing needs.

And then it can drive sustainable change, so creating lasting systems and practices that go on beyond the individuals or the individual leaders in office right now.

So with that, I will say thank you and turn it back over to Erik.

MR. STOKES: Great. Thanks, Melissa.

So our last presenter for this session for today is Harper from Fervor. I know, Harper, you have a short video, so I'm not sure if you want to play the video first or walk through your slides.

MS. HARPER: Yeah, I can. I can jump in with an introduction and turn it over to the video. And then I have a slide to close out.

So to start, hello, I'm Harper. I'm with Fervo Energy. We're a developer of enhanced geothermal systems technology. I'll be on the next workshop panel in July, and we'll talk a little bit more about our technology, what it is, how it works.

But today I really wanted to focus on the community engagement side. So I'll be showing a video that really highlights some voices from Beaver County, which is where our first greenfield development project is, Project Cape.

But just to start to introduce myself, I came into the geothermal sector from a background in environmental nonprofits, from an environmental justice background. I also worked in the

solar and battery industry. And I decided to come into the geothermal sector because the decarbonization of our grid is not equally distributed across all hours of the day. So right now, while the sun is shining, the California grid is really saturated with solar, which is great. So we have a very decarbonized grid right now. As it becomes nighttime, our grid is actually very much dependent on gas.

One of the things that I learned that really drove me to want to work in a firm technology, decarbonization technology, which means that firm means it operates 24/7, all hours of the day, I learned that if you have an electric vehicle in California and plug it in overnight, you're charging it on gas. There are some places in the country where if you plug in your electric vehicle overnight, you're charging it on coal.

And I wanted to work in an industry that would support the true full hour-by-hour decarbonization of the grid, which is why I came to Fervo about three and some months -- three years and some months ago and really have been able to see the development of our first greenfield project through many different phases.

And as the last panel on Indigenous Peoples and Tribal Nations highlighted, projects are not only, you know, not only dead in the water if a community doesn't approve, but projects are actually made significantly better when a community does support a project. And I've seen that firsthand.

So on that note, I want to share a video that highlights some of the voices from Beaver County, Utah, and the local community that have been really instrumental to our success in that project.

(Whereupon a video is played.)

"I was actually born here in Milford, Utah. And my brother and brother-in-law and my dad all worked for the railroad. It had become a railroad community. There were several hundred jobs here. It was a good living. It was a fun job.

"The railroad started cutting back on all the personnel. We went from several hundred down to probably 45 or

maybe 50 that still work there now. I was on the railroad for 32 years.

"We have everything there is to offer right here in this little valley. With geothermal, we have wind, we have solar, biofuel. We've had a small geothermal power plant up there, Roosevelt Springs. It's been there for 30-something years. And they expanded a little bit, but they just didn't want to invest the money and the new technology and the expansion and everything.

"We've seen what mining is. We've seen what the railroad has done. We've seen what Smithfield has done. They come in, they made the promise that we're going to be here forever, you know, and they up and left. And here we are now looking for Fervo. And I really think Fervo is going to be a blessing for us.

"They've really been a positive impact on me as far as a business owner of my business. Over the last few years, I would dare say tripled my business. Easy, easily. My mom's here almost every day with me. All three of my girls work every day with me, a few of my nephews. I always go to them for advice every day. I'm calling them, what do you think I should do? It's very important to have family.

"So let's talk a little bit more about how it works; right? So we were talking during the break, you guys own around 40 properties, I think you said.

"Fervo coming in has financially helped a lot of people, which is nice. And, yeah, I don't think I would have ever been even slightly interested in clean energy if it wasn't for meeting the people through my diner, getting to know the people who were involved with Fervo and clean energy.

"Milford was going through a tough time because Smithfield had just announced their intention to reduce all of their activity in the area. And the county was really suffering from that news. I walked into a room with, I thought I was just going to meet with Michaela and it was Michaela, who was the treasurer of the city at the time, Mayor Nolan Davis, and the entire city council. And I was like, okay, here I am. This is who I am from Texas. And we are a geothermal developer. We own

some leases. And we're thinking about building a project. And I want to know what acting as a good partner looks like to you all. "And so I like to joke with the mayor because he said, 'You walked in sort of as we were receiving that bad news. And I just thought you were a whippersnapper from Texas.' And I said, 'I'll believe it when I see it.' And now of course, we're very good friends. And he says he always picks up my call because he believes it now.

