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CALIFORNIA ENERGY COMMISSION
LITHIUM VALLEY COMMISSION

In the matter of,	)	
	)	
Lithium Valley	)	Docket No. 20-LITHIUM-01
Commission Meeting	)	

IN PERSON AND REMOTE VIA ZOOM VIRTUAL MEETING

Primary Physical Location:
Calipatria High School Library
601 W. Main Street,
Calipatria, CA 92233

Additional Publicly Accessible Locations:
Chula Vista Office Center
637, Suite E, Chula Vista, CA 91910

Warren-Alquist State Energy Building
Rosenfeld Hearing Room
1516 Ninth Street, Sacramento, CA 95814

California Natural Resource Agency
2nd Floor, Room 2-310
715 P Street, Sacramento, CA 9581

Franklin Public Library
32455 Franklin Rd, Franklin, MI 48025

THURSDAY, JUNE 16, 2022

1:00 P.M.

Reported By:
Martha Nelson

APPEARANCES

Lithium Valley Commissioners

Silvia Paz
James Hanks
Luis Olmedo
Frank Ruiz
Jonathan Weisgall
Steve Castaneda
Roderic Dolega
Miranda Flores
Arthur Lopez (Richie)
Alice Reynolds

CEC Staff

Erica Loza
Natalie Lee
Erica Brand
Silvia Palma-Rojas

Presenters

Jared Ferguson
Jaime Asbury – Imperial Irrigation District
William Thomas – Berkshire Hathaway
Jim Turner – Controlled Thermal Resources
Jon Trujillo – Berkshire Hathaway
Michael McKibben – University of California Riverside
Tina L. Anderholt Shields – Imperial Irrigation District
Abby Rodriguez - Sparkz

Public Comment

Maria Nova-Froelich, Calipatria Mayor Pro-Tem
Brian (NO LAST NAME)– Freelance Reporter
Edward Sheer (PHONETIC) - Businessman
Eric Reyes – Comite Civico Del Valle
(INDISCERNIBLE)

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P R O C E E D I N G S

June 16, 2022 1:09 P.M.

CHAIR PAZ: Welcome to the Lithium Commission meeting. Today, we are meeting both in person and through Zoom. We are providing interpretation services in Spanish for attendees at our location here in Imperial, and those who are participating in Zoom through their computers or tablets. The Zoom interpretation does not work for attendees who are only joining by phone. A representative from the CEC will now speak in Spanish to inform our Spanish-speaking audience how to use the service.

(Pause)

Erica?

MS. LOZA: (Instructions in Spanish) Daré instrucciones a aquellos de ustedes que quieran escuchar la reunión en español. Hay un intérprete disponible a través de la plataforma Zoom. Para unirse al canal en español, haga clic en el ícono de globo pequeño en la parte inferior de la aplicación Zoom. Seleccione el canal donde dice S-p-a-n-i-s-h. Luego haga clic en la frase siguiente donde dice "Mute Original Audio" para silenciar el audio original. Si tiene preguntas o si gusta hacer algún comentario, por favor de oprimir el icono de la mano alzada y abierta o envíenos un mensaje

en español a través de la función de preguntas y respuestas para ayudarle.

Back to you, Chair Paz.

CHAIR PAZ: Thank you. Since we are now meeting with publicly accessible locations as well as online through Zoom, to have a quorum of Commissioners, we are required to have at least one Commissioner at the primary physical location that is open to the public and complies with the requirements of the Americans With Disabilities Act, referred to as ADA. All other Lithium Valley Commissioners can attend remotely from an ADA compliant location that is open to the public, and provided in the meeting notice posted at least ten days in advance of the meeting.

The only Commissioners that may deliberate, discuss, comment, vote, or count towards a quorum on any item are those attending in person at either the primary physical location or the additional remote locations listed in the ten-day notice. I will ask the CEC staff to call the roll of Commissioners. When you answer, please indicate if you are in one of the locations provided in the meeting notice, including Calipatria High School, Chula Vista Office Center, Warren-Alquist State Energy Building in Sacramento, the California Natural Resources Agency Building in Sacramento, or the

Franklin Public Library in Michigan.

If we can please call roll?

(Pause)

MS. LOZA: ——neda?

(Pause)

CHAIR PAZ: Yes, Erica, we're ready for the roll call.

MS. LOZA: Um, Commissioner Castaneda?

COMMISSIONER CASTANEDA: Present at Chula Vista Business Center, Office Center.

MS. LOZA: Thank you. Commissioner Colwell?

(Pause)

Commissioner Dolega?

COMMISSIONER DOLEGA: Present, Franklin Public Library in Michigan.

MS. LOZA: Commissioner Flores?

(Pause)

Commissioner Hanks?

COMMISSIONER HANKS: Here.

CHAIR PAZ: Calipatria High School

MS. LOZA: Commissioner Kelley —— Vice Chair Kelley

(Pause)

Commissioner Lopez?

COMMISSIONER LOPEZ: Here, personal phone.

MS. LOZA: —— Olmedo?

(Pause)

CHAIR PAZ: Erica are you on mute? Because we cannot hear you.

(Pause)

MS. LOZA: Commissioner Reynolds?

(Pause)

Commissioner Ruiz?

(Pause)

Commissioner Scott?

(Pause)

Commissioner Soto?

Commissioner Weisgall?

COMMISSIONER WEISGALL: Present, in Calipatria.

MS. LOZA: Thank you.

(Pause)

And so, I have five Commissioners present.

CHAIR PAZ: Commissioner ——

MS. LOZA: I'm going to say, uh, I'm going to say the Commissioners that are not here, let me just re-do that.

Commissioner Colwell?

Commissioner Flores?

Vice Chair Kelley?

Commissioner Olmedo?

Commissioner Reynolds?

Commissioner Ruiz?

Commissioner Scott?

Commissioner Soto?

(Pause)

Okay, there's five present.

MS. CARRILLO: Great, and before we move on, Commissioner Lopez, I'll be giving you a quick call, if you could step away from the Zoom to pick that up from our 916 number. Thank you.

MS. LEE: Hello, this is Natalie Lee. Uh, Erica and Chair Paz, perhaps you could request —— I know there were some competing meetings on calendar today. And, could each of the hosts, if there are Commissioners present at sites, if another Commissioner arrives, can you interrupt the meeting so that we can reassess quorum at that time?

CHAIR PAZ: Yes, we'll do that. Thank you.

Okay, so we do not have a quorum at the noticed physical meeting locations at this time. We will not be able to consider any motions or take votes, unless we have a quorum. However, we will continue with our agenda, discussions, and workshop as planned.

The agenda for today's meeting is shown on the

slide, and we also have printed copies here at the location. During the workshops today, public comments will be limited to three minutes. For all other items, we request that comments be limited to two minutes.

Moving into the workshop, I want to thank Commissioner Hanks and Commissioner Scott for arranging these workshops today. I understand that they have looked at ways to consider —— to consolidate these issues into one workshop as raised by the board. But, given some of the important distinction in the issues, it was determined two workshops was more appropriate.

So, I invite Commissioner Hanks to provide an initial introduction for the first workshop.

COMMISSIONER WEISGALL: Does he need a microphone?

CHAIR PAZ: I think they should be able to hear you.

UNIDENTIFIED SPEAKER: Yeah —— yeah.

CHAIR PAZ: Yes, it's on.

COMMISSIONER HANKS: Okay, page four, right?

CHAIR PAZ: Uh huh.

COMMISSIONER HANKS: Thank you, Chair Paz and Vice Chair Kelley, wherever you're at. As we all know, this Commission was requested to review, investigate, and analyze, among other topics, the potential benefits

of and added value to existing and new geothermal facilities in the areas that contain mineral rich brines for the state, the western energy grid, and the United States. Including, but not limited to, grid stability, reliability, and resiliency.

The first workshop will focus on the role of existing and new geothermal facilities in the Salton Sea region to support reliability, grid stability, resiliency, and clean energy goals. We will hear from the state, local, and the industry perspective. I would like to introduce Eric Brand, from the CEC, Jared Ferguson, from CPUC, Jaime Asbury, from the Imperial Irrigation District, who will provide the state and local perspective.

And our industry representatives, William Thomas, from Berkshire Hathaway Energy Renewables, perhaps more commonly known locally here as CalEnergy, and Jim Turner from Controlled Thermal Resources, or CTR, who will provide the perspective of existing facility owner and operator and new facility, respectively.

With that, we will kick off the first workshop. And we would —— uh, call on Erica Brand

MS. BRAND: Good afternoon. I'm Erica Brand, with the California Energy Commission's Siting,

Transmission, and Environmental Protection Division. Thank you for the opportunity to present today.

Today, I'm going to discuss the evolution of the state's clean energy goals and the current and future role of geothermal energy, as well as the CEC's planning efforts for the resource build needed to achieve SB 100. The term "resource build," is a reference to a set of generating, transmission, and integration resources identified to meet future policy and reliability goals such as SB 100.

Next slide, please.

California has an ambitious suite of clean energy and climate goals, and geothermal energy is poised to play an important role in the portfolio of solutions that will be needed to meet those goals. SB 100, the 100 Percent Clean Energy Act of 2018, requires that eligible renewable energy resources, and zero-carbon resources, supply 100 percent of total retail sales of electricity in California to end use customers, and 100 percent of electricity procured to serve all state agencies by 2045.

SB 100 also increased the state's renewable portfolio standard to ensure that at least 60 percent of the state's electricity comes from eligible renewable resources by 2030. SB 100 requires the CEC, California

Air Resources Board, and the Public Utilities Commission to prepare a joint policy report every four years, that meets certain statutory requirements. The first report was issued in 2021, and found that the state needs a significant buildout of clean energy generation over the next 25 years to meet our goals.

Next slide, please.

Geothermal energy has provided California with clean and reliable electricity for over 40 years. Expanding geothermal energy production can advance California's progress towards its statutory renewable energy and climate mandates. Geothermal energy is considered a firm resource, which is a term for generating resources that can generate electricity at any given time. In contrast, wind and solar generation can vary over the course of a day or a season.

A diverse, clean energy portfolio that includes geothermal can help spread out renewable generation more evenly during the day and the season, supporting overall grid operations and reliability. A reliable electricity system is one that takes steps to safeguard the state's power grid by meeting generation and supply challenges with cooperative planning, innovation, and equity actions. In other words, reliability means maintaining a balance between

electricity supply and demand at all times. This balance must be sustained, responding to fluctuations to electricity demand throughout the day, and must quickly be restored when there is a grid disturbance.

And for my last point on this slide, currently geothermal energy has the smallest land footprint of any comparable renewable energy generation source. These facilities are compact and use less land per gigawatt-hour than wind or utility scale solar-photovoltaic plants. In a few slides, I'll share activities that the CEC has underway related to exploring the land use implications of SB 100.

Next slide, please.

As I mentioned earlier, the first SB 100 report was released in 2021, and it was a first step to evaluating the challenges and opportunities in achieving 100 percent clean electricity by 2045. It includes an initial assessment of the additional energy resources and the resource build rates needed to achieve the goal, along with an initial assessment of associated costs.

The study explored multiple scenarios, including a core scenario, which selected 135 megawatts of new geothermal capacity in 2045. There were other scenarios. Up to two gigawatts of new geothermal capacity was selected in scenarios where limited

quantities of wind energy were available, either from other regions across the west, or offshore. It's important to note that the estimates in the 2021 report are intended to serve as a foundation for future work and will change over time as additional factors such as cost, system reliability, landuse, energy equity, and workforce needs are more closely examined.

For example, after the modeling for the 2021 report was complete, the National Renewable Energy Laboratory, or NREL for short, released the 2020 update to their annual technology baseline, which provides a consistent set of technology cost and performance data for energy analyses. The 2020 update included a 30 percent reduction in geothermal cost projections. Moving forward, if this updated cost data is used, additional quantities of geothermal energy may be selected in future rounds of SB 100 modeling.

Next slide, please.

A key finding of the 2021 SB 100 Joint Report is that achieving this goal will require sustained record-setting build rates through 2045. Including a tripling of solar and wind build rates from our 10-year historic average, and an eight-fold increase in battery build rates from 2020.

Next slide, please.

Thank you. Following the release of the 2021 report, the California Energy Commission, California Public Utilities Commission, and the California Independent System Operator, or Cal-ISO for short, initiated a collaborative process to focus on the resource build requirements to achieve SB 100.

So again, that's the set of generating, transmission, and integration resources that may be needed to meet the future goals. This slide captures some of the ongoing activities related to SB 100 analysis, and planning for the resource build.

Last summer, the CEC, CPUC, and CAISO hosted three workshops. The first workshop focused on next steps to plan for the SB 100 resource build. The second workshop focused on identifying in and out of state transmission that may be needed to achieve SB 100 goals. And the third workshop focused on energy resource and land use mapping.

Several themes emerged from participant and stakeholder feedback at those workshops. The first was recognition of the unprecedented pace and scale of the resource build and the challenge ahead to decarbonize. The second is the need for investments in the transmission system to achieve SB 100 goals. And third, that the SB 100 planning effort and the resulting

resource build needs to achieve multiple goals so that our future system is clean, reliable, equitable, resilient, and protects the environment.

Moving along, one of the first, um, products that came out after the SB 100 report was what was called a Starting Point Scenario and Resource Map, to inform the Cal-ISO's 20-year transmission outlook study. I'm going to describe that starting point document further in a couple of slides.

The final box on this timeline reflects SB 100 land use related activities that were kicked off at a workshop earlier this year. Recognizing the scale of new power plants and transmission lines that may be needed to achieve SB 100, the 2021 report included a number of recommendations related to exploring the potential land use impacts of different pathways to achieve SB 100.

So, earlier this year there was a workshop that focused on land use and energy planning. And there were a couple of key themes that emerged from that workshop from participant and stakeholder feedback. The first is that land availability for new generation and transmission is a potential barrier. The second, is that long lead times for building transmission is a potential barrier. And the third was a recommendation

to integrate communities into land use analysis for energy resource planning.

CHAIR PAZ: Erica, if I can interrupt you for——

MS. BRAND: Yeah.

CHAIR PAZ: —— a second, I just want to note for the record that we have been joined by Commissioner Olmedo and Commissioner Ruiz here in Calipatria.

Thank you, Erica, we —— we can continue.

MS. BRANS: Okay, no problem. So, related to land use, the CEC is researching and evaluating how we can consider land use impacts and integrate them into planning for future SB 100 studies.

Next slide, please.

I'm going to focus in more detail on the 2040 starting point scenario document that was released last summer. This document was designed to provide information for a wide range of potential transmission needs driven by a diverse combination of potential renewable and zero-carbon resource opportunities. This slide here shows what type of generation resource and how much was considered in the starting point scenario, so the technology assumptions in megawatts for the year 2040.

And this starting point scenario was developed by taking the 2040 SB 100 core scenario from the 2021

report and increasing assumed natural gas power plant retirements to 15 thousand megawatts by 2040, as you can see here in the red bar. The starting point scenario also included 2,332 megawatts of geothermal, which was an increase from the SB 100 core scenario. It's important to note that the use of the starting point scenario for the 20-year transmission outlook study that CAISO conducted isn't a commitment to the resource and storage mix on this slide. The energy agencies intend to consider a range of scenarios in forthcoming analytical and stakeholder work. For example, the liability assessments and land use analysis.

Next slide, please.

One of the other steps that the agencies collaborating on this document had to take was to geographically map the resources on the previous slide to specific regions. This map here on the left shows the renewable resource potential by transmission zone from the modeling done for the SB 100 Joint Agency Report, and this was used to inform the starting point scenario. On the map, you'll see geothermal resource areas shown in orange. The map on the right zooms in on the Imperial Transmission Zone.

As a starting point for CAISO's 20-year transmission study, and to more fully understand the

ability for geothermal to scale in and around the Salton Sea region, the agencies allocated most of the geothermal capacity to the Imperial Transmission Zone. Studying the transmission implications of this level of geothermal development in the Imperial Transmission Zone can help improve the inputs and assumptions in future energy system planning, including the next SB 100 Joint Agency Report.

So, moving into planning for the next SB 100 report, we're working to update the data, the methods, and the analysis for how we do this kind of geographic, um, mapping of energy resources and the analysis of land use and environmental implications.

Next slide, please.

So, picking up on that point, we have a number of SB 100 and land use related activities that we are conducting this year, and planning for moving forward. So, the first is the agencies are continuing inter-agency coordination on land use in energy resource planning. This means collaborating together on key planning processes, like SB 100, the Integrated Resource Plan, and the transmission planning process. We continue to seek stakeholder and public feedback on how the agencies can best incorporate land use implications in future planning for SB 100.

We are expanding our local outreach and engagement efforts to explore the future resource build pathways to achieve SB 100. And so, this is really an opportunity to hear perspectives on the opportunities, challenges, and how the state can better integrate state-wide electricity planning with local land use and energy planning efforts.

And finally, we're coordinating with the CEC team that's leading this year's Integrated Energy Policy Report, which will include something called the California Planning Library, where the environmental and land use analysis that I touched on in the last couple of slides, and for SB 100 moving forward, will be included. So, there will be another opportunity for engagement there.

Next slide, please.

Thank you so much for this opportunity to talk about SB 100, the role of geothermal, and some of our SB 100 implementation activities moving forward. Thank you.