"I would say a lot of people on our technical teams, drilling, completions, geophysics, all of our subsurface people, a good portion of that squad derives directly from oil and gas.

"I loved my time in oil and gas. I loved the blue collar workers I worked with. I loved getting up every morning before the sun for day shift or, you know, in the afternoon for night shift and tromping around in the dirt and being really tired and dirty at the end of the day. And this is such a beautiful mix of both. I often say that this is like using my powers for good, my powers being what I developed in the oil and gas industry. And I had seen spills from operators like eating their lunch and overflowing, you know, a tub of chemical onto the ground that would ultimately seep into the water table that I was like, I knew exactly what I wanted from a spill prevention perspective, from a cleanup perspective. I didn't necessarily have trust that the operator that was coming would ensure that, you know, no harm came to our land and our aquifer.

"Geothermal energy uses heat from the earth to generate, in our case, electricity. And so what we've done is we've taken an oil and gas approach, which is drilling horizontal wells, so we have hot rock everywhere. So if there is a way that we can harvest that hot rock that exists anywhere you look across the world, then geothermal will be scalable.

"So before Fervo, I was working at a coal power plant. A lot of the similarities between a coal plant and a geothermal plant is they're both, the biggest thing is they're both baseload, 24/7 power. And the biggest difference is one is 24/7 green energy and the other's brown power.

"The impact this job's had on my life and my family's lives, it's allowed us to stay in the area, stay where we want

to be. And I'm able to, you know, to live in the community that I want to live in and be able to do the things that I love and enjoy.

"They were already waving at me. I told you they're going to give me a hard time. The one in the pink cleats, that's number, three is mine.

"My understanding of what they said they were going to do was come in here. They were going to build a business that was environmentally conscious, and they were going to hire locals and bring jobs to this area. Jobs are a huge thing in a rural community, but there's not a lot of careers. That's one thing that people say in Beaver County is that we're looking for careers, and Fervo's coming in and giving the opportunity for people like me and my young athletes.

"To have a career, to see one of your young athletes come out of high school and get a job opportunity that's not just a job but a career. And I'm getting emotional now because it was a full circle moment. That's what you want as a coach, especially when you invest in your kids in the way that we do. And his excitement came from knowing what we're about, getting to come out and experiencing it, and then now he gets to come work for us, and that was super exciting for me. I literally got teary-eyed like I am now in the job interview, and I was like, this is a proud moment. Like I think it's possible because Fervo is here.

"As a principal of a high school, as we watched this boom invest and some of those things that happen as different companies come and go, it has a huge impact on the students.

"One of the first companies that owned the mine, one of their execs met with me and said, how can we help the school? We really want to help the school. And the first thought that came to my mind was provide a steady job so that my students and their parents have a steady income so they can be stable, so then they're in an environment where they can learn.

"That's actually in progress to have happen here with Fervo. They're definitely investing in things with a long-term mindset in place.

"Fervo was donated last couple years to our program, and what we like to do is our welding pathway completers, we like to get them welding equipment so that when they're going either to a trade school or whether they're going into the field, they have some of the equipment that they need to get started. And they made a donation earlier this year, which will help this year's seniors as they go into a trade school or into the trade next year.

"The biggest problem we have here in Milford, Utah now is housing. We've been short housing for quite a few years. It's like that all over, but what makes it so difficult in Milford is we haven't had the growth. We haven't had the sustainable jobs and everything where people are willing to come back, buy a home and try to raise a family.

"In a way, it's bad. Housing would have to be top of the list, and that's what I hear most of the townspeople talking about. It's weird because there's not enough housing for the Fervo people, but it's also raising the cost of housing for the locals. The rent is just insane. People know they can charge so much because people from Fervo need a place to stay and they'll pay it.

"Locals are starting to feel rent hikes and they're starting to feel limited supply in the community. I think some of that is kind of inevitable. And going back to my whole desire to not incur boom and bust on this community, I told Michaela, 'Look, we need to ensure that housing gets built that Milford believes is sustainable for its community.' And she said, 'What I really need in order to know what housing is good is I need to reduce a zoning plan. And so I need Fervo's partnership to help me do that so I can know what housing is right for us. And so that's what we're doing today.

"That was going to be quite costly because we have to have an engineering firm out of Milford, Utah do that. And when we was talking about it, they said, 'Well, we want to help you out. We'll go ahead and make that donation.' So they made that donation. I'm just so appreciative of the collaboration that we have and their willingness to work and look at our problems.