(Pause)

CHAIR PAZ: (INDISCERNIBLE) announce that Commissioner Flores joined us in Sacramento at 1:18. And again, Commissioner Olmedo and Commissioner Ruiz joined us in Calipatria High School at 1:34, so I

believe we have reached quorum.

COMMISSIONER HANKS: Okay, we'll move on to our next speaker, Jared Ferguson. Jared is with the CPUC.

MR. FERGUSON: Thank you. Sorry, go ahead.

COMMISSIONER HANKS: Well I just —— going to say go ahead Mr. Ferg——

(laughter)

MR. FERGUSON: Sorry about that. Thank you for inviting me here today. My name is Jared Ferguson, and I'm an analyst with the Integrated Resource Planning Team in the Energy Division at the California Public Utilities Commission. I have a few slides here to briefly introduce the CPUC's Integrated Resource Planning, and to talk about the most recent IRP portfolio results focusing on the new geothermal resources that are included. And, to discuss how those portfolios are utilized in transmission planning.

Next slide, please.

Established by SB 350 in 2015, IRP is meant to guide the electricity sector's resource planning to help the state achieve its greenhouse gas reduction goals while maintaining that system reliability. We focus on the electric system at large, looking across the boundaries of the various load serving entities to

identify resources, optimization opportunities, and issues that may not be apparent on a individual LSE by LSE basis. We have just wrapped up the latest IRP cycle, which was guided by the state's SB 32 goal of reducing GHG emissions 40 percent by 2030, and also the need to keep the state's electricity sector on a trajectory towards achieving those deep decarbonization goals of SB 100.

A typical IRP planning cycle is divided into two parts. The first part is where the CPUC staff and commission identify an optimal resource portfolio for meeting the state's policy objectives, and then sets requirements for LSEs based on that portfolio to dev—— to develop plans for —— for their own individual resource procurement.

In the second part of the cycle, CPUC aggregates and analyzes those LSE plans and portfolios and compares that plan system produced by the LSEs to the previously identified optimal system. The CPUC then eventually adopts a final preferred resource portfolio through a commission decision, which is used for planning and procurement.

Next slide, please.

This slide is just here to show the complex electric sector planning ecosystem that IRP works in.

I'm not going to go in to too much detail on all the interrelations, but it's just to demonstrate the scale of the inter-agency coordination involved in this effort. The IRP process relies on key policy guidance from both the carb-scoping plan and SB 100, and a variety of import assumptions from —— from load assumptions taken from the CEC work and so forth.

The IRP then feeds directly into planning and procurement by those load serving entities, and also directly into the Ca —— California ISO's transmission planning process.

Next slide.

So, the recent decision in February by the PUC that adopted the Preferred System Plan did a few things, including lowering the greenhouse target down to 38 million metric tons by 2030, and included a preferred system plan portfolio for use in planning and procurement and for transmittal to the ISO.

This PSP portfolio has over 40 gigawatts of new renewable resources and storage that need to come online by 2032. In addition to including significant amounts of solar and battery storage, it also has a variety of long lead-time resources. Resources that take many years to plan and develop, such as offshore wind, long duration energy storage, and particularly,

1.1 gigawatts of geothermal, as seen in the summary table on the right.

Next slide, please.

So, this 1.1 gigawatts of new geothermal in this portfolio is —— is spurred predominantly by the recent mid-term reliability decision, which seeks to ensure there are sufficient resources online by —— in a mid-decade timeframe to ensure reliability while meeting the state's GHG goals. As part of this procurement decision, LSEs are required to procure a thousand megawatts of new clean, firm, renewable resources. And as Erica mentioned earlier, geothermal is one of these firm, renewable resources.

As part of the IRP, we then take these amounts of resources that have been identified in the portfolio and map them to specific locations through a Busbar mapping process. This Busbar mapping process is a joint effort by staff at this Commission, both the CPUC and the Energy Commissions, and, as well as the ISO, to downscale the resources selected to individual substations so that the ISO can use the portfolio in its —— in its transmission planning process.

This joint effort relies on a stakeholder vetted methodology that uses a variety of criteria to identify multiple l—— or optimal locations for these

future resources. These criteria include limiting land use and environmental impacts, utilizing available transmission capacity or identifying cost-effective transmission upgrades for the resources. And finally, aligning with commercial development interests, particularly locations where there are projects progressing through the inter-connection queues of the Cal-ISO, or the IID, and other balancing area authorities.

The most recent results of this Busbar mapping effort back in February for geothermal are shown on the table here to the right. Over half of those 1,100 megawatts are mapped to the Imperial Valley on the southern side of the Salton Sea. Then, about 400 megawatts are mapped to Nevada, interconnecting with the California ISO in Southern Nevada. And finally, small megawatt amounts are mapped to both the Eastern Sierra area south of Mono Lake, and to the geysers area in Northern California. This aligns with the development interests we're seeing, with most planned geothermal projects in the queues being concentrated in either Nevada or the Imperial area.

Next slide, please.

As I noted, the CPUC transmits these portfolios to the ISO for use in the ISO's annual

transmission planning process, which covers a ten-year time horizon to assess future reliability, economic, and policy driven transmission needs. The CPUC typically transmits multiple mapped portfolios each year for the —— the ISO to use in the TPP. The first set of portfolio is the Reliability and Policy Driven Base Case Portfolio. This is the portfolio that —— that the Cal-ISO uses to identify transmission solutions and upgrades that then can go before the ISO's board of governors for approval.

The CPUC also transmits sensitivity portfolios, which the ISO studies in the transmission planning process. However, the transmission solutions and upgrades identified in these portfolios have generally not gone up for approval. These results still provide additional insight into potential transmission needs under various scenarios and are —— and are key information sources for future IRP work.

This year's TPP, which is the 2022-23 TPP, the Commission transmitted the mapped 2021 PSP portfolio, which I just showed, as the reliability and policy driven base case for study out to the year 2032. The CPUC will also be transmitting a sensitivity portfolio by the end of June. This portfolio models a lower greenhouse gas target, and also utilizes a high

electrification load forecast from the CEC.

Additionally, this portfolio looks at the resource build needs further into the future with a study year of 2035, rather than 2032. And to wrap up with one little point of information about the TPP process, is this year I noted the portfolio included 600 megawatts of new geothermal, meaning to come online by 2032 in the Imperial area, and this is not a new development. The base-case portfolios in the previous two TPPs included similar amounts of new geothermal in the geo—— in the Imperial area.

Next slide, please.

Thank you very much. Back —— back over to the Commission.

(Pause)

COMMISSIONER HANKS: Alright, we'll move on to the third speaker, Ms. Jaime Asbury.

MS. ASBURY: Good afternoon. Thank you, on behalf of IID for allowing us to take part in this. I know Director Hanks sits on the Commission, and we're very appreciative of that. But, it's nice for us to be able to tell you how IID sees its role in the development of geothermal and what we are doing currently and in the future to facilitate that development.

Next slide, please.

A little bit about the district, just as a whole, because it —— it will make more sense in the context of —— of the information that I'm going to provide. We're a load serving entity in California with approximately 158 thousand retail customers, and a peak load on the worst hour on the worst day of summer of 1,185 megawatts.

We have internal generation resources of 629 megawatts, and we have procured resources including geothermal. And, we have additional geothermal under contract to commercially be operative in 2024 and beyond. IID is also a balancing authority, and we handle not only our load and our generation, but also additional independently owned third-party generation of 1,300 megawatts.

Next slide, please.

With regard to the existing geothermal, IID is very fortunate to be home to this really tremendous resource, and we've had interconnected geothermal facilities on our system since the late 1980's – early 1990's. We have 17 going concern plants with nameplate capacity of 652 megawatts. The existing Salton Sea KGRA capacity of that 652, 488 of it is located within the Salton Sea region. And, within the KGRA at the Salton

Sea we have CalEnergy with 11 plant and Energy Source with one plant. There are also additional resources currently in development in that area.

What is existing exports both into the California Independent System Operator Corporation Balancing Authority Area, but we are also sending a portion of it to the east to the Salt River Project in Arizona. Remaining geothermal not located within the KGRA is largely plants owned and operated by Ormat, they're located in the East Mesa and the Heber area, and West Brawley. I did want to highlight that we have significant geo and a —— and a lot of experience in geothermal resources.

Next slide, please.

We also have queued generation geothermal, specifically in our innerconnection process. Right now, our current total interconnection queue consists of 21 projects proposing a host of technologies and resource types. Biomass, geothermal, solar, and storage, and those projects combined have a proposed capacity of approximately 2,307 megawatts. IID interconnects generation by way of a process defined under its open access transmission tariff. IID's tariff is less complex than that of the ISO, because we are a traditional transmission service provider, the ISO is

more of a market in addition to being a planning authority and balancing authority.

With —— with regard to IID's current queued geothermal, there are plants proposing new capacity of 907 megawatts, all located within the Salton Sea region. We're excited about that development. We are hopeful that it all develops, that would be the best of all scenarios. And generally, the projects that are being proposed at this time are associated with secondary processes for lithium and other mineral extraction.

Next slide, please.

So, IID's been busy the last couple of months, looking at its existing system, and what we could do with what we currently have, what we can do in terms of interim measures, and what we can do for a long-term strategy to support export of this resource and this generation from the IID system. If you look at your screen, the blue line in the center is —— is largely where all of the double line, the KNKF line, is largely where all of the current geothermal aggregates, and it exports out of the IID system at the Devers Mirage intertie with Southern California Edison.

So, right now, we can export —— and we're currently exporting 750 megawatts —— it's ready for that amount. It has the ability to go almost double that as

it currently exists, and as projects come along that become real. In order to raise that, we're subject to going to another regulatory authority in order to increase that. And there's a study process associated that is underway at this time and the district is prepared to facilitate those stud——

Next slide, please.

This is what we propose as an interim solution. It's currently under way, and if you look below the double blue line, you see a line—— an indication of —— we're calling it the new geothermal switching station, because they haven't had an opportunity to be creative in naming it. But that's intended to export additional generation from the IID system into the California markets. That will take the Path 42, or the existing double line up to approximately 1,750 megawatts (INDISCERNIBLE) of export.

Next slide, please.

Then the much longer term plans that IID is looking at, is you see the yellow line above the blue line, it would take aggregated geothermal out of the Salton Sea region. It will export it up into the Devers system, but it also —— we're looking at a longer-term solution to be —— then becomes necessary for export in

the southern part of the system as well, by that sort of taupe colored proposed transmission line.

This is a proposed 500 kb backbone system. This would approximately allow us to export double what we are currently contemplating, or approximately 3,000 megawatts. Should the resource develop to that level of potential.

Next slide, please.

So, we see significant benefits of geothermal just from the system perspective and being a balancing authority in addition to it being a resource that we procure for load-serving purposes. From a system perspective, it provides grid-resiliency, it provides a level of comfort to the district, it helps us significantly integrate the intermittent resources. Erica mentioned that earlier.

Solar is tha—— we have no wind on our system, surprisingly, but we do have a —— a lot of solar interconnected to the system. And as it ramps in the morning, it's —— it's a challenge, but it's more of a challenge in the evening when it drops off, because it doesn't drop off in a glide path, it drops off rather rapidly. And, when you have a baseload resource like geothermal, it allows you —— it certainly provides, as Mr. Martinez likes to say, it's a shock absorber for

transient events on the system, and it also helps fill in the —— those valleys that we sometimes get when there's cloud cover.

Geothermal is a true baseload renewable resource with geo sources naturally occur in heat and effluent from the earth. The resource is sustainable and sta—— a stable source of generation. We have found that those operators of facilities within the Salton Sea KGRA are good stewards of that resource. That resource has been producing for over 32 years, and it doesn't show any sign of slowing down, and you —— we're hopeful that it remains stable long-term.

The technology is also evolving. Ramping capability will provide further benefits from that tip —— that particular type of resource as —— as it continues to evolve with other secondary and tertiary processes. We've had some really interesting discussions with developers and concepts. And eventually, those concepts will come to fruition.

Next slide, please.

So, the geothermal resource —— I'm going to get —— this will make more sense when we get to the next couple of slides. There's been some questions about royalties and how those come to be, and what they are.

And, the royalties are based on how the geothermal resource is used. And the resource is very clearly defined in the California Public Resources Code. I won't —— I won't read it, but it's essentially whatever comes from below the surface of the earth.

Next slide, please.

Generally, royalties arise in the context of a real property lease, or in the —— in the —— within the use of a piece of real property. IID has purchased property in the KGRA, and owners have retained that —— that IID purchased from have retained mineral rights. So, that would make a little more sense when we get a couple of slides down.

But generally, royalties are based on use and how the use of the geothermal resource arises. If that resource is produced on the property, or unitized, you know, grouping —— groupings of land within a unit. As electricity is generated by a facility using the resource, or minerals that are extracted from the resource produced from the property, the royalty and the value of the royalty is generally a negotiated rate, and it is generally determined based upon the type of transaction.

For example, if you're selling the resource, it's a certain percentage of gross production. If you

are producing energy, it's a val—— it's a percentage based on whatever that gross production is. Or, if there are minerals extracted, it is based on, again, negotiated value, but based on it—— whether it be ton or whether it be whatever other measurement is used within the context of that negotiated agreement. Again, they generally arise in the context of a real property lease or reserved the right under the deed.

Next slide, please.

So, mineral royalties —— and we've most recently entered into a lease on property that IID owns with a private developer. And, we will receive payment from the sale or use of the resource, or extracted mineral from (INDISCERNIBLE) or receive payment from instead of lessee. But it will be dependent upon the type of the transaction. It's generally based upon, again, gross production, and the value is negotiated at the outset of the agreement.

Whether or not, for example, IID leased part —— a parcel of property, there is intended to be generation source there, IID has also entered into a power purchase arrangement with the lessee of that property. So, whether or not we take generation from that resource, eventually, will —— the value that we'll pay, and —— or

will be paid in terms of royalties on the other side of the transaction, will be based on what the negotiated percentage is within the agreement. Probably doesn't make a lot of sense. It makes a lot more sense in the context of the documents themselves.

Next slide, please.

So currently, what those projects that are interconnected, the existing geothermal plants that have been online many, many years, and which were nego—— negotiated many, many years ago, IID receives approximately $400 thousand dollars annually, plus or minus, based upon the gross production that comes from those geothermal facilities.

In large measure, that comes from the electricity generated, and from no other source. And recognize that some of these royalties are less than, you know, one tenth of one percent. Royalties in this situation, for the existing geothermal, are paid into a lease and there are 20 remaining overriding royalty holders to whom IID pays a proportional share of the annual interest, and it's based on interest they've retained under separate agreements.

For example, repurchased property —— they retain the mineral rights, but we've now leased the properties so they are entitled to a share of the

royalties that are generated. And the value of future royalties that may be payable to IID, or to any other third party, will be dependent upon the gross production and how that resource is used going forward.

So, awful lot of information, but what I would also like to say today is, it's very clear that all of these things —— all of these agencies have a very significant and important role in planning and assessing and implementing getting this resource online and able, in support of the California grid and from other —— for other load serving entities within California. And so, we're certainly happy to be part of that solution for the state, and appreciate very much the time today, and would be happy to take any questions at the appropriate time.

(Pause)

COMMISSIONER HANKS: On to our next presenter, Jim Turner, with Controlled Thermal Resources. Oh, pardon me, I skipped over. We'll move to William Thomas with Berkshire Hathaway.

MR. THOMAS: Good afternoon, everybody, thanks for having me today. So, my name is William Thomas.

(AUDIO FEEDBACK)

(Pause)

Good? Geothermal Resource Director at

CalEnergy, or Berkshire Hathaway Energy Renewables. I work here in Calipat, right at the field. And, just a little bit of background. I don't have a presentation today, I apologize. I just wanted to give a little bit of background about what we do on the day-to-day basis out there.

COMMISSIONER HANKS: I'm not sure if the audience —— I'm not sure if you're close enough to the mic.

MR. THOMAS: Can you hear me there?

COMMISSIONER HANKS: Yes, excellent, thank you.

MR. THOMAS: Excellent, thanks. So, just a little bit of background there. For, for the facilities at CalEnergy, BHE Renewables have been operating out there for the past 40 years or so. Currently, we operate 345 megawatts out of various units. Those 345 are operated with about 60 —— 60 wells, both production and injection wells. That's a daily operation, really, of maintaining those wells, making sure we continue to deliver those 345 megawatts.

And, I think over those 40 years, we've really continued to look at the—— the resource and ha—— and h—— the sustainability of that resource. So, having the ability to produce those 345 megawatts for a —— for a

period of time without really having reservoir decline gives us the confidence to continue to —— to, to operate at that rate for —— for years to come.

In addition to that, I think we know the —— the Salton Sea area, the KGRA, is really a robust geothermal reservoir, one of the —— if not arguably the largest geothermal reservoir in the world. And it is underdeveloped at the moment. And, so, not only our goal is to continue to operate the 345 megawatts, but really to also grow and help support SB 100 and continue to expand in the area in a sustainable manner. I think over the years of having —— having the ability to operate at that 345 megawatts really shows that it is truly a renewable, where we can sustain that amount.

Not all geothermal projects —— often times they're not able to do that. We have that history to show that, um, that we've been able to do that and plan to continue to do that. Like I said, I really —— I didn't have a presentation here today, so, I'm here, happy to answer any other questions that we have after the —— after the rest of the talks.