"You know what we can see down there? You can see this plant that we've built. It's like such an extreme tangible manifestation of when you are driving towards a mission as challenging as helping to solve climate change. It's just like deeply satisfying.

"What civilization wants as a whole is clean energy. To me, they're on the forefront of it. I really feel they're going to be here for a long, long time.

"I am hopeful that we can actually succeed in making the world a better place for our kids. And then I'm like picturing this road trip down the line where, and maybe we have a van, I don't know, and we go to Zion and we go to Bryce Canyon and then we roll up here and it's like, mommy built this thing. How cool is that? That would be so cool. And Mayor Nolan will still be here for sure. So we'll hopefully go break bread at his table and it will be just really lovely."

MS. HARPER: Great. Well, I have, I think, only a couple minutes. So just to close out on my last slide, this type of engagement, we want to apply to every future project and continue with the standard of incredibly robust community engagement. So we've been collaborating with a number of nonprofits, environmental nonprofits, to create principles for responsible geothermal development. These principles are things that if any other developers want to join our trade association at the federal level, EGS DC, they have to sign on to, along with a number of other commitments to communities, to environmental sustainability and more.

So we'll get into this in the panel. But just to share, these are principles that we want to carry through into our development, no matter how quickly or fast we grow in different geographies.

Thank you so much. Appreciate it.

MR. STOKES: Great. Thanks, Harper.

So I'd like to bring Ann, as well as our other panelists, back on camera. And so Ann's going to moderate the panel discussion among our panelists.

MS. GARTH: Wonderful. Thank you so much. This has been fantastic to hear so many varied perspectives on a really important topic. I have so many questions I could ask.

And maybe what I'll start with is, if we can just do kind of a round on, in each of your experiences, what do you think communities need to see or hear from project operators in order to feel comfortable moving forward with geothermal development?

Eddie, maybe start with you.

MR. AHN: I was just going to even begin with the technology itself and the envisioning of it. One example that comes to mind in some of Brightline's offshore wind work, again, kind of like a utility-scale clean energy source that is very hard for people to imagine the size, the amount of construction, and the amount of overall resources it takes, workforce it takes to make something like that happen.

So one thing that was done by Brightline itself, and I know of another great group in the Central Coast called Seafrog that did this was using VR modules like, Oculus kind of headsets, to then have people just explore what a worksite looks like or what offshore wind installations look like. And it's relatively cheap. You know, you're not putting people literally into a helicopter ride or on a boat to go see the technology, but at least being able to put their hands around virtually what that clean energy installation entails is a first step. I wouldn't say it's all-encompassing, but it's a tool.

MS. KUEHNE: Yeah, I would completely agree with that. And thinking about proactive and authentic engagement and education, so really starting with an understanding of the community and how to talk about these projects.

I think one of the things that local government and government, I know, is very guilty of is going in and using all of these technical terms and acronyms and all of these things that go right over the head of the general community who doesn't live and breathe these types of projects. So I would definitely second what Eddie was saying in terms of making sure that they really, the community really understands what this is going to look like, what impacts this may have on their day-to-day lives,

but also taking into account how you go in and talk to the community and get feedback.

I caught the tail end of the previous panel, but thinking about things like cultural competency and language access, particularly in some of these more technical and scientific spaces, the translation and interpretation needs to be done very carefully to make sure that it literally translates to the communities that you're trying to engage with.

MS. HARPER: Yeah, I completely agree with both of those points from Melissa and Eddie. Those are critical.

And one other thing I would say there is also doing what you say you're going to do, that's actually one of our corporate values, but I think it's different being a value to actually living it. It's really important to do exactly what you say you're going to do and also not over-promise and under-deliver.

An example with geothermal projects is there's a construction phase and then there's an operation phase. So there's, during the construction phase, there's tons and tons of jobs on site. There's a million things going on because people are actually building the project. Once the project is up and running, there's fewer opportunities because there's not as many things being built.

So being really transparent with what is the construction opportunity, but then what's the career opportunity? How do those differ? How does the community interface with that? And being really transparent about not only what the project will look like in the next couple of years, but in the next few decades. Because these projects, you know, last for decades and we've seen geothermal power plants around for over a century now. So it's so important to be transparent about what the project will look like in the short and long term.