COMMISSIONER HANKS: Thank you.

(Pause)

MR. TURNER: Good. Thank you for the

opportunity today, my name's Jim Turner. I'm the Chief Operating Officer at Controlled Thermal Resources, and for those of you who don't know me already, I've been associated with all the geothermal plants at the Salton Sea in one form or another, generally senior management, since 1993.

Built several of them, so I have a fairly long history on that resource. And first of all, I don't have any slides. Knowing I was going to go last, I figured that the other presenters probably would say pretty much everything I was going to say anyway. But I would like to make some comments on —— on top of what's already been said.

The very first one is what Billy Thomas just mentioned about the longevity of the Salton Sea geothermal resource. And that is a testament to the reservoir engineers, reservoir managers, and the people that —— that actually operate that reservoir for their knowledge and expertise, and —— and actually making that reservoir as robust and as healthy as it is.

We can all point to other areas in the world where that hasn't been done, but these Salton Sea is definitely a shining example. CalEnergy has led the way, Magma Unocal before that, but it is a, definitely a testament to those people.

To echo just a couple of things that Jamie mentioned. These plants are highly resilient. They have a —— a very positive addition to the grid. They act as a spring so that if something happens on the grid, to a fair extent, because they are such a large rotating mass, they can help keep that grid stable. We all need that, we want to be able to go home at night, hit the switch, turn the lights on, make sure the air conditioning is working, especially down around here. And, and, these geothermal plants, because of their design, are some of the most stable plants globally. If you go back to 2011, if some of you remember we had a large outage in Southern California. I think the only plants that remained running when that grid went down were the geothermal plants out here. They definitely helped IID get started again when their grid was cleared for operation.

So, these have a remarkable addition to grid stability. The one thing about these plants though, is that they do take a lo—— a fair amount of time to develop. It's not something that you can start today and it's running tomorrow or next year or the year after. Typically, the development time for these plants might be anywhere from five years, probably at the best, to maybe eight or nine years, depending upon your

researchers you have at your availability.

The other thing I'd like to mention, to echo some of what Jamie had to say, is that we desperately need good transmission and good transmission paths to move this power out to the rest of California. We're —— we're located in a wonderful area, except for the real high loads are over in the coast, as many of you know, and the transmission paths to get that power over there are fairly limited, and those that exist are pretty congested.

So, if there's one thing to re—— to remember and maybe bring back to other people, is we need those transmission paths in order to be able to move this power out of the valley. We —— we won't be able to use all of the power here in the valley because we are rural, however, we can satisfy a good portion of what the Imperial Valley needs, and then still have some leftover when we fully develop the Salton Sea resource.

They are capital intensive. This is a —— a significant resource, in that it has some corrosive materials in that brine. And so, you typically do not build these plants out of carbon steel. You end up using alloy material that is expensive, and today, as we've seen in some of the supply chain issues around the world, they take a long time to obtain if you're

building new plants.

And the Salton Sea resource, I don't think anybody's mentioned what the current capacity projection is of this, and it's a little bit of an estimate, but it's close to 3,000 megawatts. And as you heard from others, there's only probably close to 500 megawatts that's currently being produced. So, we have a lot of energy we can still produce from this reservoir and still maintain its robustness and —— and longevity.

So, a lot of us are trying to do that, but again, these —— these take a while to develop and, and get to where they're operational.

The last thing is, we all want clean air. And this is one of those renewable resources that provides a lot of good electricity and very little dent on the clean air. So, this is one that we need, it's robust, it runs 24 hours a day seven days a week. We can go a number of years in between major overhauls on these type of plants, and so their uptime is phenomenal.

If I go back to the 1990's when I was at CalEnergy, we actually received a letter from Southern Cal Edison that we had the highest capacity factor, which means the —— the most megawatts for the size plants that we have, of any third-party generator on Southern Cal Edison's list.

That was quite an honor, and what it means is that the operators and the maintenance personnel that actually run these plants, you know, can do in a —— a, just a fabulous job at keeping them operating. So, with that, I'll end.

CHAIR PAZ: Well, thank you to our presenters. And I want to thank —— all the presentations were very informative. We now have an opportunity for any Commissioners to pose questions for the panelists. And then we will go to public comment after that. Before I start calling on Commissioners, I do want to note that Commissioner Reynolds joined the meeting in Sacramento at 2:07.

I have a couple of questions, so maybe I'll start. So, to summarize the state perspectives, what I heard is that geothermal is going to play an important role to help us achieve the 2045 clean energy goals, right, 100 percent. What I didn't hear in, you know, just layman's terms, it's like, what percentage —— out of the portfolio, what percentage is —— is it going coming from geothermal, and what is determining that value?

(Pause)

COMMISSIONER HANKS: Do you have any particular person you ——

CHAIR PAZ: So, I think maybe the people from the state who —— I don't know who was —— both Erica or Jared?

MS. BRAND: Hi, Commissioner. I would have to look at the portfolios and provide a range back of a percentage. I don't have that off the top of my head, I apologize for that, but I'm happy to follow up.

CHAIR PAZ: Thank you. Okay, so my next question, and the reason why I'm asking is —— well, they're, we're —— this is the Lithium Commission, right? And, my other question is how does lithium extraction affect geothermal? We're going to speak about the challenges in the next panel, but I also wanted to understand, as we are starting to remove lithium from the geothermal, what is going to be the effect on the geothermal itself?

And another question related to that is, will it increase the need for geothermal plants? And maybe some of the developers can answer that question?

MR. TURNER: Sure. This is Jim Turner again. First question, regarding if we extract ——

(AUDIO FEEDBACK)

I have an echo.

Okay. If we extract lithium, lithium only exists in the brine in the parts per million range. If

you extract lithium from that brine, although you extract lithium from it, the resulting brine just about looks identical to what it looked like before you took the lithium out. There's no chemical change occurring in the brine as a result of extracting the lithium. The brine can go back in the ground, it can obtain more energy from the heat in the earth and be just as renewable as it ever was. And —— and if someone were to analyze the brine, basically do an analytical technique, all they would see is that the lithium is —— most of it is probably, you know, gone.

The second question is probably the more important one, in that I —— from my perspective, what lithium does is it helps us spread the cost of the infrastructure to obtain renewable electricity. The wells that we drill are terribly expensive. They could be $10-15 million per well because of the high cost of the alloys. It's expensive to drill.

The infrastructure, moving the brine to where it needs to be for processing is expensive, and if we can add a lithium extraction plant utilizing those assets, whether they're brand new or whether they're existing, that helps spread that cost. And —— and that is a good thing, you know, for any kind of an operating company.

So, that's where I see that part on the cost, and I think going forward, as we —— as we get used to and we develop new technology for lithium, integrating extraction with the production of power is, I think, going to help us reduce our development and capital costs even further. And —— which reduces the overall costs, whether it's electricity or —— or the lithium, and that's, I think, our hope, and I'm sure shared by everybody else that's in this business.

(Pause)

COMMISSIONER HANKS: Quick comment and then a question.

CHAIR PAZ: That is Commissioner Hanks. So, if you can say your names when you speak.

COMMISSIONER HANKS: Jim Hanks, with the IID. And I don't know —— hope I don't get into an area where I shouldn't go. If I do, I'm sure Jaime's going to stop me, okay.

I'll —— when —— when the PPA was negotiated with IID, there was consideration given to the cost of that PPA. Basically, a credit because the —— of the lithium extraction, which benefits all of the IID energy customers in both the Imperial Valley and the Coachella Valley, is that not correct?

MS. ASBURY: That is correct. So, we are buying energy from a independent power producer, and they are paying back to us a royalty on the use of the geothermal resource, and those royalties will be different and augmented by the fact that they're using the resource and they're generating electricity from it. So, that's one bucket or two buckets of royalties.

The third bucket will be to the extent there's a lithium extraction component that will augment, that will be additional revenue that comes back to IID under the lease agreement. So, it's a series of interrelated agreements. But, we buy from them, and then we receive revenue back from them based on what they've produced.

COMMISSIONER HANKS: Okay. My second question, again, Jim Hanks, and I'll address this one to Jim Turner. What would you say is the percent, say, of a 50-megawatt flat, and with the, the extraction of —— of the recovery of the lithium, what percent of it —— of that generation would be used for recovery purpose and what would be available for export?

MR. TURNER: This is Jim Turner again. Excellent question. Our estimates would be probably just under half of our overall generation would be used for the lithium plant. Obviously, it depends on the technology one chooses, and the particular lithium

compound that you're trying to make.

Just to give you an example, if you're making lithium hydroxide, which is highly sought after especially by the US auto makers, and —— and you make it via a chemical reaction process, you'll use one amount of electricity. If you decide to make lithium hydroxide from an electrochemical process where you actually put electricity into the solution and you make lithium hydroxide that way, you tend to use more electricity for a ton of lithium hydroxide. So, it depends on the type of process.

But in general terms, we expect that it would be just under half the production of electricity would be used internally for lithium compound production, and then the other half is available for sale to others.

COMMISSIONER HANKS: So, now I'm going to show you what I don't know. I hear —— I hear quite often ——

(AUDIO FEEDBACK)

I hear quite often that the geothermal has great value as far as inertia and frequency. Can you just, from a very eye level, tell us what that value is, and how valuable that would be to, to the grid?

MR. TURNER: I don't know if I can put it in numbers. This is Jim Turner. But, one way —— one way to look at this is, if you get home at night from work, and

your air conditioner's not running, and the lights won't turn on, how valuable is that? And it's July out here, and it's 114 degrees. I mean, it's like in the old days when we had dial up telephones and all of the sudden they didn't work. That's when we started about how valuable, you know, the telephone is.

Well, the spring in the system, Jaime Asbury mentioned it as —— I forget the term she had up here, but I use the word spring, she had shock absorber. So that when we get upsets in the transmission grid, those rotating generators and turbines, because they are so heavy, are able to absorb some of that upset. And —— and so, these plants all have rotating masses. And even though they're not gigantic like a nuclear plant generator, combined, they do provide a lot of spring to the system. And so, there's been lots of studies to try to put a dollar amount on that spring, and the —— I know there are dollar amounts out there, but the real value is when you go home at night and it's been 116 degrees outside and you find your air conditioner's off and the lights don't work and you can't find anything, what's the real value of —— of that event?

And —— and quite often, by the time that event happens, the value goes sky high. While we're all

sitting here today the lights are on, it's cool in here, people tend to put a lower value on that spring, if they put a value on it at all. So, it's one of those mystical characteristics of the types of generators that we use in this business that helps us to be comfortable with the air conditioner on and the lights working.

(Pause)

CHAIR PAZ: Any other questions from Commissioners here in Calipatria?

COMMISSIONER WEISGALL: I do. Luis, you, I'm sure you Luis. Why don't you go ahead.

COMMISSIONER OLMEDO: This is Luis Olmedo, and, I —— I know this is not what you're talking about. But I always have a sensitive spot whenever —— you know one situation I always hear is about, well do you want jobs or do you want this. And I, I almost felt that that's where you were going with your example. I don't think you were, but just for far too long disadvantaged communities are always in a situation where it's like it's this or that, you know. And we can have it all. It all can be done and —— and again it's not in anything you said —— I just —— my, my brain, it's already very sensitive spot to whenever I hear anything that is leaning in that direction, because, you know, year after

year, decade after decade, it's —— it's always a tradeoff, you know. And these tradeoffs seem to be much more profound in disadvantaged communities. And —— and here, you know I've —— I'm very optimistic of what could happen with the opportunities in front of us.

Again, nothing you said I think, but, just reminded me —— just a good reminder, right, that I think we're living in a different time. That —— you know, what's one of the main priorities have been very clear, and is that, you know, there —— there can be and there will be a —— a path of equity and justice, you know. And, you know —— and I sometimes say the win-win plan, right? Industry succeeds, the community succeeds, right? So, thank you, that's all. I don't have any other questions.

CHAIR PAZ: Thank you. Commissioner Weisgall?

COMMISSIONER WEISGALL: Sure. Number of different points. Number one, I'm no expert, Chair, but I —— I think geothermal now constitutes about six percent of the total load in California. But let's just make a note to ask Erica to follow up. Let's —— and, and Erica, let's assume that thousand megawatts comes online. I think it would be useful to know —— get a good guess as to what that mix will be. Obviously, that's going to be

tough because there are very broad assumptions about offshore wind, for example, that —— that have their own challenges. But, I think it will be very important for us to —— to nail that down.

Jim Turner, you —— you talked about the 2011 outage, and just now even that spring or shock absorber capability. Black start is another term that's used. Can you talk about that in terms of the value of geothermal?

(Pause)

MR. TURNER: This is, if a power plant is down, usually you need a little bit of power in order to be able to start it up. Yeah, it's ju—— actually it's just like your car. You have a battery in your car. That provides a little bit of power to get the engine turning and started, and then it basically goes by itself and at the same time in a car, of course, it recharges your battery, hopefully.

So, in these geothermal plants, the way that most of them at the Salton Sea are designed —— not, not all of them have that design, but most of them are. I think there's one that doesn't. We designed these so that we have a —— an auxiliary generator, and if the plant is cold, it's down all the way, it's not operating

— and the — the grid system is down, so there's no electricity that we can actually pull in from the grid, we can start these plants with a little bit of help from that generator that we use for either emergency purposes or for black start. We can get the generator — the power plant running.

Once it's running, and I mention this on that 2011 example when we had the outage, if the gas turbine, say that IID has, if they don't have the ability to start themselves with some extra power coming from somewhere and the grid is operational, then our plants, our geothermal plants, can provide the power needed for IID to start the rest of their generator system. So, there's — there's a benefit there.

And in one case, you can tab your generator, or note it, as a black start generator. If you do, you have to do extra things periodically to test it and so forth. But, because these — these generators either can start with the help of a small little diesel gen— driven generator, or more importantly, if the grid goes down, our generators out here are designed — and — and this goes for all the plants, whether it's Energy Source, CalEnergy, and ours when we build them — they're designed so that they don't turn off, they go down to

where they're operating just enough power to be able to run the plant itself, we call it house. It —— it goes down to house load.

Then when the grid is operational again, we basically in effect become a black start generator that can help others get up and running. So, there are some characteristics of the way we designed these plants, and all of us design them this way today, that actually provides a —— a real help to IID out here if we were to lose all the power on the grid like we did in 2011.

COMMISSIONER WEISGALL: So, also what you're saying is the grid can go down, but mother nature doesn't go down, and that's where geothermal has an advantage over other resources. Is that a good way to——

MR. TURNER: Absolutely. That's a really good way to put it. You know, mother nature is there, we don't mess with mother nature. We don't mess with mother nature, you know, the heat's still there, and we can keep these plants running and actually be the assistance for the rest of the generation system to get going.

COMMISSIONER WEISGALL: Are you aware that (INDISCERNIBLE) pay for that value?

MR. TURNER: They —— they ——

(AUDIO FEEDBACK)

They do —— they do pay for it wrapped into the rate that we all charge for a kilowatt-hour of energy. We don't —— we don't try to separate out those attributes. We actually, when we do our economic analysis on these plants, we look at the —— the price we need to charge for energy so that we have acceptable economics for the owner of the company, the shareholders et cetera. And —— and we get things wrapped in with it like the ability to black start, the spring that we talked about, the resiliency portion, all those characteristics as well as the —— the notation that it's clean energy. It all goes with every kilowatt of energy that goes out.

COMMISSIONER WEISGALL: (OFF MIC)

MR. TURNER: Actually, they could ——

(AUDIO FEEDBACK)

(Pause)

—— the sun shining, they're making power. Whether or not they're making enough power to help start up a —— a remote generator somewhere is, that's a question. And the same for wind. If the wind is blowing, and the propellors are turning, they have the ability to generate power. The question is, is it enough power to start, say, a gas turbine in the area or

some other significant power plant.

COMMISSIONER WEISGALL: Another question for you ——

(OFF MIC)

—— that's not the case elsewhere. Can you tell us a little bit about the geysers, because that's usually held up as an example where things did not work out as well as they should have, but there were solutions found.

MR. TURNER: I wasn't going to use that as my example. I didn't, but I will, now that you've asked. The geysers —— the geothermal industry learned a lot from the development of the geysers back in the 1960's. The geysers was originally thought that it would put out somewhere near 2,000 megawatts. So, some of the infrastructure was installed for that.

Basically, they had too many straws in the milkshake, and what happened by, oh, the 1990's I suppose, the —— the ability for the subsurface reservoir, which is the steam reservoir at the geysers, was not enough to sustain as many megawatts as they had installed power plants. And so, their power output dropped.

And they did do some marvelous things. They actually inject water into that reservoir, it's hot, and

produce steam, and they've been able to maintain a production rate today —— I think it's around 900 megawatts, somewhere in that range. Much less than the original output that they thought they could achieve out of the geysers. And everybody learned from that.

Now, this was 50, 60 —— 60 years ago, when —— when those lessons were starting to be learned. And, and so again, when you look at the Salton Sea reservoir, and I'm sure a number of other reservoirs around the world, those engineers and scientists that —— that work on that facet of geothermal production, they —— they actually have done a marvelous job out here.

As a General Manager of CalEnergy when I ran it, and same thing with EnergySource, sometimes you get frustrated because you want them to draw more out of that reservoir, but, you know, they say no and pound their fist on the —— on the table, and you know, you listen to them. And when you look back five or ten years, you know —— you know exactly why that reservoir is as healthy as it is. It's because of those men and women who, you know, insisted that we run it in a certain way.

COMMISSIONER WEISGALL: Tell us a little bit —— distinguish between the geothermal reservoir at the

geysers and the um, at —— and the nature of the geothermal reservoir here at the Salton Sea, especially regarding brine and, and steam issues, things like that.

MR. TURNER: Sorry, can you repeat that?

COMMISSIONER WEISGALL: Disting—— tell us the difference between the, the resources up at the —— the geothermal resource up at the geysers vs the geothermal resource here.

MR. TURNER: This is probably better answered by Jon, however I'll just —— just quickly tell you that this is a liquid dominated resource. So, the reservoir down below is basically saturated with liquid brine. It's very hot, it's under pressure, and we just tap into that. We bring brine out, we extract the energy in the form of steam, then we put the brine back in, let mother nature heat it back up.

The geysers, basically, is a gigantic block of granite about 10,000 feet or so down in the ground, and it's hot. It's surface is about 600 degrees Fahrenheit, an what it does is it boils any moisture in the 10,000 feet above it enough so that it becomes pretty high pressure steam. And so, at the geysers, the wells extract steam, and they're able to put that right into the turbine, after they clean it up a bit, and make electricity.

We have to take an additional step down here. We bring up the liquid brine, we put it into a vessel that's about half full, and as soon as you do that and open the valve at the top, it's like a pressure cooker on your stove, steam comes out of the water, water temperature goes down, the steam gets cleaned up, goes into a turbine.

COMMISSIONER WEISGALL: So, you're telling me that the —— (OFF MIC)

—— with you and (INDISCERNIBLE) real quick questions. Jaime, I just want to clarify that the royalties you've talked about are all based on percentage and not flat rate numbers. Is that a correct statement? In terms of ——

MS. ASBURY: That is correct, and they —— the amount of percentage varies based on the use of the resource. Correct.

COMMISSIONER WEISGALL: Excellent. Question for either Erica or Jared. You know, we heard about the PSP, we heard about the IRP, we hear about the TPP. Erica, you showed a slide, it was number 17, it's the one that showed the 15,000 megawatts of gas coming off and then the additional increments that are needed.

Where —— where does the transmission need come

into that planning process? Is it a fair statement to say that you make the calculations of what's needed, and then you send all of that to the CalISO to do its transmission planning? Or does the need for transmission come in earlier in that process? Or something else, I don't —— would like some clarification.

MS. ASBURY: Yes, so that slide I shared was from the 2040 starting point scenario document that was prepared last summer with the CEC, CPUC, and CalISO for the purposes of informing the 20-year transmission outlook that CAISO then —— then performed, which looked 20 years ahead, potential transmission needs based upon that scenario. And that 20-year transmission outlook became available from CAISO earlier this year, the results of that.

COMMISSIONER WEISGALL: Okay. I may have more but let —— let me stop there and turn it back to you, Chair. Th——

CHAIR PAZ: Thank you. I saw Commissioner Frank Ruiz, you had a question.

COMMISSIONER RUIZ: Yeah, thank you. Frank Ruiz, here. This question has two parts, and I'm trying to put it in layman terms so that everyone can understand. You were referring as these form of energy

as one of the more —— of the most not just consistent, but reliable. And so, the question is, what can interrupt, you know, this —— this really reliable form of electricity? Especially as, you know, it will continue to increase, you know, because of lithium extraction.

And the second is, if it is reliable 24/7, and in 360 days, how many of those dates, you know, is this energy running, right? Because you had mentioned that this is a very corrosive, you know, that —— you know, way of, you know, extracting energy, and —— and it requires a lot of maintenance.

MR. TURNER: I'll answer the second question first.

COMMISSIONER RUIZ: Okay.

MR. TURNER: So ,the seco——

(AUDIO FEEDBACK)

The second question about reliability. To give you an example, and I'll —— I'll use CalEnergy because that's the most familiar with the history there. In the early days, Magma Power made all their plants out of carbon steal. Unocal made one plant with expensive alloy materials, and there were two different thoughts on —— on how to have what we call high operating factors, in other words the plant is up running full speed for as

many days as you can.

And the right answer was probably a mix of what those two companies were doing. You want to have alloy material and you monitor the chemistry. These plants typically, when —— when we do a financial model when we're developing a plant out here at the Salton Sea, I think most of use 95 percent of the time, it's up running at a 100 percent output in our model.

With good operating procedure, good maintenance procedure, and you have built that plant out of good materials, not just carbon steel, these plants really run probably better than 98 percent of the time. And a —— a lot of that is because of the training of the people who operate and maintain. Their experience and their expertise goes a long way to have that kind of a operational excellence.

Because of the corrosive nature of the brine, we do have to take these plants down a certain amount of time —— typically every year would be a plan. It might be a long weekend just to check. But every two to four years or so, we would typically take these plants down for anywhere from a 15 to 18 day what we call a turnaround. We'd shut them all the way down, we take everything out of all the vessels, get in there, check the vessels for how they are, clean them up, make

repairs, that type of a thing, start the plant back up.

So, we've learned that over the years, and —— and the —— and the most important is, train people well. Get them the tools and the resources they need to —— to do what they do best operating and maintaining these plants, and then obviously build the plants out of the right materials, and they practically run themselves. It's —— it's really this —— this kind of the same scenario as I mentioned with the reservoir where you learn your lessons, you apply your lessons, and you hire and train people to, you know, do an excellent job.

Now I forgot what the first question was.

COMMISSIONER RUIZ: What —— what are the bigger challenges ——

(Pause)

—— to the production?

MR. TURNER: It's —— I can tell you it's not earthquakes. People think that it could be, because, you know, the earth moves and we have lots of wells down in here. But our experience out here, and John can correct me for recent experience if —— if I'm incorrect here, is that we typically don't see a change in the production or the injection capability in the wells. On the surface, all the years that I ran CalEnergy, only

one time did one earthquake trip a plant offline. And, and I forget what year that was, but it was the Elmore plant, and the epicenter was fairly close to it. Didn't trip the rest of the plants out there, but it tripped that one. Didn't cause damage, but the way these generators and turbines are built and designed, they have vibration monitors on them, because these are big masses that are spinning. So, we have vibration managers in w—— um, uh, that we typically set very sensitive, so if we get a vibration that is outside the threshold, it will shut the turbine or the generator down, you know, as a protection means.

And so, earthquakes aren't it. Typically, it would be operator error. If we had a shutdown where maybe a pH, which is a measure of how acid or basic they —— the su—— the material is. If that control feature gets out of whack it could cause the plant to shut down. But again, the training that goes on at these plants is such that that's pretty rare. And that's one of the main reasons why we see these high operating factors.

If you go to the old Magma plants, I mentioned they're all —— were originally made out of carbon steel. There have been upgrades over the years, but it's not quite the same as if you'd build a highly alloyed plant in the beginning. And so those are probably the

toughest ones to —— to operate and maintain at those high levels. But they do operate at pretty high levels from everything that I've seen. And even the most —— the oldest plant out here that Unocal built, it went commercial in 1982, it's still running today. Not made out of a lot of alloy material, but again, that's a testament to the guys and women that are running it. So, 40 years of operation is pretty dog-gone good for a power plant.

CHAIR PAZ: I think Commissioner Olmedo has a——

(AUDIO FEEDBACK)

Luis, do you have a question?

COMMISSIONER OLMEDO: Two, actually. One is, are the comparison, you know, about geothermal serving as a, sort of a jolt of energy into these power plants that could go off. Just can't help but thinking as to what a great opportunity for IID to get into the business of geothermal and start retiring the old fossil fuel plants. I don't know what goes into that, what the costs are to the public, I know they're a public utility, and you know, this a very, you know, low income disadvantaged community in general, for the most part. So, can't help but think that, right? That's the direction we as —— as the earth is moving in that direction.

So, the other question is —— well, that wasn't a question, just a comment. I don't really expect answers at this time, but I certainly would continue to drive that question —— hopefully trigger some conversations around that. So, question specifically for BHE is, with all the push towards electric vehicles, innovation, a lot of these companies tend to display a lot of the innovation, whether it's in concept, whether it's, you know, full proven test mode—— models, and just all technology in general.

And I'm just wondering if BHE, in the life that —— in the time that it's been there and where it's headed, if it has thought about investing in —— in technology that would zero out waste management, you know what they call cradle to cradle, or you know capture emissions. I mean, I don't know. I mean, I'm just —— I don't know the —— the many different opportunities that are there. And if it's not, would it —— does it have in its plans of how it shares that type of innovation with the community, with the public, because I think there's value in that, you know, in terms of learning, education, perhaps even inspiring, you know, the —— the young generation who one ten —— one day in the future will be the future workforce, the

future innovators.

So, given that there is so much of that going on, you know, and maybe it's just new language, you know, to me, or maybe to others here, you know, there's just so much talk about startups and investments, because those —— that kind of language hasn't, sort of, been here for a very long time. And this is an agricultural community, that's kind of what we've always seen, you know. And so, just curious, you know, that —— where is BHE now, where is it going, or you know, is it already doing these things we're just aware of —— and I appreciate the tour, by the way, you know. Going beyond that.

MR. TRUJILLO: I hear you, Luis, and —— and first off, I want to compliment you on the —— on the idea and suggestion to, to evaluate any f—— any replacement of fossil fuel energy with geothermal. I mean, that's, that's where we have to go as a society and as a state to —— to be reliable. And as Jim accurately said, feel confident turning on the lights and making sure that our fridge is still working and we've got AC to keep —— keep our families cool when it's 105 outside.

When it comes to technological advances and reducing waste and emissions, absolutely. You know, we

— we're part of this community. We have standards within all of our regulatory aspects, and honestly, it's good business to — to reduce our waste streams as much as possible. And — and with that, we're — where we were, you know, we've been here for 40 years as an operator. And — and at times, the market wasn't there for more geothermal. I wish it had been, but I'm really excited about what's happening right now, both on the geothermal front, and the lithium front. And the ability to — to hopefully and successfully align those is — is really tremendous.

So, at times, we probably could have done a better job communicating what we were doing and expressing that out to the community. We're — we're now focused on geothermal development along with making sure that we have operational excellence and continue to operating — operate our plants right now.

We have 40 years of lessons learned that we want to apply to our new developments, and also as we retrofit equipment and make it more reliable for future use, apply those benefits as — as pieces of equipment we wear out an say how can we do this better. And so, so with that — and then of course we're in progress with our lithium demonstration facility. And so, we're very

excited about that, but, you know, as you probably heard Jonathan say before, we want to crawl before we want to walk, and walk before we want to run. And so we're —— we're really in progress of that phase and, and looking forward to seeing the results of the demonstrations both for the recovery and capture of lithium from the brine, and then secondarily being able to convert that to a better grade product that would allow us to operate electricity vehicles or in balance with the, with the grid for IID and others, develop batteries that —— that will help —— help with storage on these intermittent renewable resources when —— when geothermal is not everything.

I'm —— the —— Erica as well as Jared had presented a lot of facts where, unfortunately, geothermal isn't number one. And I'm a cheerleader for geothermal, so I'm —— I want to see it up there as high as possible, but the reality is, is we're going to need other resources and a lot of that's going to come from storage too. So, being a part of that factor by supplying California and American made lithium, and that, that removes us out of this geopolitical game is —— is foremost in everyone's mind.

The —— the other thing that I can say is —— is

with our newfound recognition to —— to develop and support growth within the community, that is a win-win here, we are proactively getting together better and —— better communication plans and then—— and aiming to engage with community and make sure that everybody understands what we are doing and how we're doing it, and making sure that they —— they believe it's safe and know that it's safe.

So, I guess that —— I hope that answers the question for you at least.

CHAIR PAZ: Thank you. I hate to be the one to —— I hate to be the one that needs to interrupt all these conversations, but it's my job because otherwise we're going to be here all night, and we have another panel. So, just one request, just please bottom-line your questions and bottom-line your responses. And then we can probably speed it up. But —— Commissioner Olmedo?

COMMISSIONER OLMEDO: I —— yeah, I just wanted to just make a recommendation to BHE and, you know, to anyone else, but BHE in this case here. A big company. And, I don't understand the full scale of all your brands and technologies, but I get the sense that there is —— that there are environmentally conscious programs and directions, policies that —— that the company —— I

don't know, and I don't want to mis-characterize it, but, I don't know if it's a conglomerate or company or portfolio, however best describes BHE. I —— I would recommend that —— like to see more of that. Of —— I'm sure it has great model, maybe we're just not hearing about it.

UNIDENTIFIED SPEAKER: Sure.

COMMISSIONER OLMEDO: But, we would like to see some of those models, policies, designs, and how BHE is, is —— because I - I feel like BHC is, maybe we just don't know ——

MR. TRUJILLO: No ——

COMMISSIONER OLMEDO: ——right?

MR. TRUJILLO: If, if BHE is ——

(Pause)

—— Entities like CalEnergy and BHE Renewables, and, and other predominantly utility companies. But, at the end of the day, what you're saying makes —— makes perfect sense and I —— and I think we can certainly follow up with our own sustainability goals that go beyond regulation and mandates. We, you know, we're —— we're not only in this community, but we're in lots of other communities throughout the United States and —— and, those are homes for us, and we want to make sure

that —— that our sustainability goals are, are advance —— advancing beyond just what we need to do.

COMMISSIONER OLMEDO: What —— would it a fair assessment if, for a ——

(INDISCERNIBLE)

—— Warren Buffet, who is a, I don't know if it's a name or a brand, or a founder, or subsidiary, I'm not really sure how to characterize that.

MR. TRUJILLO: Yeah, so, so Berkshire Hathaway Energy is, is owned by Berkshire Hathaway Incorporated.

(Pause)

—— a shareholder of Berkshire Hathaway.

COMMISSIONER OLMEDO: So, would it be fair to say that, if I understand this correctly —— (OFF MIC)

(Pause)

—— as well, towards climate, or other social good types of programs. I don't —— I don't know where I——

MR. TRUJILLO: And, and ——

COMMISSIONER OLMEDO: Is that correct?

MR. TRUJILLO: I, I guess I don't like to speak for Mr. Buffet, but I —— I defer to Jonathan if, if, you know of a better way to say that statement. But there —— there is certainly a truth there.

COMMISSIONER OLMEDO: The reason I say that is——

MR. TRUJILLO: Yeah.

(AUDIO FEEDBACK)

(Pause)

COMMISSIONER OLMEDO: —— I also have that type of direction, right? But beyond (INDISCERNIBLE)——

MR. TRUJILLO: Yeah, I mean I'll ——

CHAIR PAZ: Not to be (INDISCERNIBLE)

(Laughter)

UNIDENTIFIED SPEAKER: But ——

CHAIR PAZ: Okay, I'm going to start being rude if we continue like this. Because this conversation, like I said, you all know each other, you can talk, but one——

COMMISSIONER WEISGALL: One word answer.

CHAIR PAZ: Go ahead, Jonathan Weisgall.

COMMISSIONER WEISGALL: Yes.

CHAIR PAZ: Okay. Yes, is the answer, and the company will aim to follow the leader, is what I'm hearing. So, now I still have Commissioners who are joining us via Zoom, and I don't want to skip you. Um, so, Commissioner Castaneda, are there —— do you have any questions from Chula Vista?

COMMISSIONER CASTANEDA: I do not have any questions, and there is no one in the audience here at the does either.

CHAIR PAZ: Thank you. Um, I believe this is Commissioner Reynolds at the Sacramento Rosenfeld Hearing Room? Do you have any comments, questions?

COMMISSIONER REYNOLDS: Thank you, Madam Chair. I do have couple comments, or questions, and I'll try to be really streamlined in my questions and get to the point quickly.

Relating to, and I really appreciate the discussion of the details of the energy production process and —— and the synergy and co-location of lithium extraction, and I wanted to follow up on a couple of points that were made in the discussion with just what I hope will be fairly quick questions.

One is —— we heard that there is a potential for essentially an increase of 2,500 megawatts up to 3,000 megawatts of generation in the Salton Sea from the current 500. And then we also heard that there's about —— the ratio between the —— the, um, capacity needed for extraction is about ha—— 50/50 versus —— uh, so, I think it was extraction of lithium versus export and use for the grid. Is that —— does that ratio stay the same as ——

so is —— is the potential for grid support up to 3,000 megawatts, or is the potential for grid support 1,500?

MR. TURNER: This is Jim Turner, I'm the one that mentioned the 3,000 megawatts. And, if we are able to achieve that here at the Salton Sea, and if it took half of that to run our lithium plants, then yes, we have about 1,500 left for grid support. It is highly dependent on the lithium extraction method, if —— if we need all that power, or if we are able to do it with less. Obviously if we can do it with less, we have a little bit more to put on the grid.

COMMISSIONER REYNOLDS: Okay, great. That's helpful. And the—— my next question, I think it's for you to —— also, Jim. The —— you talked a lot, it was really helpful, about the capacity factor of geothermal, and what a —— a great resource geothermal is to compliment grid needs. I'm wondering if —— and that it, you know, can operate 24/7. Is there a capac—— is there a potential also for ramping for this resource in the way that the geothermal works? So, can you vary the output to meet grid needs, or is it more like a constant —— operating at a constant level?