MS. GARTH: Yeah, I think it's interesting you all are saying, I think, such similar things, which really aligns with my experience as well. I've heard people say development moves at the speed of trust pretty often. But I think what I'm hearing from you all is that trust really moves at the speed of

knowledge, both technical knowledge of how something works, but also knowledge of the people building it and knowledge that they're going to do a good job. So I think that piece of it really can't be overstated.

And that's actually kind of a segue to my next question, which is around key stakeholders. We've talked a lot about engagement, respect, you know, helping communities understand. Who do you all think are the key stakeholders who are important in building community trust for geothermal deployment?

MS. KUEHNE: I'll say there's no one size fits all. It's very dependent on the community itself that you're trying to engage. When we go in and do engagement projects, one of the things that we always start with is we call it a community landscape, but it's essentially an assessment of your -- of the community you're trying to work with, you're trying to engage with. Who's going to be impacted by the project? What do your -- what does your census data look like? What do your language -- what languages are spoken? How computer literate are your community members?

And then from a government perspective, the next layer of that is we ask them to look at who do you have relationships with? So who are your existing community allies, the community-based organizations you already work with? And then what are those gaps and how can you build those relationships?

But in general, you want to make sure that the community is at the table, other agencies that are at the table, your business community is at the table, schools, academic institutions. But it really is going to be more specific to each engagement in my experience.

MR. AHN: Yeah, just to add on to that, like local community-based organizations, you know, that have been ideally embedded in the community for a long time. So the reason why I spent so much time at the front of my presentation talking about direct services is I've always considered them often the salt of the earth in terms of understanding, you know, generosity in a non-transactional sense. And if you can get those CBOs bought in, ideally, that's great.

Workforce is another angle, like it's been touched upon repeatedly, both in Harper's video and even in the earlier kind of reporting that we've done. But I guess like thinking through academic institutions in that lens, so not necessarily like the university setting, right, but like community colleges or trade schools or pre-apprenticeship programs, I really like interfacing with people who lead up that programming. Because often, again, they are working with communities that are wanting jobs, if not now, then in the short term. They're not hoping for like a job 10 to 15 years out, right, after like a recourse training program that may or may not exist.

Again, like I think what Harper said, again, about not over-promising and under-delivering is really important in that context. So when you're providing a -- what is actually the economic opportunity they can have, like realizing it's not going to be immediate, but soon enough.

MS. HARPER: Yeah, and I would also zoom in on the school element. I think there's many stakeholders, to answer your question, and across the community.

To zoom in on to the example, too, of local schools and educational facilities, I think also the quality of engagement really matters. And that doesn't just take the form of donations or positive engagement. It's also looking at some of the more hairy issues related to development. For instance, we have a seismic monitoring station at the local high school, and that's also monitored by external university partners.

So it's important not just on the, you know, the benefits front in terms of jobs and education, but also looking at, okay, how are these projects impact? You know, how are these projects impacting my community right now? And how am I a part of that conversation with monitoring what those impacts are? So I think also the quality of engagement in each place is incredibly important, and the transparency and depth of discussion.

You know, people in communities, they're fighting for the improvement and betterment of their community and the people in their communities. So being honest and transparent in each

of those places is even more essential than all of the places that you might go for that engagement.

MS. GARTH: Wonderful. Thank you so much, everyone. I think we have time for one more question, but Erik, please tell me if we don't. But I guess maybe for sort of a speed round, what, for each of you, what support do you think the state can provide in helping industry, local communities, EJ groups kind of engage with those people around supporting the deployment of geothermal? What do you think is kind of the role of maybe California in that scenario?

MR. AHN: I'll start. Brightline is always interested in what are the broader community benefits that can be provided. And if the State of California can help with being a fair referee in that, I know it's a tough thing to oversee and create, you know, uniform standards around something like a community benefits agreement. But ideally, like in my mind, government is always the group at the end of the day that brings very diverse interest groups and tries to hash out those differences. And it's never going to feel 100 percent right all the time. That's not a reality of government. But getting it to a good enough, perhaps, where the communities accept the development projects on their own terms, that's the point of a CBA or even just more broadly community benefits.

MS. KUEHNE: From my perspective, I think it's also important that the state -- we're talking about -- we're talking about building relationships and that proactive and authentic piece of this right, so it's not just in time. And so I think that that's important from a state perspective, as well, is to understand the historical context in all of these areas of the state that they may be wanting to engage in these programs with.

Harper, I appreciated your comments about the, essentially, not taking advantage of these communities; right? And so there's definitely been some under resourced communities in California that have seen these large scale projects come in, and then they're out as quickly as possible without meeting all of the promises that have been made to them. And so I think it's really important to -- it's going to sound worse than I mean it to, but managing expectations, but -- so being authentic and keeping your promises and thinking about that.

So I think, yeah, having face time, having the state understand the local intricacies of some of these areas, understanding the realities on the ground, and then support for capacity building, whether that's technical assistance, whether that's money, you know, having that support for these potentially under resourced communities to be able to meet the need for these types of projects. There's often a gap there.

And so I think the state can play a role in that, as well as a convener. When you think about these projects, there's so many state agencies that are involved in some of this. And so how can the state maybe help facilitate some of that and connect those dots so that the developers or the local agencies aren't the ones trying to figure out all of those dots?

MS. HARPER: And I'll jump in here. And I just love the study that Clean Air Task Force did that you highlighted some of the stats from. It's just so interesting. And one of the ones that sort of stuck out to me was how communities feel that the projects actually benefit their community. You know, there's, of course, you know, electricity that comes into the system, but that doesn't feel as tangible as, you know, things like money, just, you know, straight out economic benefits immediately. And one of the facts I like to share about the geothermal industry is it's actually the only renewable energy technology that pays royalties to the federal government on federally leased land. And 50 percent of those royalties go to the state, 25 percent directly to the local communities, and the last 25 percent goes to the feds. So I think that that's a standard on the federal side that directly pays out a royalty structure to communities. And it's certainly something that I think is important if our industry is to move forward and develop in other communities from the state perspective.

There are some people on this call who are far smarter than I in terms of how to apply that from a state perspective as well. But I think that there is opportunities to build in that automatic system that really supports local communities in the state in the way that they deserve.

MS. GARTH: Wonderful. Thank you, everyone.

And I think, Erik, I will turn it back over to you.

MR. STOKES: Yeah. No, thanks, Ann. Thanks to all our presenters and panelists.

We're going to transition to our last Q&A portion of the day. And I'd like to turn it over to my boss, Commissioner Gallardo, to see if she has any questions for our panelists.

COMMISSIONER GALLARDO: Thanks, Erik.

Well, first of all, I have a lot of gratitude for all of you joining us. It's really beneficial for us to get the perspectives of -- you know, from your points of expertise and experience, and so I really appreciate it. And I thought that was, you know, a great presentation, that study and the results and the findings. And something I'm sitting with is, you know, it seemed like engineers and scientists are trusted most. And I'm wondering if the ones from the state would also be trusted or if that changes, you know, if there's nuance there because of government.

And Eddie, really appreciate how you brought lessons from the work you've been doing in offshore wind and with clean air. And also that camera idea, I think, could be really valuable in particular for some projects that we're working on with our -- through our permitting proceedings. So I am also sitting with that and seeing how we can make something like that happen.

And then, Melissa, you're doing tremendous work out in the Imperial Valley. I've been a part of that and have seen how much value has come about because of, you know, smaller investment led to just such a exponentially bigger impact in terms of outcomes on training and grants and all kinds of things. And so really appreciate that you're sharing that here with us as well. And also the realities of what local government is going through in terms of their hardships of, you know, personnel capacity and other thing, so, again, taking that into consideration.

And Harper, so glad to see you again. And wonderful to see all the things that Fervo is doing here, enjoying tremendous success. And I love that you're also showing that the engagement with the community and that interaction that you all are having is part of that success. And I think that video

just speaks volumes on what it looks like for developers to be a good neighbor.

And, you know, the question that was asked by your colleague there about what does acting like a good partner mean? And being receptive to whatever that, you know, means from the eyes of the community is really important. So, you know, that's questions that all of us can ask, even at the state as well.

And also something else that struck me from the video is a comment that one of the residents said about how she became receptive to clean energy as a whole, having met the people of Fervo; right? And it comes down to like a human-to-human type of connection and their action. It makes such a big difference. That's something I heard from all of you, but really got it through that video.

And I think, you know, a key message for me from what I heard all of you say, and also the prior panel with the tribes and Indigenous communities, is that for government entities and developers, we can't be solely extractive. And that's what it often looks like with the projects that we're bringing forward. And so I think, you know, the example, Harper, you showed about those principles and sharing that with the community is a good example of how we can overcome those barriers.

And then, also, just knowing that sharing information candidly and making investments long term for a community also means benefits for the state and for the developers and the workers that are on those projects and living there. So I think Eddie and Melissa did a good job of having us learn from their example. So really enjoyed this.