MR. TURNER: The Salt—— (OFF MIC)

—— currently designed to operate best at a

constant level. They do have a little bit of ability to vary that output. It's not fast like you might see in a gas turbine, or in some other types of electrical power.

COMMISSIONER REYNOLDS: Okay, that's great. Thank you, that's all I had. I really appreciate all of the panelists participating today.

CHAIR PAZ: Thank you. Let's see. Are there any questions from Commissioner Flores in the California Natural Resource Agency Building?

COMMISSIONER FLORES: No questions from me, thank you, Chair.

CHAIR PAZ: Thank you. Are there any questions from Commissioner Dolega in Michigan?

(Pause)

Is he still there?

MS. PALMA-ROJAS: He was there.

(OFF MIC DIALOGUE)

CHAIR PAZ: Okay.

(OFF MIC DIALOGUE)

He's not there anymore.

CHAIR PAZ: Okay, thank you.We will move on to the next panel. So, thank you again to our panelists. And we will take public comments at the end of the second panel for both —— for both workshops or panels.

So, now I will a —— thank Commissioner, was it

Hanks and Commissioner Ruiz, who worked on this next panel, and I will hand it over to Commissioner Ruiz to introduce the panel.

COMMISSIONER RUIZ: Thank you, Chair Paz. And the workshop on Overcoming Challenges: Extraction, Processing, and Production of Lithium from Geothermal Brine has two sessions. We will first have a panel discussion with lithium extraction project developers. We will have a conversation with Jim Turner, which is on, you all heard, from CTR, and Jon Trujillo from BHE Renewables to help identify some of the challenges to lithium extraction from geothermal brines in the Salton Sea.

As we start this conversation, I also want to recognize that the two projects are fundamentally different with one planning to add lithium extraction to existing facilities, and one building a new combined geothermal and lithium extraction facility. So, I welcome any input you can each provide about how your projects face unique challenges.

During previous workshops, we've heard about the technologies each of the facilities will be developing, and perhaps we can get a —— a brief update on the status from each developer. And at the same time, I would like to ask each of them what is their likelihood

of reaching commercial scales as planned for lithium extraction, and provide an explanation of what the final products coming from each facility will be.

I think we need to —— we need some clarification of the process —— of the process —— especially the processing steps that are part of each planned facility. Building from a —— of that understanding, I will also like to —— to ask each of you to share what are the primary risks or vulnerabilities are to reaching commercial scales, and perhaps even expanding beyond current plans?

This text —— the —— this —— this statute asks for ho—— it specifically to look at technical and economic challenges so that we will ask you to try to address each of those areas.

Finally, perhaps you can each share your recommendations you may have to overcome the risks and challenges you are or expect to experience, and how these ideas can translate into findings and recommendations for the report. Um, now, uh, use your time.

MR. TURNER: Okay, this is Jim Turner, from Controlled Thermal Resources. To answer the —— the first area, lithium extraction basically is not something

that's new to the world. It's —— it's new to the Imperial Valley and the Salton Sea, because we haven't —— we haven't extracted lithium before on a commercial basis.

But the —— the techniques in which to extract lithium from brine have been around for, actually for decades. And —— and our brine system, because we have so many different types of salts, and we have dissolved silica, we have to do a little bit of brine preparation in order to be able to do a good, efficient job of extracting enough lithium so that we can make products at a —— an economical cost that's reasonable, you know, for having a business.

And, and so, one of the steps that we have to do, which we've been doing it to make power ever since the beginning in 1982 out here at the Salton Sea, is we have to manage silica. Silica is dissolved in the hot brine in the earth. When you begin to cool that brine, it wants to crystallize and silica is sand. So, it wants to crystallize out as a solid. And, if you're not careful and if you have any kind of steel associated with that brine, silica wants to locate on top of a —— an iron atom, and make a compound called an iron silicate, which is really hard and it'll clog up your pipes just

like if you have a lot of hard water and you see your pipes over the years get smaller and smaller and smaller. The same thing will happen with silica, but it happens much faster.

So, we manage the silica. We've been doing it for years out there. The guys in the early days in the 1980's developed a real good process for doing that, and it's been used successfully ever since. All the plants do that. There is another method to control silica, it has a —— a negative impact in that you, you end up putting hotter brine back into the ground, so you —— you're putting BTU's back in that, if you extract the silica and manage it you can use it to make electricity. So, that's the first step that all of us typically are looking at, is to do some conditioning of that brine to get it in shape to do a good job of actually extracting the lithium. Then, the key is, can you go in there and just grab lithium and not have anything else go with it. Fundamentally, and ideally, that's what you want to do. Chemically it's very hard to do that.

We have a lot of sodium in our brine, sodium chloride. That's table salt. We have about six percent of that brine in that round numbers is table salt. We have a lot of calcium chloride. If you lived up north in Michigan like I did when I worked for DOW chemical

for 20 years, we put calcium chloride on the pavement to melt snow. It looks like table salt, tastes a little different.

We have a lot of potassium chloride in this brine. Matter of fact, we have so much potassium in our brine that if it was extracted and turned into agricultural fertilizer products, we could probably do a pretty good job of satisfying the California demand.

And, and —— but, when you go in there and reach in and try to extract lithium, you tend to pull a little bit of the calcium, a little bit of the lithiu—— or the potassium, a little bit of the sodium along with it. And so, when you're all done, you have a water solution that has the lithium in it, but it has some of these other atoms in there so there —— they become contaminants that you eventually need to clean up before you can make your —— your batter grade lithium product.

And, once you have that lithium out and that water solution, and we all end up basically with the same water solution, then it's a matter of —— of which direction you want to go to make the lithium product that you're selling to your off-taker.

So, the two most prominent lithium products are called lithium-hydroxide, and the other one is

lithium-carbonate. And we tend to group 'em all together, and you probably have seen the acronym LCE, that's lithium carbonate-equivalent. Well, it includes a whole body of lithium compounds like hydroxide, like lithium carbonate, like lithium hexafluorophosphate, and I mean it's just a whole bunch of them in here, because they all contain lithium.

Well depending on what the battery maker wants, which usually is dictated by the car maker for — for those kind of batteries, you're going to make one of those products. And, I think we're all — all three developers out here are trying to make battery-grade material. Battery-grade material is nominally 99.5 percent pure lithium carbonate in water, or pure lithium hydroxide in water. And then, you sell it to a — a battery maker. They make the cathode into the battery. And —and — and they mix it with other chemicals for the formulation for that battery.

And so, you might have a process that makes carbonate and it does step one, two, three. You might have a process that makes hydroxide, and maybe it only has step one, but it — then it has step four. So, depending on the chemical process — and there's a handful of different ways to get to those endpoints —

you choose one that works, that you feel comfortable with and you think you can get the highest yield for the lithium that's in the brine to the lithium in your ultimate product your ultimate product out here. And —— and you make it, dry it out, put it in a bag, load it on a truck, and off it goes to a battery maker.

So that's —— that's kind of the process. And, it looks simple, when you're all done and it's running, you probably look at it and you say yeah, that was simple, but it —— it's like any chemical process, it takes a lot of hard work. You have really good engineers, really good scientists and other people, and —— and they look at how they can combine each of these little pieces. And we call them unit operations in the chemical industry. Combine those unit operations together to get your end product at a cost that you can then sell it, make a little money, obviously, because we're all in here to make money, and then go off to, you know, the next product that you might want to make.

That's what you —— I think you had in your —— your question there, that you called that pre-treatment on the front end. Treatment, in the environmental world, is a kind of a negative word to use. So, we're not really treating, because it carries some issues

associated with the 1984 Resource Conservation and Recovery Act in the environmental world. So, what —— what we're all doing is, we're conditioning that brine. We want to make it in the best shape we can so that when we do the actual extraction, we get the purest form of, say, lithium chloride in solution.

Let's see. What was the next one here you had? Primary risks to reach commercial scale. Excellent question, it's probably the one that keeps a lot of us up at night, is choosing the right partners. Extremely important, whether they're financial partners, technology partners, construction partners, choosing the right ones.

You, you —— you got one really good shot at the apple on your first project, you want to make it a winner. You want the right partners out there. And, and so, we, and I'm sure BHE and I know EnergySource, we —— we're all pretty particular who those partners are. We want good partners.

I don't think, personally, that there's much in the way of technology risks. And that's probably because I spent 20 years at DOW chemical, and have pretty good background in, you know, building and operating plants. But, that doesn't mean the financial community feels the same way.

They tend to look at the old style of making lithium products for batteries, which you see out of Australia. Those are big open pit mines, they actually produce an ore. They ship the ore to China, that —— China then takes out the lithium, I'm not sure what they do with the other part of the ore, because the lithium is only about five percent, so there's out of every hundred tons, there's 95 tons that gets put someplace. Then they refine that ore, much through the same type of processes that we do in the back end after we extract the lithium.

Down in Argentina and Chile, they have the real old way of separating out salts. So, what they do, is they —— they bring up the salt in a salty water out of the earth, and they put it into these gigantic evaporation ponds. These are 10,000 acre ponds, huge. And —— and they let the sunlight and the temperature evaporate water.

And when you evaporate water out of a mixture of different types of salts, you separate out the salt, you might get sodium chloride first, and you scrape it off. You might get potassium chloride, and you scrape it off —— other salts. You finally get lithium chloride, and you scrape that off. Then they t—— then they re-do

it again, and finally they get a pretty cure—— pure form of lithium chloride salt, and it looks like table salt. And then they refine that, and then they go through the same back-end processes that we all are probably going to end up with here to make your final battery-grade product.

But Argentina and Chile use a tremendous amount of water, in order to be able to make their products. To the extent that they are lowering the water table in the Atacama Desert. And then, they have some pretty significant political issues in those two countries for a lot of things. But, one of them is exporting lithium. They're starting to really tax the heck out of every ton of lithium that goes out, to the point where it, at some point will make them —— make it hard for them to compete.

But typically, they don't make battery-grade there. They'll go part-way, and then they ship that product over to Asia, and —— and it's finished there and then it's shipped to wherever the battery makers are and the auto manufacturers.

So, in our case, I think all of us are really aimed at making battery-grade material right here. Right here in the US. My feeling is it'll all be sold in the US. I don't see us really competing amongst the

three of us. If we could make all the battery-grade lithium stuff that the Salton Sea would offer, we'd sell it all right here in the United States. And we'd probably be helping each other ship it out, just to, you know, move it out of the way.

Let's see. Technical and economic challenges, reco—— recommended —— recommendations for the legislature. My recommendation, based on the 48 years I've been out here working —— and I'm actually an old guy here —— is, California wants to establish a tax on the production of lithium. And —— and that's fine, because we —— we tax in every state, minerals, oil and gas, et cetera with a reasonable tax. And —— and I —— and I'm supportive of doing it here. Mainly, because a lot of that money is going to come right back here to the community. You know, if we had our way, and I'm sure BHE and EnergySource would be the same way, of 100 percent would come back here. I mean, we'd just stand up and be counted for that.

But a good portion's going to come back. So, my recommendation is to the —— to the state, is make it a percentage of gross revenues. Because, if you make it an absolute number, which is a concept that's being bandied about at the state level, that hurts the little

guy in favor of the big guy. And so, it's much the same as our personal income taxes. If we had a flat tax, then the guy making a lot of money isn't hurt as much as the guy making a little money.

So, my recommendation to the state is, yeah, just have a tax, but let's have a percentage, and we can argue about what that number is for percentage, but let's have a percentage on gross revenues. Then —— then, the tax is proportional to the amount of money that's made, and it looks like virtually every other state in the nation —— it then is similar to how we pay royalties to landowners, et cetera. Because, I think it's just a much more fair way to do that for the developers.

And —— and if we're not careful, we can drive away development. And if we drive away development, we're driving away jobs from the Imperial Valley, and the vast majority of the jobs operating and maintaining these plants, those people already live here in Imperial Valley, and those are the people who are going to fill those jobs. I would venture to guess it'll be much more than 95 percent of those jobs will be filled with people right here.

And if you look at these geothermal plants, you'll see that. The successful operators and maintenance people are homegrown. We've seen that for

years. I don't think that's going to change, that they make the best workers. So, we want jobs here, we want to attract business here that doesn't otherwise have to locate, and like a battery manufacturer, that —— that would be tremendous. But, we need to make sure we have those incentives lined up the best, so that they're here and they're not in Tennessee.

Did I miss any?

Jon, it's up to you.

MR. TRUJILLO: Oh, alright. Well Jim, thank you. Okay. I —— I, I will aim to be quick, and thank you for that, I was trying to take those same notes.

I do want to go back to one question that Jim had talked about, the iron-silicates, and the—— and all the pre-treatment. And, it also comes back to Luis' question earlier about waste. Is —— is I do want to recognize within geothermal process in the Imperial Valley, and specifically the power plants in the Salton Sea, there's a thing called filter-cake, and it's a non-hazardous iron-silicate that Jim described very eloquently.

It —— it is the key to making that resource renewable and sustainable. And it's odd to —— to hear that, and even to say it, that —— that because of that

one minor waste-stream, that we're able to sustain and maintain those injection wells to keep this process cycling over and over again so that fluid and that brine is able to be reheated and reproduced and power our homes on a —— on a —— a long-term, 40-year basis so far on our proven record, and we're looking to, you know, at least doubling that 40-year record.

So, it is, and it's a very minor component, it's not even a fraction of one percent when it comes down to it, when you look at the brine —— but it is —— it is an important waste stream that allows us to stay sustainable.

As far as lithium, we are in process of determining if —— if our technology is commercially fe—— commercially —— commercially feasible through our demonstration facilities. That's —— that's certainly not complete. We do have a demonstration facility for recovering and capturing lithium from the geothermal bine that's been constructed, and —— and the next phase of that is, is what Jil—— Jim and uh, covered quite well is, is capture. And then taking that captured lithium product and developing a battery-grade product that's —— that's sellable. And then, at that point, we'll evaluate the —— the both the technical challenges as well

as the commercial challenges.

The —— I guess there is —— when I —— I guess I do want to hit on a question that was sent out to me earlier, but may not have been mentioned here is —— is the infrastructure. And that's where —— where we see a lot of benefits to the community as well as our facilities is —— these facilities are going to increase the workforce, they're going to increase a lot of —— lot of —— a lot of activity in the area. And so that, you know, it does come down to simple things like roads, bridges, broadband, emergency services, schools, and even public transport.

And so, as the —— as the growth of the community increases through these projects, I, I see those as both needs for these projects but also benefits to the community there.

When it comes to —— when it comes to recommendations. I would have to say that, that —— what, you know what, let me jump back to the technical and economic challenges, and I'm going to hit a pretty broad one here, but it's —— it is certainly an effect on, on us and everybody, is supply chain issues, right now. Inflation, all of these aspects, when you're a developer, change the economics of the whole situation.

So, a —— it's not only, you know, the cost of equipment and cost of metals and materials, it's how long is it going to take for them to get here. Will it arrive on time so that we can meet our contracts, so we can deliver power on time, so if we can deliver lithium on time.

So, those are challenges that are not unique to us, but they are challenges that I want to make sure that we —— we all understand and probably feel in our pocket book, 'cause I filled up my diesel, it's seven dollars a gallon before this. (Laughter). It's painful. So, we're not immune to those.

So, I —— I do want to just make sure that everybody's aware of that. As recommendations, buy —— buy California provision. If something that promotes the idea of —— of manufacturing EV batteries and batteries for energy storage from lithium that comes from California, and hopefully those batteries are manufactured in California as well. But, I —— I, that's a —— that's certainly a recommendation I, I see, and we see, as BHE that would —— that would be something to, to take back for. So. Hope that covered the eight minutes.

CHAIR PAZ: You did great

MR. TRUJILLO: Thanks.

(Pause)

CHAIR PAZ: So, there is a second session to this workshop, and now that Commissioner Hanks can introduce (INDISCERNIBLE).

COMMISSIONER HANKS: Second session of this workshop is (INDISCERNIBLE) presentation from another party, and it's on Economic Challenges and Solutions Lithium Extraction, Geothermal Brines in the Salton Sea Region.

I would like to introduce Professor Michael McKibben, from the University of California, Riverside, who will provide an overview of his research on this topic. Tina Shields, from the IID, who will discuss the IID's water supply. And, Abby Rodriguez, Sparkz, with its perspective of supply chain considerations related to the lithium battery production industry.

(Pause)

MR. MCKIBBEN: Thank you. Good afternoon, everyone. I'll wait till they get the slides up.

(Pause)

Next slide.

(Pause)

So, thank you. I was asked to assess challenges and solutions to geothermal lithium recovery.

Next slide, please.

So, the technology that's being proposed on the Salton Sea brines is direct lithium extraction. That's the selective removal of lithium using a variety of engineered materials. And most of those are now focused on lithium adsorption and desorption onto fabricated micro or nanomaterials.

Someone mentioned earlier, this is not tech—new technology. That's correct, it was developed back in the 80's by DOW chemical, and it was commercialized in the 1990's by FMC for use the on the Salar lithium brines in Argentina.

For these materials, the ratio of lithium to other cations that get deposited onto them defines the extraction efficiency and the initial purity of the lithium process. In the Salton Sea brines, manganese, calcium, and magnesium are the most problematic interfering cations for this technology.