And Ann, I think you captured it well about trust moving at the speed of knowledge. I think that's huge. And sometimes it's difficult to be able to share the knowledge. And sometimes we'll face communities that might not be receptive to it, but it's our responsibility to share it anyways and make sure that it's available to help increase awareness and help educate folks, you know, even if they're not willing, just put it out there. So I think that's all very important.

I'll transition to you, Erik, to see if there's any questions from the public. I want to make sure they have a chance. And if not, then I can ask something.

MR. STOKES: Yeah, so we'll take questions from the public now. So if you have a question, please chat again.

So this is from Benny Johnson with PG&E. "When collaborating with communities, are there specific considerations that are unique to California?"

Let's see if anybody wants to take this question?

MS. HARPER: I'll jump in. We haven't developed a project in California. But one of the things that I've really learned from our permitting team is in terms of ground cover. You know, when we develop and construct projects, once that development and construction is done, we have to go back and replant the region that's been disturbed.

And local BLM field offices have a ton of insight into what the correct plant coverage is and also how to integrate new native species back into -- or native species, not new, native species back into that region. And in terms of each BLM field office, that mix is going to be different. In terms of each region, that's going to be different based off of the needs.

And I think that really, really hyper-localized consideration is one area that I find fascinating. But also from a regulatory standpoint, you know, our regulations ensure that, you know, that is the approach. You can't just plant anything there. It's really specific to the region. And I think the state and regulators have been a part of creating that story and also reintroducing native species that might have been taken over by invasive species as well. So I imagine that there's that same process in California like we've seen in other places.

So just highlighting some of the great work the state is already doing to push forward a responsible development.

Any other questions from the public?

COMMISSIONER GALLARDO: Melissa, did you want to respond to that too? I saw you start to unmute.

MR. STOKES: Oh, sorry. Apologies.

COMMISSIONER GALLARDO: It's okay. It's hard to see sometimes.

MS. KUEHNE: Oh, I was just going to clarify, was the question around -- also around engagement, unique -- how to approach engagement in California versus --

MR. STOKES: Yeah.

MS. KUEHNE: Okay.

MR. STOKES: I think we're getting to talk about engagement, too, and like what might be specific to California.

MS. KUEHNE: A couple of things that I would just throw into the consideration is, one, I know the diversity exists everywhere, but I think California, more uniquely than some other parts of the country, obviously is very diverse in all of the perspectives that you can be thinking about that. And one thing to consider, particularly from an engagement perspective, is what works in San Diego isn't going to work in Fresno, isn't going to work in San Francisco, isn't going to work in Arcata, isn't going to work in El Centro. And so, again, you have to be really hyper aware of the region and community and local norms and cultural components of that community that you're trying to engage.

And then it sounded like the comment came from PG&E, and so you're probably aware of this, but the other thing that I would highlight in California is some of our regulatory environment in terms of meetings and engagement and public meetings and what that looks like, particularly when you're thinking about our elected official voices, and to be very careful of that plan in your planning for your engagement processes and making sure you're building in those timelines and not unintentionally stepping on any issues there.

MR. STOKES: We have one more question, but I think it's probably better suited, less for this panel and probably more for the general comment period.

So if no other questions, I'd just like to thank our panelists again, and I'm going to turn it back over to Sandra for the public comment period.

MS. NAKAGAWA: I was also just going to check, Commissioner Gallardo, were you able to ask all the questions you wanted for that panel?

COMMISSIONER GALLARDO: Yeah, I think that's fine. I wanted to make sure the public had a chance. So anyway, thank you, everybody. And don't be surprised if you get a follow-up request for briefings or meetings, given all the good stuff that you shared here. So much appreciated.

Thank you, Sandra.

MS. NAKAGAWA: And thank you, all the panelists and moderators for participating today.

We're now going to move on to our public comment period. One person per organization may comment, and our comments are limited to three minutes per speaker. While we welcome all comments, we're not able to respond to them during this public comment period.

The workshop notice also provides information about how you can contact us with any follow-up questions. You can also email iepr@energy.ca.gov. You can also choose to make a written comment, submit that to our docket. The deadline is July 23rd.

All right, so for our public comment period, we're going to use the Zoom raised-hand feature. That's how you'll let us know that you want to make a comment, that's if you're joining through a computer or a device. If you're joining via phone and you called in, you would hit star nine to raise your hand, and then star six to mute and unmute.

We're going to start with Zoom first, so I'm going to look to see if we have folks with raised hands who want to make public comment. We've got a few in queue. All right, we are going to start with Claire Broom. Claire, I've asked you to unmute. Let me know. Oh, looks like that worked. I'm going to be starting a three-minute timer once you begin, so go ahead.

MS. BROOME: Good afternoon. Can you hear me okay?

MS. NAKAGAWA: You're coming in loud and clear.

MS. BROOME: Great. So I'm Claire Broom with 350 Bay Area.

And first of all, I would like to congratulate the Energy Commission and presenter Dhruv Bhatnagar for using the terminology of fossil gas rather than natural gas. I noted that on your presentation, and we deeply appreciate it.

Secondly, we really appreciate the potential and are excited about what apparently can be accomplished with enhanced next-generation geothermal, so that's -- I look forward to this proceedings and discussion.

My comments are primarily related to our California electricity cost crisis. I don't have to tell you all that this is real and urgent. As we've heard strongly from Wilson Ricks, transmission cost, congestion, and delays are a substantial problem, and it's one of the real benefits of this kind of development of enhanced geothermal in the state so that you're avoiding those transmission costs and delays.

When will the Energy Commission and the Public Utility Commission use modeling which differentiates between utility-scale, large-scale solar, which requires transmission, i.e., is remote, versus front-of-the-meter solar and batteries on the distribution grid, which do not require transmission?

I would suggest, when you are looking at alternatives for resources, that the same way you are differentiating between geothermal requiring transmission and local geothermal, that the same attention be paid to solar, which is a resource that is very available, sophisticated. You are relying heavily in your modeling on CCS. I think it's pretty clear that locals, larger-scale, front-of-the-meter solar has immediate potential to address some of those needs when paired with batteries.

MS. NAKAGAWA: All right. Thank you, Claire. We, unfortunately, are at our three-minute timer now, so we are going to move on to our next speaker for public comment.

I see Fred Huetten. I'm sorry if I'm getting that last name right. Fred, I'm going to allow you to talk. You'll need to unmute from your side.

MR. HEUTTEN: Hi everybody. Can you hear me okay?

MS. NAKAGAWA: We can hear you. Go ahead, and there will be a three-minute timer --

MR. HEUTTEN: Great.

MS. NAKAGAWA: -- in the upper right-hand corner of Zoom or if you look at my Zoom window as well.

MR. HEUTTEN: Okay. Thanks. This is Fred Huetten in Portland with the Northwest Energy Coalition. Thanks, and happy Juneteenth, everyone. We operate in all four Northwest states, and also work collaboratively with organizations in California and across the West. In that regard, I'm the Lead Coordinator for the Geothermal Group of the Western Clean Energy Advocates. We really appreciate the balanced and wide-ranging workshop today.

Why would we here in the Northwest want to participate in the California proceeding? While geothermal is literally under every square mile of the planet, the Western geothermal resource is uniquely large and widely available, and it's our trust responsibility to get geothermal done right, meaning not just intentions but actions. This is a really exciting time, a new era with new challenges for geothermal. It's a great fit for our current and future energy system needs.

As we heard today, research by Stanford, by Wilson-Ricks both at Stanford -- excuse me, at Princeton and at CATF, US DOE, and many more show the extraordinary scale and immediacy of that opportunity. But with great opportunity comes great responsibility. Reflecting on the insights and guidance of the Tribal and Indigenous Panel, this is a very long game.

I toured the geysers in 2007 and saw the early stages paying a lot more serious attention to maintaining a degrading reservoir for the long run. So, as I think Andy Blair said, the reservoir is the engine. Geothermal, overall, not just the reservoir, requires a long, joint term effort -- a joint long-

term effort to manage thoughtfully, effectively, and responsibly.

We know California will coordinate with our other states in the sovereign-to-sovereign engagement with Tribal nations. We and the other Western states want to coordinate with California across all the issues, including coordinated transmission access and development, workforce and supply chain development, avoidance of cumulative impacts, support for technology innovation, environmental protection, and a community- and Tribal-first development approach. We see geothermal as an emerging and eventually foundational piece of a reliable, clean, sustainable, affordable, equitably-oriented energy system.

Thank you to the California Energy Commission and all the participants today for moving us forward.

MS. NAKAGAWA: All right, thank you, Fred.

We're going to move on to our next public comment, which is Caity Smith, XGS Energy. Caity, I think you're going to need to unmute on your side.