It's also been mentioned previously that avoiding precipitation of silica and iron compounds is important. Not just to clean up the brine, but you also don't want those to precipitate on the adsorbents, because that will block them from taking the lithium out of the brine.

So, brine clarification and avoiding further

cleaning of the brine is very important, and this issue plagued early efforts to development the Salton Sea geothermal field, and extract metals, even before the reactor clarifier technology that's now used was perfected.

These adsorbents are very efficient. In fact, the efficiency is higher at high temperatures and higher lithium concentrations, so that favors their use on geothermal brines, and some of these adsorbents remove over 90 percent of the lithium in the brine in one pass, so very quickly.

Next slide, please.

So, right now there are three types of adsorbent materials that are in common use. Aluminum, manganese, and titanium oxides. The one I'm most familiar with is the one I've been working with in a research collaboration, and that's hydrogen and titanium trioxide. But basically, you load up this adsorbent material with proton ions in the holes that lithium likes to go into, and then you expose that adsorbent to the brine flow, and the lithium swaps in for the protons, and then you remove that adsorbent, wash it, and then you elute the lithium out of the adsorbent, usually by running it through hydrochloric acid.

That produces a lithium chloride solution.

And then, you want to produce a product, lithium hydroxide monohydrate, or lithium carbonate, and you can run that through different kinds of processes to produce those products. One possibility is electric dialysis, which is nice because it keeps the magnesium out, but it's also uses more electricity than some of the other methods.

So, the way that these are put into practice, is these adsorbent particles are placed into a larger porous materials. Either a ceramic bead, or a pellet. And these are things that can be packed into reactors and then exposed to very high brine flow rates, and then washed and eluted to release the lithium ions.

So, not everybody —— not every company has talked about exactly what material they're using, but, for example, Controlled Thermal Resources has said that they will be using Lilac Solutions and that off the shelf product, and that's a manganese oxide bead technology. So, they create these very small particles of manganese oxide, and then put those in these porous ceramic beads and it's very easy to pack those beads and remove them and wash them, and recycle them. And, I have some references there, if you want to look these techniques.

Next slide.

So, the technological challenges in applying this to the Salton Sea brines are many-fold. Removing the interfering cations and preventing the silica and iron precipitation, that's already been mentioned. You need to keep the brines from exposure to air, because oxidation enhances the precipitation of iron, in particular. There are questions about how stable the adsorbents are at high temperature and the pH values of these brines, and so how many cycles can you put them through before they get worn out. You need to wash and elute the, the beads or pellets, or strip them of the lithium. SO, what are the reagent costs and the reconstitution costs for water and acids.

What water are you going to use for these processes? And that's, obviously, of great concern in the Imperial Valley. Is it going to be canal water from IID, is it going to be shallow well water, is it going to be self-supplied steam condensate from the plants themselves, or are you going to use reverse osmosis and desalinization methods to produce water.

And then, is it that —— been alluded to by Jim and Jon, the process you use for converting that lithium chloride to the carbonate or the hydroxide form, dictates the amount of energy that you're going to use and some of the reagents you're going to use, so the

cost of that.

And then, the biggest challenge for the companies, and they're all going through this now, is scaling all of this up. And pilots or demonstrations plants are critical, and so I thought I'd give you one example of this problem from the zinc plant that they tried to make in 19—— in 2003.

So, they got very good results on the lab bench scale for zinc recovery, they got more than 80 percent zinc recovery on their lab bench studies. And then they build a full-scale plant based on those studies. Unfortunately, in the lab bench, the brine was in full contact with a resin, and therefore taking out as much of the zinc as it could on a small lab bench scale resin column. But, when they scaled these up to columns the size of half this room, then you got channelized flow through those columns, and you didn't get full contact with the brine with the resin, and so their zinc recovery dropped to below 20 percent.

They also came on the market at the time when the zinc price was dropping dramatically, and so that, that really, —— among many other problems, caused failure of that plant. And so, the solution to that particular problem is to use a reactor that maximizes brine-adsorbent contact, and that's —— would be a —— a

fluidized bed reactor, or a fluidized expanding bed reactor.

So, next slide, please.

This is why pilot plants, or demonstration plants are so important, that you make sure you can scale this up and it's going to work at full scale. So, there's one example, Berkshire Hathaway Ener—— Berkshire Hathaway Energy Renewables has buil—— is building a one tenth scale commercial plant to make sure everything's going to work before they go to full scale.

Next slide.

There are a lot of economic challenges, and it's already been alluded, a lot of the lithium production in the world comes from South America, Chile and Argentina in particular, and Australia. And, and the main competitors, in terms of cost, are going to be the South American brine operations.

So, these salt flat, or Salar producers have some advantages. Their labor is inexpensive, they're using free sunlight energy to do the concentration work. But, some of them are using and or going to switch to DLE, as the technology to process more brine more quickly, and not put these huge ponds out on the surface that you can see from space. And that wastes far less water and land but uses a lot more electricity.

Their disadvantages are, it takes one to two years for this evaporation process to produce a lithium product, versus days for a direct lithium extraction. There are a lot of infrastructure issues with these Salar deposits, because they're up in the Andes at elevations as high as, as 10,000 meters. And so, having roads and power at these remote Andean locations can be a great problem. That's one reason the Bolivian Solars have never been developed, but in part it's because of infrastructure issues.

And then they are experiencing growing local and environmental backlashes over water use and the footprint of these, these huge ponds, which are draining the nearby lagoons and affecting the flamingos, which are the major tourist attraction of these countries. And finally, the governments of Chile and Mexico, for example, have threatened, or are actively nationalizing the lithium production, and that's a big threat to a lot of foreign owned and partnership production in these countries.

Next slide.

So right now, a direct lithium extraction from geothermal brine is projected to stay competitive with salar brine production. So that figure on the right, I — I know it's hard to read in the audience here, that

shows the cost of producing lithium carbonate in thousands of dollars per ton. And on the left are the salar brine marginal costs. And in the middle on the right are, are the hard-rock open pit mines in Australia, which are the most expensive.

But, you can see that the geothermal cost estimates for —— which is that band across the diagram in the middle, are competitive right now with Salar costs, which are the lowest costs in terms of thousands of dollars per ton. Another DLE application is to oil field brines, and we see that going on in Alberta and Arkansas right now. And those, those operating expenses are, are comparable to DLE for geothermal. So, it's a four to five thousand dollars per ton of LCE produced. So, all these DLE operations, whether they're geothermal brines or oilfield brines, look like they're going to be competitive favorably with the Salar deposits in South America.

What could help geothermal, would be using self-supplied electricity from the parasitic load of either existing power plants or newly build power plants. And with self-supplied thermal energy, there's a lot of waste heat, particularly out of the old plants down here, that could be harvested with some minor work done on them. They could supply their own water from

the steam condensate, and finally, they could produce co-products that would improve the economics. So, the next slide will sort of summarize some of the co-product issues.

So, additional strategic commodities that could be generated from these brines, besides lithium, would be manganese, zinc, potassium, strontium, and rubidium. I've shown there —— column formatting's a little bit off on this —— the main use for all of them. And then, the import reliance in the US for most of them is extremely high, and many of them are 100 percent, so we don't produce any domestically.

And finally, the import sources include countries that we don't always have friendly relationships with, and I've highlighted those in red. And then finally, the US government provides the US depletion allowance, which is a tax deduction from the gross income to stimulate production of these materials within the United States. So, there's a lot of advantages of producing these co-products from the Salton Sea geothermal brines that could be taken advantage of.

Next slide, please.

(Pause)

What actions could make geothermal DLE non-

competitive? This has already been alluded to. But, a flat tax could have the result of making geothermal DLE marginal costs higher than Salar brines. And it could raise geothermal DLE costs closer to parity with hard rock mine marginal costs. And that would be bad, that would make geothermal less competitive as a source of lithium in these other metals. And states have made mistakes in the past of assessing taxes that are too high on minerals production without too much thought going into them.

So, Minnesota did this late in the 20th century on their iron mining, and basically the mines closed and Brazil and Australia took over the iron market around the world. British Columbia raised their mining severance taxes so high in 1975 that mo—— a lot of the mining companies left for Alaska and the Yukon. So, states need to be really careful in applying these taxes to commodities. Particularly, when they're trying to get developed and get off the ground.

Next slide.

There are some reservoir limits on how much lithium can be produced annually on the field down here, and that's determined by the brine production rate and the recovery efficiency. So, if we take the current field, which is producing about 400 megawatts, and we

take the annual produced brine, which is shown on the chart on the left over the last decade, we know the average lithium content of those brines is about 200 ppm. And so, if you assume a reasonable recovery efficiency for lithium —— that's been achieved at least on the lab scale of 90 percent —— then you're looking at about 115 tons of lithium carbonate per year for a field that's operating at 400 megawatts electric.

Next slide, please.

So, let's scale that up, along with the geothermal operators plans for expanding the geothermal field. So that's 288 tons per year of lithium carbonate per megawatt. So, if we look at what the companies have announced, Berkshire Hathaway ha—— currently has 345, they're said they're going to add another 395. Energy Source Minerals looks like they're going to stay at 60. Controlled Thermal Resources, and Jim will correct me, but I believe has announced right now two stages. One at 50 megawatts, and stage two at 260.

So, I added all those up, and that's 320 thousand metric tons of lithium per year recoverable at that amount, slightly over a thousand megawatts. That's 60 percent of global lithium production, so it's a significant amount of lithium. If the field eventually scales up to two gigawatts or three gigawatts, I've

included the numbers there, and those would totally dominate global production.

Next slide.

How long will the lithium production last? Well, we know the field's already been going for 40 years, it's a very long-live field. I've presented to the Commission before my estimates of the reserves of lithium in the reservoir, and they range from five to 32 million metric tons of lithium. We can be half optimistic if you want today, but we're looking at 50 years of production.

We need a more sophisticated reserve and depletion estimates for the reservoir, because, as was mentioned earlier, you're going to be pulling lithium out, and that's going to eventually dilute the ris—— reservoir and lithium. But, some of the lithium depleted brine that is reinjected might pick up more lithium, just like it picks up more heat when it's reinjected, and that might build the concentrations back up. So, we need a better reservoir model to kind of refine these numbers.

But, one solution would be to try to reinject the spent brines into the rocks that we think the lithium's coming from to make sure it gets replenished. But, that's not always feasible, because sometimes you ——

you have to reinject where the well permeability exists, and that's independent of the lithology.

Next slide.

Well, the market challenges are due to lithium supply and demand, and I'm sure you're all aware of how volatile the price of lithium has been over the last year. That's largely a result of the world responding to pandemics and wars, and those effects on lithium and nickel and cobalt supplies, which are the main battery components. The cost of energy, and then sales trends for electric vehicles and storage batteries.

And, just a few weeks ago, Goldman—— Goldman Sachs really upset the lithium market by announcing that the price had reached its peak and was going to come down for quite a while. Benchmark Minerals, Bloomberg, and S&P disagree with that assessment, and —— and, I think it's pretty clear that the pricing's going to be volatile for a while, and there might be some temporary over supply and temporary price decline, but over the long haul, the market will become more stable, particularly as the winners in this production cost bell appear and globa—— global decarbonation trends take over —— decarbonization trends take over.

I think the winners in —— in the —— the price

battle are going to be the Salar producers, especially those who are going to switch to DLE instead of evaporation ponds. And the DLE from geothermal and oil filled brines, and eventually hard rock mines will become too expensive and too environmentally deleterious to justify their continued production of lithium.

Next slide.

So, this is the forecast for the sales of internal combustion automobiles in green, and electric vehicles in, the —— sorry, blue for the internal combustion engines and then green for electric vehicles. And all the projections are for the sales for electric vehicles to —— to start taking over the market for the rest of the century.

So, I think Imperial Valley should focus on the long-term gain and not worry about short-term volatility and lithium prices. DLE is clearly going to be the future for supplying electric vehicles. Recovering these co-products could be very important, and then integrating battery manufacturing and recycling, I would emphasize into the region, I think would be very important. Not just for environment reasons and getting us off of fossil fuels, but also jobs and —— and the future of —— of the county.

Next slide.

So, the Salton Sea geothermal field lithium produces could really finish coming to full scale at the right moment, the late 2020's. Most of the forecast for demand for lithium and the balance in the market are suggesting that in the latter half of the decade that the demand is really going to start to exceed supply and that's about when most of these will come up to full scale operation, I believe.

Next slide.

Here's what worries me. The impact of air quality and asthma problems on the potential for a lithium revolution in the Imperial Valley. I guess my time's up. This is my last slide.

CHAIR PAZ: (INDISCERNIBLE) eight minute mark.

MR. MCKIBBEN: This is my last slide. Health issues related to the sea drying up need to be tackled successfully, if economic prosperity for the workforce and the communities is going to be realized. In particular, we now know there's a bacterial component in the bio-dust that seems to be causing the asthma. And so, trying to mitigate that should rally parallel the Lithium Valley development efforts. Because, people want to work in an area where they're going to be healthy and they're not going to get asthma. And so, with apologies to Kevin Costner and Field of Dreams,

but, I'll caution if you build it, they may not come, if you resolve those health issues.

So, thank you.

COMMISSIONER HANKS: The —— our next speaker is Tina Shields, with the IID.

(Pause)

CHAIR PAZ: A reminder for speakers were asked to keep their presentations to eight minutes. That's I give wrapped up in to what you're saying, but I lose track of the time itself. So, please try to be more attentive to the minutes. Tina?

(Pause)

UNIDENTIFIED SPEAKER: Looks like she's——

MS. SHIELDS: Hi. Can you all hear me?

UNIDENTIFIED SPEAKER: Yeah.

UNIDENTIFIED SPEAKER: Yes.

MS. SHIELDS: Okay, I'm having a really challenging time hearing your conversation, so I'm going to jump right in and share my screen. Give me one second here, I'm travelling and not in my office so this is more —— a little more challenging than normal.

(Pause)

Okay, are you able to see the screen now?

CHAIR PAZ: Yes.

MS. SHIELDS: Hi. My name is Tina Shields,

and I am one of the water department managers at Imperial Irrigation District. I was asked to speak to you on the status of the Colorado River, and I wishing I had better conditions to report to you, or frankly that the conversation was current a week ago. Because, we've had a lot of near-term information shared with the district recently about the status of the Colorado River. So, I'm going to try and update you all on that and talk about some of our policies.

So, just a broad overview of the Colorado River. The river starts up in Colorado and Wyoming and travels through seven different stated. IID is a bit of a nuanced perspective, because we contribute no water supply to the basin. Most of the snowpack and runoff occurs in the upper basin and some side tributaries. So, it's a little interesting perspective given our large water rights and senior water rights.

The basin as a whole is divided in to two systems with the middle point being Lee's Ferry. In the upper basin, there are the states of Colorado, New Mexico, Utah, and Wyoming, and in the lower basin we have Arizona, California, and Nevada, as well as Mexico.

This river serves broad populations and uses, including over 4 million acres of farmland, over 30 million people are served by the multiple Indian Tribes

and environment uses, as well as hydrogeneration facilities that serve as low cost power for more than 3 million people.

But, the Colorado River system is very challenged. It's a very impressive system. From a storage standpoint, it has over 60 million acre feet of capacity, which has allowed the water agencies to have generally full supplies until the last couple years. Despite a 20-year record breaking drought.

Unfortunately, those supplies have been taken off the system throughout that 20 years, and the reservoir elevations have been dropping. And now, the system is at only about 35 percent of capacity. And I'll talk about some new challenges we've recently become aware of.

When the system was allocated back in the day, the original yield was thought to be about 17 and a half million acre feet, and that formed the basis for the entitlements for the upper and lower basin each of 7.5 million acre feet, and another 1.5 million acre feet for the country of Mexico. The challenge is the hydrology has been decreasing. At one point, it was thought to be about 15 million acre feet, but in the last 20 years, the system has averaged less than 10 million acre feet a year. And the period of record we now use for modeling

is 20 years of drought.

So, this a graphic trying to illustrate on a visual basis what the allocations are between the states, and in particular, IID's share. You can see California has an annual entitlement to 4.4 million acre feet, and IID's share is capped at 3.1 million acre feet under the terms of a 2003 settlement agreement. So, it's a very significant supply, and encompasses over 70 percent of California's share of the Colorado River, as well as IID being the single largest contractor on the river.

The challenge we have is the hydrology. So, this is the hydrograph for the calendar year 2022, and the black line is the 20-year average. The red line was last year, which is the second worst hydrology year on record as far as the water that actually makes it physically into Lake Powell resulting from the runoff from the snowpack, as well as the tributaries.

The blue line is this most recent calendar year, that is closing —— closing to an end from a water cycle perspective. You'll see from the graph, the peak water period is usually April 1st. That happened much sooner this year, and when you see peaks occur sooner, you often get less runoff to the system.

The challenge we saw this calendar year was we

peaked in December. We had an awesome month with snow, and everybody thought this was going to be the year, even if we didn't break out of the 20-year drought, that we at least got some significant relief and saw the reservoirs increase. Unfortunately, after December, there was no snowpack, no new additions of snow fall, no new additional rain events that added any significant volume. So, the system essentially plateaued out when we should have seen a dramatic increase, and that rise should have gone and peaked above, probably 16 million acre feet.