MS. SMITH: Yep. Are you able to hear me, Sandra?

MS. NAKAGAWA: We are. Go ahead.

MS. SMITH: Wonderful. Hi, everyone. My name is Caity Smith. I'm the Director of Stakeholder Engagement for XGS Energy.

First of all, I'd just like to say thank you to the CEC staff for organizing today's workshop and for including geothermal in this year's IEPR. And thank you to all of the speakers who have shared their knowledge and experiences with us today.

As we've heard, geothermal, particularly next-generation geothermal, has an important role to play in meeting California's reliability needs. XGS has developed a geothermal system designed to deliver clean firm power wherever there's accessible heat. This approach expands both the productivity of existing geothermal fields and opens up new areas of development across California.

I really want to underscore that for geothermal to meaningfully contribute to California's resource mix, it must translate into scalable in-state generation. Technologies that meaningfully expand where geothermal can be deployed within California, not just in limited resource areas, will be critical to reducing reliance on imports and ensuring long-term grid reliability and electricity affordability for Californians.

Much of the focus today has been on enhanced geothermal systems. However, XGS encourages the Commission to evaluate the full range of next-generation geothermal technologies during this IEPR process, including approaches that circulate water in closed pipes to access subsurface heat. These additional pathways are essential for unlocking geothermal development across a much larger portion of the state.

Given this, we recommend that the IEPR include a dedicated assessment of next-generation geothermal that explicitly evaluates the full range of approaches under development today, include both drilling-only systems and those that involve stimulation, and importantly, their potential to scale within California. Taking this broader, technology-inclusive approach is critical to fully understanding how geothermal can deliver the same, firm, in-state power at scale.

Thank you for the time.

MS. NAKAGAWA: Thank you, Caity.

We're going to move on to our next person with a hand raised, Fahad Kalamtan (phonetic). You'll have to unmute on your side.

MR. KALAMTAN: Hello?

MS. NAKAGAWA: Yep, you're coming in loud and clear.

MR. KALAMTAN: Hey, yeah, I just wanted to make a comment that the CEC doesn't really spend as much money as it should on geothermal, so I guess I have to make it more as a comment than a question. But are there any, you know, like plans to spend a good amount, like \$50 million or more, on geothermal projects? I mean, it's a 24-hour baseload energy, and we're all working for it, but the CEC's not funding it, the

Department's not funding it, so how are we going to solve this without having any investments into it?

Thank you.

MS. NAKAGAWA: Thank you, Fahad.

If anyone else would like to make a comment who is on Zoom, you can raise hand. And if you are calling in via phone, you would hit star nine to virtually raise your hand. I'm not seeing any more Zoom participants, so if anyone on the phone wants to try star nine?

All right, well, again, we welcome written comments. Those are due by close of day on Thursday, July 23rd, and instructions about how to submit written comments are in the notice for this workshop.

Commissioner Gallardo, over to you for closing remarks.

COMMISSIONER GALLARDO: I'll make them quick. Thank you so much, everybody. We realize this is a Friday, and we were here all day. It's Juneteenth. It's a wonderful way to celebrate Juneteenth with you all here through this workshop focused on clean energy and geothermal energy in particular.

We also are so grateful for all of the panelists who shared their expertise, their insight and experience. We will be considering all those ideas and already have some action items in mind.

And I want to thank the staff, in particular the IEPR Team who helped put this on, and to my team for moving this effort. And in particular, my Chief of Staff, Erik Stokes, who's leading the geothermal chapter for this IEPR.

Hopefully we get to see all of you on day two, July 9th, I believe, and yes, July 9th. We'll be looking at a whole sort of different items. And we'll also take into consideration what we heard here and see if there's anything that we need to pull from what we -- the questions that were asked today to put into our day two, that way you get more answers, including some of those questions about investments.

And there are some investments being made by the federal government now. They're very supportive of geothermal, so that adds to the reasons why we should be looking at geothermal more seriously. It's a window of time where we can maybe leverage that federal support. And the state does have some funding for geothermal. The Energy Commission, in particular, does handle some of those. So that might be something we can highlight next time better so that you all have a better understanding of what's available.

Again, thank you to everyone. Geothermal is a journey. We're really excited to be on this journey with all of you and looking forward to determining how can we make geothermal more successful in California.

Have a wonderful weekend, everyone, and see you on day two. We're adjourned.

(The meeting adjourned at 3:54 p.m.)