Instead, we were very lucky to get an almost normal year, but if you'll see from these numbers, the water that actually made it into the system wat only about 62 percent of average, or less than 6 million acre feet. And when you see these types of numbers, it just continues to push the reservoir elevations down in Lake Powell and Lake Mead.

It's very challenging. We think this is related to climate change. We think that the water is actually going into the soil profile, given the drought that has occurred for so many years, it just essentially sucks it up or evaporates on the way down the system.

So, this is a chart that shows the annual inflow from the snowmelt into Lake Powell from 1964 on,

that's when a lot of the more local records have been kept. You'll see that the average for 20 years is about 9.6 million, vastly lower than the 17.5 million acre feet that the entitlement prorations were based off of back when this system was divvied up between the states. And you'll see that 2021 blue bar that was the second lowest on record, second only to 2002, which was right in the midst of the, the declining hydrology cycle.

The green bar indicates what we're hoping for this year to be, it's the most probable circumstance, but at this point it's only a 62 percent inflow year. Which, again, just continues to put pressure on the existing reservoir elevations and drops them lower. These low percentages are very challenging, because the lower basin entitlement is 7.5 million acre feet, so you don't even have enough water going into the system to feed one of the basins, let alone two of them.

So, this is what's called a key-cup diagram, and it's sort of a simplistic way of looking at the reservoir. I think one of the important things you can note from the shape, is that as the reservoirs decline, they're much smaller due to the trapezoidal shape at the bottom. And so, they tend to drop quicker and faster as the elevation goes down. When the elevations are higher, about one foot of elevation equals about 100

thousand acre feet of water, but now that they're down lower, you're probably talking less than 80 thousand acre feet for every foot of water. So, things happen very quickly, and that's the challenge we've seen the last year or two.

But in, in 1999, the system was full. We were contemplating flood control releases, because we were worried that the snow runoff would overtop the system, and we were developing surplus criteria about how to share all of the excess water. The reservoirs were close to brim, I don't think you could get much better than this, and boy wouldn't we love to see this condition now.

Unfortunately, this is where we're at today. The reservoir elevation has dropped significantly. We see that they're less than 30 percent in most cases. And the way the reservoirs operate, is they have balancing criteria, which means if one reservoir gets high and another is low, reduced —— releases are reduced, which is what we're currently seeing happening. Conversely, if Lake Powell is a higher volume content than Lake Mead, you would have additional releases, which have happened in years passed.

The upper basin has a 10-year requirement to send 75 million acre feet down to the basin, the lower

basin. And, while they are meeting that treaty obligation, if these drought conditions continue to occur, there could be a jeopardy situation in two or three years where they're not meeting that legal requirement.

And then, again, you have these allov—— elevations that are very concerning. In 2022, the first shortage was declared on Lake Mead. That was a result of the elevation of the system dropping below 1,075 for the first time ever, based on their operating criteria, and it caused significant shortage, reductions to the states of Arizona and Nevada and the country of Mexico, as well as some additional conservation those states put forth to try to keep these reservations higher.

We have new concerns these days about Lake Powell, because as Lake Powell drops, it's only about 40 feet away from declining below the hydropower generation level, and when that happens, not only do you lose the power supply, but you lose the ability to have water go through the system, which is the primary delivery method is using the hydropower generation facility, and the only way to physically get water from Lake Powell into Lake Mead is to use four emergency bypass tubes.

The other challenge when you drop below that 3,490 elevation, is there's only physically 4 million

acre feet of water left in Lake Powell before you head dead pool. And so really, in order to meet the annual delivery obligation, you're almost entirely reliant on the year-to-year snowpack runoff. So, these are very different situations which we've seen in years past, and frankly, it's been a surprise to a lot of the states.

We knew the system had challenges and was starting to be of critical elevations that are concerns, but the Bureau has put out more recent projections in the last week that indicate there is a need to cut demand by two to four million acre feet to prevent these critical elevations from being breached. And frankly, to keep Lake Mead above dead pool, which is about elevation 890. That's the point when there physically can be no deliveries out of Hoover Dam to downstream states and water agencies, which included IID.

So, the Bureau annually, and semi-annually, and quarterly puts out different hydrographs and modeling forecasts of what it thinks conditions might be in the future. This is a 24-month study, and you'll see that red line is sort of the worst-case scenario, which isn't supposed to happen. And unfortunately, it has been happening repeatedly, and that is the basis of Reclamation's near-term concerns and calls earlier this week for massive reductions in demands starting in 2023

through at least 2026. Those negotiations have just started, the Secretary has ind—— or the Commissioner of Reclamation has indicated if the states don't come up with a voluntary plan, they will impose restrictions on water agencies, and they were not specific as to how they would do that.

Again, this is just the third-tier shortage condition that we are looking at possibly breaching in the 2023 calendar year. When you get to those various elevations, there are either reductions of water that is essentially taking from certain states and countries based on the schedule I've shown here, there's also a drought contingency plan that was authorized by many of the states and water agencies in 2019. Those states at that time agreed that they would do more conservation sooner, in order to try to keep some of these critical elevations from being breached.

Unfortunately, despite their best efforts, including about operational —— an operational change that was made in 2022 only a month ago to, to leave another million acre feet in Lake Powell, and try to keep that elevation about its hydropower generation levels. The system has just failed from a water supply standpoint, and while these efforts have been successful in adding elevation, the hydrology decreases have, in many cases,

offset those. So, they were sort of neutral at the end, and you didn't see the significant increase in elevation that you should have.

A particular note here, is California has senior water rights. The Central Arizona Project in Arizona, in order to be constructed and access some low cost funding from the federal government to build their facility agreed to subordinate their water rights beneath California's. So, in theory, they should be turning off before California takes any reductions.

Despite that, certain California agencies, not including IID, did a greet to do some voluntary conservation efforts at the point wherever the lake starts —— Lake Mead in particular —— starts to drop below 1,045. Again, to try to forestall some of these critical events from happening.

And, the reductions and shortages and conservation and volume shown here do not reflect Reclamation's comments this week that there needs to be an additional two to four million acre feet in demand reductions or conservation beginning next year. So, that is a whole new challenge for the water agencies and states to work through.

What does IID do with that water? Well, we're located about 80 miles off the river. The water comes

in to our system through the All American Canal. IID has very senior water rights to 3.1 million acre feet. Again, while we do have very senior water rights, the system actually has to have water in it for those water rights to be honored, and that's the challenge we're facing now, is simply a lack of water in the system and reservoirs that may make it almost impossible to get that water delivered to our community.

We have a huge farming area with this water we have always served over a half million acres of active agricultural land. In the winter time, if you're eating vegetables and leafy greens, that probably came from the Imperial Valley or Yuma Valley. In addition, the water has essentially created all of our communities that wouldn't exist the way that they are today without that water and without that farming agrarian economy.

Just to give you an idea, this is not actual water deliveries, but it was a chart I had handy, and it's very close. We're looking at a proportionate system to be put into effect later on this year, that will give water budgets to our growers and our cities and our commercial users to ensure that IID does not exceed its annual entitlements. This is critical in a shortage year such as 2022 for the first time we don't have operational flexibility to exceed our water order

and then pay it back in the subsequent year. We have to now live within that 3.1 million acre feet.

So, of the water we have there is approximately 98 percent that will be apportioned to the ag water users based on uses to date. I don't want to go into all the details about how we come up with this, but about 97 percent of our water is delivered within the valley or to ag users. Potable water, that's the cities and the treatment plants, they use a little over 1.3 to 1.7 percent, and then we have only about a percentage or two percent of our water use for industrial and commercial water needs.

So, how does IID supply water to new non-indu—— non-agricultural projects. In 2009, the IID Board of Directors adopted an interim water supply policy. There were a lot of projects being bantered about, and the word on the street was, there wasn't water, which was ridiculous, so the IID put together this policy to set aside 25,000 acre feet of water for new non-ag projects. However, it turns out that those projects are more speculative than reality, and to date, only one contract —— one amended contract has been issued under the IWST for 1,200 acre feet of water. That leaves a balance of 23,800 acre feet available for the IID board to contract with new project users.

The IWST requirements include that the project has to submit a lot of data and information. They have to do their own CEQA compliance as to the impacts of their water needs and their drainage. They have to provide to us information regarding their water use efficiency and the BMP's they're implementing to ensure that their water use is on an efficient basis, and there isn't any waste associated with that use.

The IWST also has a fee structure in addition to the delivery rate of the water. One is sort of a holding fee associated because we had a lot of projects that were speculative, and we didn't want them to lock up water supplies and then ne—— not develop. The second, is a water supply development fee that will allow for additional conservation to be contracted for and constructed to ensure that we have sufficient water for these projects.

And I'm just going to end on IID's conservation efforts. Because we do have a large water supply, we are often a target to solve other areas' problems. I think we will see a lot of that moving forward as well. But on an annual basis, IID and its growers conserve about a half million acre feet of water a year to meet transfer obligations. That water is moved to urban Southern California, and contributes to

the water supply resilience and water supply reliability of San Diego, of Los Angeles, and of the Coachella area. And it's a very significant effort, it's about 15 percent of our water supply, at least to date to 2003 when a lot of these water transfers went into effect. The district has conserved, this graph's a little bit out of date, but I would say that I would say that number's over seven million acre feet already over these past two decades. So, very significant number.

And that's all I have. I appreciate being given the time to speak here, I wish I had better news. Unfortunately, we're not —— we're just learning about the challenges we have ahead with the Commissioner's new demands, and the Secretary's call for additional reductions throughout the Colorado River Basin, and we will be working through that with the Basin states, as well as here locally with our growers to see how we might collaborate to ensure that we have as much of a secure supply as we can in the future while again avoiding those critical elevations that could prevent water from actually being able to get to the valley.

CHAIR PAZ: Thank you.

COMMISSIONER HANKS: Okay, thank you. And continuing then, we'll move now to our next presenter, Abby Rodriguez.

MS. RODRIGUEZ: Hi everyone, thank you for the opportunity to share a little bit about Sparkz today. My name's Abby Rodriguez, I'm the product and business manager with Sparkz.

Next slide, please.

So, a little bit about Sparkz. We are a lithium-ion battery startup. I'm extremely excited to share our perspective and story today from —— from the perspective of a battery manufacturer, so. Our goal, form the Sparks side, is to development and manufacture and distribute world class lithium-ion batteries that are made and manufactured here in the US.

We're actually based out of Livermore, California. And, we've got a couple other locations around the country as well. Our focus is on cobalt-free lithium-ion environmentally friendly, vertically integrated manufacturing processes. We currently are focusing on two cobalt-free chemistries. One, is a mature technology called lithium-ion phosphate. And from here on out, you will here me refer to that as LFP.

And, we're currently in the development of a nickel-iron-aluminum chemistry, which is sometimes referred to as NFA. And, we have a —— a pretty comprehensive toolbox of resources through our partners and strategic organizations. And, at this time we're

looking to partner with major OEM's.

Next slide, please.

So, Sparkz has a —— a pretty extensive, well experienced management team. If —— as you can see across the board, we have industry expertise across international battery with battery manufacturing setup, capital allocation and leveraging through Richard Dapaah, our VP of BizDev. With Dr. Abouimrane, he was with Argonne National Lab, and before that did work —— some work in Canada under Michelle Arman.

And our founder is Sangiv Malhotra. He has been in the battery industry for a couple of decades, has founded and spun out three startups, and after his work on those three ventures, joined the U.S. Department of Energy as the inaugural Chief Commercialization Officer. And during Sangiv's work at DOE, him —— him and his team studied the battery supply chain and the infrastructure and looked at battery manufacturing from the perspective of —— of the US, and where does —— where do we fall on the battery production scale.

And his te—— through his —— him and his team's work, they learned that the US does not have any battery manufacturing, and we do not have a robust supply chain setup or established for those critical battery

materials.

So, if we could go to the next slide, please.

So, through that work, Sparkz was founded. Through Sangiv's work at DOE, and Sparkz has come to focus —— and we believe that batteries are a key to address two major shifts that we —— that we're looking to address as a nation, and globally as well.

So, first, being the decarbonization of our electrical system. Sparkz is approaching this from the perspective of renewables. So, it's estimated that by 2050, there will be some net-zero scenarios that envision around 90 percent renewable use through —— whether that's through wind or solar, but you will still need energy storage through batteries to use those renewable resources or energy resources most efficiently.

So —— and the second one that we see and to address this major shift is the electrification of transport. Which, you know, many that have spoken before me today have said the same thing about electrification of our transportation. And again, it's been predicted that around 2050, up to 70 percent of our total transport will be electric. So, in order to —— to reach that goal, we're going to need to establish

battery manufacturing and scale it up rather quickly.

Next slide, please.

So, Sparkz is seeking to address these —— these main markets right here, as you can see. And I tried to make it clear with pictures, and the size of the circles are just relative to the size of the markets based on the research that we've done. Sparkz is seeking to provide batteries and provide —— whether that —— that be at the material or the cathode level, as has been mentioned today. At the cell level, module pack, we seek to very flexible for our partners, which is something that has not previously been seen in the battery industry.

So, we are seeking to serve the industrial and the off-road market. So, if you think of the forklift, or agricultural equipment market, we're also addressing the stationary market needs. So, if you think of data centers, generators, and whether that's for your household gen—— household generator, or thinking on the —— on a commercial scale for hospitals, critical infrastructure, Department of Defense applications. All those need stationary storage.

And next, we'll address the medium and heavy transportation. So, thinking those class four to eight trucks, last mile delivery vans, public transportation,

school busses, those kind of vehicles, as well as looking to address the light duty EV market in a couple of years down the road, and then of course in the future, addressing the very large consumer electronics market.

Next slide, please.

So, the Sparkz approach to LFP production, and a large reason that I'm —— I have the opportunity to speak with you all today, is that we're looking to leverage the opportunity to obtain our lithium from a domestic source here in the US. First of all, which is extremely exciting, and will hopefully help us create the domestic secure supply chain that our customers are looking for, and that we feel is a national security need for our country as well to be sustainable and to be able to supply our own critical minerals from that side.

So, another perspective from the Sparkz side, is that we choose to leverage water-based binders in some of our formulations. So, then the more non-technical way to say that is instead of using volatile chemicals that need specialized explosion proof equipment that can actually be quite dangerous to the —— to the manufacturing workers and the operators on the line, we choose to use water instead. So, we're able to purchase equipment domestically, it is made in the US.

But also, you know, the top priority for our company above —— above and beyond all else, would be the safety of the team and our workers. So, being able to use the water-based binders and water in our manufacturing process as opposed to dangerous —— more dangerous chemicals, not only will reduce our waste as a company, but also will increase the safety of our employees.

And, we also would like to utilize renewable energy and power capacities to power our manufacturing plants, which we feel is something that's quite —— quite unique to our business. We do take a large focus on the manufacturing and product development side. Again, as I said, trying to be flexible for our customers and meet their needs, instead of tell them here's a one-size-fit-all approach, take it or leave it.

We also try to focus on robust quality management, and making sure that our customers, we provide them product traceability form mine to market, so they're able to see and have full visibility of the supply chain as they go through.

And, again, as I've said, a culture of safety and continuous improvements is paramount to Sparkz and to our team.

Next slide, please.

Thank you. So, moving forward, some needs

that Sparkz sees as we seek to grow manufacturing and material manufacturing in is —— oh, I'm sorry, could I go back one more slide, please? Thank you so much.

As we seek to grow our operation in California and get into the materials manufacturing as well as the battery and cell manufacturing, we see a need for federal matching funds. I'm sure many are aware that through the bipartisan infrastructure law, there is quite a bit of funding for materials processing, battery manufacturing, and —— and those that are seeking to play in this market.

So, matching funds for those federal dollars are a huge need. State support to purchase and validate manufacturing equipment would be another great need from the industry perspective. As well as state support for workforce training and development. We've had the opportunity to engage with the California Workforce Development Board but furthering that support so that Californian's can find meaningful sup—— support, and then training and employment through this growing market.

And some community impacts that —— that we hope to see through the —— through the Lithium Valley and through our work at Sparkz, is to provide local jobs through material manufacturing as well as through the

battery manufacturing. We seek to be a green manufacturer with little to no waste —— little to no hazardous waste, especially. I —— I know the professor that spoke briefly talked about the risk of asthma and certain —— certain other diseases in the area. So, we —— we seek to address and mitigate those risks from the beginning.

As I said earlier, safe manufacturing, safety of our —— of our plant and our employees is number one. And —— and certainly seeking to do what we can to grow the lithium market and see this —— this opportunity to have a domestic source of lithium grow and of course supply not only us, but other US battery manufacturers.

Next slide, please.

And that is all I have. Thank you to the Commission, and to the audience for giving me an opportunity to share about Sparkz. If there's any questions or comments, please feel free. Here's our social media handles, our website, and a general info email where inquiries can be made to the company. But, thank you all for your time.

(Pause)

CHAIR PAZ: —— question first each here, then I'll go to those who are online and if you have —— if we

still have time, I'll take another question from people here. So, we're not leaving those who are on Zoom little ——

UNIDENTIFIED SPEAKER: We're still going to have time for public comment, right?

CHAIR PAZ: Of course.

UNIDENTIFIED SPEAKER: Alright.

CHAIR PAZ: So, we're going to start with questions from the Commissioners here in Imperial, and I'm starting my time.

(Pause)

Commissioner Olmedo?

COMMISSIONER OLMEDO: Yeah, Madam Chair, I did —— this is your opportunity to ask questions that perhaps clarifications, and you know that we also have a time that we set aside for these meetings, and I —— I do want to recommend, and this is not a question directly to the presenters, but I do want to recommend that if we need to add more meetings, we add more meetings. Because I think we are shortchanging ourselves and our ability to have a full opportunity, you know, when we have these experts in the room.

But that's not my question. Actually throughout them all the different presentations, and there's a few things that —— that —— that I took away

from this. One is, that my understanding is there are legislation that reclassifies the waste streams that are coming out of the geothermal processes, depending on where it's coming out. The other is —— and presenters can take notice, right? I'm just going to put 'em out there. The other is similar to the way that gold is separated from its ore utilizing cyanide, it's very unclear as to how the lithium will get separated and how that's going to get —— that waste is going to get managed.

It's clear that —— again, looking at information that there's —— there's water, there's you know, multiple streams of waste, and still very unclear how those are going to be managed. Mr. McKibben brought up the economic concerns about the tax, and —— and the question with that one intrigued me most, because, you know, this last presenter talked about the importance of lithium to this country. And, couple things for Mr. McKibben, and this —— this question. One is, I'd be curious to know the —— your background. Your background is in economics.

Two is —— is there any policy recommendations that this country of this state can put —— can act on to assure that extraction in the United States does not get

undersold, or —— or put in a hard situation when competing with other countries, because what also comes to mind is that if other countries let's say are not utilizing the best practices, are not utilizing the best environmentally sound science and practices, then what exactly is it that the US has to do, or California, to be competitive? Is it having similar practices? Or is there a policy recommendation that the US can take to assure that the environment, the health, the economy, and the investments of the industries, and on top of that, because it is a mineral priority, there's considerable resources —— that's what I took away. So, I —— I'd be curious to know if in your experience —— I don't know if it's economists, of how you see this tax being such a risk. Taking all of that into consideration.

MR. MCKIBBEN: So, it's mainly from comparing what has been proposed, which is the flat tax. What's (INDISCERNIBLE) to other states (INDISCERNIBLE) the severance of minerals from the ground by the state or the county, and mostly the other mining states in the Western United States are using a —— a percentage tax. Either of the gross income, or the gross income minus the expenses with some deductions. And those taxes range from one to five percent, depending on the state

you look at. Nevada is probably the most tax-friendly, for example. So, it's not clear to me where the idea of the flat tax came from, because that's very inconsistent with what's being done in other western states. And I was just urging the Commission to advise the governor to have some flexibility in how they look at that.

The depletion allowance is a federal incentive on the —— on the income tax deduction that's often used to stimulate domestic production when we don't have much. So, that's why, for materials like manganese and cobalt and many others I could list that are considered strategic commodities that we don't produce domestically, they set the depletion allowance pretty high at 22 percent for domestic production. So, that's another way the federal government could stimulate the production of —— of lithium. And they do, they have it set very high at 22 percent.

So, I would just urge the Commission to advise the governor's office to look —— look at what the other states are doing, and look what —— what seems to be working well and what doesn't seem to be working so well.

COMMISSIONER OLMEDO: Are those examples you're drawing from similar to conditions that being set today's priorities with, you know, the subsidies,

policies, (INDISCERNIBLE)

(AUDIO FEEDBACK)

MR. MCKIBBEN: Um ——

COMMISSIONER OLMEDO: Just curious as to how do you draw those examples, and (INDISCERNIBLE) your experience on economics (INDISCERNIBLE) make those.

MR. MCKIBBEN: So, I'm not an economist, but I —— I studied mining and I studied tax law and —— and regulations related to mining and metals extraction. So that's the experience I'm drawing on. But, each state's a little bit different in the way they might split up the severance. So, some of them might exempt the first so many millions of dollars of production from any severance tax, and anything above that gets taxed at, let's say two percent.

Other states would —— would not provide that exemption. So, the states are quite variable in how they handle it, and I think some of them have a better track record of —— of promoting mining being able to occur without forcing it out of the state or forcing it overseas.

(OFF MIC)(INDISCERNIBLE) those differences carefully, is there some way it could be structured here in California that would assist the development to the lithium industry?

CHAIR PAZ: Dr. McKibben (OFF MIC)

(Pause)

Are the other states similarly investing in the private sector to promote the development of some of these materials?

DR. MCKIBBEN: Um ——

(AUDIO FEEDBACK)

Wait a little bit?

I know in the past, the states have —— have done stimuli to invest. So, Arizona with its copper mining, Nevada with its gold mining currently and in the past with its silver mining. So, it kind of depends on the commodity that they're trying to promote and support.

I'm not aware of any state that —— that is putting in the effort that California now seems to be putting in —— into a commodity right now. And it —— it may be somewhat unique for California because we have what could possibly be one of the largest lithium deposits, if you will, in the world. And not all the other states necessarily have a huge deposit like that that they could focus on.

I don't know if I answered your question.

CHAIR PAZ: (INDISCERNIBLE)/(OFF MIC)

—— was around water. You mentioned water as a challenge, and we got a presentation and there's a reason to be worried about water overall. But, I was wondering what exactly —— like how would you define the water challenge, especially when we're talking about the lithium production. Is it the quality of the water that's available, the quantity of the water that's available, so what exactly is the water challenge when we're speaking particularly (INDISCERNIBLE).

DR. MCKIBBEN: It's both the quantity and the quality. So, to wash the adsorbent, you need relatively fresh, clean water to be able to remove materials. So, steam condensate, for example, would be a very clean water.

The downside of using steam condensate is —— is our operators have mentioned, the reason this field has stayed so constant for so long, is they are constantly re-injecting everything back into the reservoir, and that kept —— keeps it going. If we're going to start to remove some of that steam condensate and use that for process water for the lithium, then that's less water you're putting back in the reservoir, and that's created problems at the geysers. COSO, (INDISCERNIBLE) was not reinjecting at all, and that's a complete environment disaster now there, and their field is now half dead

compared to what it used to be. So, maintaining the reinjectivity is —— is important and that would be the downside of using the steam condensate.

Having said that, if you look at the EIR for Simbol's Hudson plant, which they were going to do with the older version of Energy Source Minerals, they were going to use 70 percent of their lithium water was going to be from the steam condensate from the power plant.

Other solutions to that problem. What the geysers has done, is they —— they take greywater, wastewater from three local communities, including Santa Rosa, and they pipe it to the geothermal field and they're injecting it into the reservoir. And so, that might be another solution here to —— to reinject fluid in the reservoir and allow the geothermal companies to use more of the steam condensate for the process water.

(Pause)

COMMISSIONER RUIZ: (INDISCERNIBLE) obviously more for Tina Shields, I don't know if she's still in the room. And this is following up on the question that you are posing about water. Obviously, we live in a really extremely volatile water, you know, environment with experiencing one of the worst droughts in modern history. And —— and I think, you know, it's come to a point where we need to develop water budgets, you know,

for pretty much every industry, you know, that we are dealing with.

And so, I —— this is, you know, a two-part question. One, is how can we avoid having the lithium industry competing with the ag industry, with the other entities in terms of water, right? We have a water bank, and we can only withdraw water. We cannot put water back in there. This is a finite resource.

And —— and second, can we perhaps discuss a water budget. What would be the water cap? How —— how much water can we make available —— assuming that, you know, the industry will continue increasing in —— in production. Can we establish a water cap? Will that be something that can —— can benefit the industry, the community, the you know, the —— pretty much all together in the long run?

MS. SHIELDS: So, obviously, the news we've been hearing lately about the drought is really unprecedented. The volume of reductions that they're looking at is going to be a tough situation for folks to work through. IID, in particular, has a very large water supply with senior rights, and we've basically been put on notice that we need to be part of the solution.

But that being said, I think a lot of the water supply situation within the valley and throughout the (INDISCERNIBLE) policies that exist or will be adapted in the future, and that's where our responsibility is to this community and to our water users, is to find mechanisms to make things work.

There certainly are some conservation options, there are retreatment and recycling options that we have not looked to in the past, because we haven't needed to. We've had more than sufficient supply, and those are not in —— in many cases they're expensive ——

(Pause)

UNIDENTIFIED SPEAKER: We're having some (INDISCERNIBLE)

CHAIR PAZ: You are on mute, Tina.

(Pause)

MS. SHIELDS: And can you guys hear me?

CHAIR PAZ: Yes.

COMMISSIONER RUIZ: Yeah, we can hear you now.

(Pause)

CHAIR PAZ: We can hear you now.

Maybe she can't hear us?

(Pause)

MS. SHIELDS: Hi, can you hear me now?

CHAIR PAZ: Yes.

COMMISSIONER RUIZ: Yes.

MS. SHIELDS: I'm assuming that nothing I said earlier came through. So, the —— the drought's unprecedented, the district's going to have to take actions and collaborate with other states, and that's going to be a tough process we'll work through.

As far as providing water to these industries, the board has indicated that this is a priority for it to serve these new types of industries that have potential for great value to our community from a jobs and economic growth perspective. I think that we will be challenged in the future, but I do think that there are opportunities.

I will also say that, under our interim water supply policy, we still have water available. The projects never actually happened and were developed, they were talked about. So, we're going to sese as these moves —— as these projects move forward what those water demands are and how we can generate that water. We have options available. We have not looked yet into recycling and retreatments. We have a lot of water that flows into the Salton Sea that, with sufficient funding and treatment technology, can be cleaned up. There are some groundwater supplies available on the eastern portion of our valley that have not been cost effective

in the past, and may be in the future, depending on what the economics of the situation are.

So, I also think there's some opportunities to save from the location of these projects. They're at the end of our system, and there may be some opportunities to collect the runoff and do some basic retreatment, or just collect carriage water that would normally spill into the Salton Sea. I think your challenge is always going to be —— the more efficient you are in your water usage and the more conservation that you create, the more —— the more Salton Sea impacts you have and we'll have to work through the mitigation of those. It's —— it's, you know, it's a tough choice down here. If you use more water and become more efficient, you're actually causing impacts to the Salton Sea. And it —— and it's a difficult challenge. But, as I indicated earlier, the Board's been very forthright in their concerns and interests in finding ways to serve these, and we will work through those in the next couple of years as the projects develop.

CHAIR PAZ: Thank you, Tina.

COMMISSIONER RUIZ: Thank you.

CHAIR PAZ: Jim, you have a response to that as well?

MR. TURNER: Yes. I —— this —— I liked it, so that everybody knows. CTR, and I'm sure BHE will do this when they get to that phase of engineering. We —— we are studying how many times we can reuse a gallon of water before it's basically not usable anymore.

And, to address Dr. McKibben's point about the steam condensate, actually all of our water at the end will go back into the reservoir. Now, we may have to treat some of it so that we get the conditions right, but the —— the real key is, and —— and we've —— we made this decision several years ago, that at the appropriate time, we would study how many times we can reuse a gallon of water.

In the old days, we tended to use it once and throw it away. But, knowing that water is as precious as it is, and it may take some additional processing, but we'll reuse water as many times as we possibly can. And like I said, I'm sure BHE will do the same when they get to that phase of engineering.

CHAIR PAZ: Thank you. Are there other questions?

COMMISSIONER WEISGALL: I'm on the public time. I just want to thank all the panelists today. These were really terrific presentations, and we neglected to thank that first panel. Really very, very

—— very helpful to everybody, and I want to move this along.

CHAIR PAZ: Thank you. I will go now to Chula Vista, see if there are questions from Commissioner Castaneda?

COMMISSIONER CASTANEDA: None, thank you.

CHAIR PAZ: Okay. I will check with Commissioner Reynolds in Sacramento?

COMMISSIONER REYNOLDS: No questions from me, thank you. I also wanted to add my thanks to all the panelists.

CHAIR PAZ: Thank you. Commissioner Flores, in Sacramento Natural Resources Agency?

UNIDENTIFIED SPEAKER: She stepped out a little bit, so——

CHAIR PAZ: Okay. And, I know Commissioner Dolega texted that he also to leave. So, I think those are all the questions from the Commissioners and right on time. So, I will now open it to public comment. And, at this point, we will take public comment related to the workshop. And so, related to all the presentations that we've been discussing. And, I will start here in Calipatria and you can just start walking maybe towards the podium, and if there's others you can line up, that way we can do it ——

MS. NOVA-FROELICH: Hi, my name's Maria Nova-Froelich, Mayor Pro-Tem for the City of Calipatria. I also work here at the school district. I'm Director-Coordinator of the Calipatria-Nyland Family Resource Center.

So first of all, I want to thank the Lithium Commission for being here. I want all the presenters and the geothermal developers that are here today. So, I'm —— I'm very excited about the lithium project coming. God-wiling, you know, that we will have some community benefits coming. We've been advocating for 30 percent of the community benefits coming to the North End.

I understand that the geothermal plant has been very successful, has been here 40 years plus. I think it's healthy. Very happy to hear, you know, that IID is supporting the lithium projects that are coming. I understand also there's a programmatic EIR that's com—— that means that there's going to be more than just one lithium project.

So, with that said, I want to say that I heard that there's a campaign going on behalf of some of the developers that are —— that are opposing some of the —— some of the —— the flat rate tax rate regarding the lithium extraction. And, I just want to say that the developers are going to be making a lot of money. This

is a very healthy project. The extraction of the lithium that's going to be taking place for —— for many many years to come, and many generations to come.

With that —— with that said, I want to say that I think that they stand to make billions and billions of dollars from our rural Imperial County. We're very much impoverished in the North End. 85 percent of —— or more of our kids are free and reduced lunch. And I want to say that I think it's fair that the geothermal plants, you know, pay their fair share in regards to the lithium extraction projects.

I know for a fact that the Calipat school district has benefited a lot from what you have given, and we are forever grateful. We've had a lot of students and generations come through our school district. But, the —— this is different now. Geothermal is going to —— the lithium is going to serve 40 percent or more globally throughout the whole world, and so I'm thinking that —— I support the flat rate in regards to the lithium tax, and with that said, thank you again for all of you for giving a wonderful presentations. The IID, the presenters, as well as CTR and the other geo—— geothermal plants that are here, and the other presenters that are here.

Thank you very much.

CHAIR PAZ: Thank you.

BRIAN (NO LAST NAME): Hi. Thank you. My name is Brian, I'm a freelance reporter. Jim, you mentioned about the percentage of profits. What profits did CRT make last year? How much?

MR. TURNER: We haven't made any.

(Pause)

—— same thing, we're building, we're developing our first plant.

BRIAN (UNIDENTIFIED LAST NAME): So, like, how long has that been there?

MR. TURNER: Well, we've been in the di—— we've been developing this since 2012. So, we've yet to build the first one. We're hoping to do that.

BRIAN (UNIDENTIFIED LAST NAME): I mean, I understand that the profits, you know, like, the people want to like pay by the profits, but, you know, like —— I was talking to John the other day —— he says he hasn't been here for how long, he hasn't made a profit yet, in the —— in the geothermal energy. And is that creative accounting? Or poor management? I mean, well —— I mean, what are we going to get from nothing?

(Pause)

What's the percentage of nothing? 'Cause you can creative account it, pencil-whip anybody, but can you guys answer that? Like, what are we —— what are we actually looking at? What's the number?

CHAIR PAZ: We don't have time to —— to Q & A, unfortunately because ——

BRIAN (UNIDENTIFIED LAST NAME): Well I've still got ——

(AUDIO CUT OUT)

(Pause)

CHAIR PAZ: —— them, because they are, like you said, they're just starting the geothermal. There's other companies that do have geothermal, but I think, I mean, we've —— he's answered that question.

BRIAN (NO LAST NAME): Well how 'bout Jon (INDISCERNIBLE). How much have you guys made, last year?

(Pause)

COMMISSIONER WEISGALL: I didn't know we were going for Q & A. I'll tell you about (INDISCERNIBLE). We have three —— three positions. Number one, there's got to be one tax, not two from the county and the state. Number two, we want revenue coming back here. And number three, the tax has to be reasonable.

CalEnergy, BHER, has operated under a net operating (INDISCERNIBLE) in California for a number of years. As far as tax is concerned, there are different ways to go. There's a flat tax. You can do a percentage. You were talking, and you were grilling Mr. Turner about the percentage of profits. You can also put a percentage of revenue. So, even if you lose money, you can still ——

BRIAN (NO LAST NAME): Yeah but that would make (INDISCERNIBLE).

MR. TRUJILLO: Well, what's ——

(AUDIO FEEDBACK)

This is not appropriate for here. Thank you very much. I'm not aware this is a Q & A.

CHAIR PAZ: Yeah, no. And commit—— we don't have to answer questions, just so you know. The public has three minutes, they can use their three minutes, finish early, but if there's —— it's not a Q & A. So just want to (INDISCERNIBLE).

Next speaker?

MR. SHEER (PHONETIC): My name's Edgar Sheer. I'm a business man. Strictly a business man. I've had businesses in Niland for 35 years. Service stations, restaurants, that's all I've done.

I listened to the gentleman right here, and we

were talking about how to come up with some kind of a rate, okay? And he said, well maybe two percent of the gross profits after expenses. Been in business all my life and I —— I don't quite understand what you mean by gross profits after expenses. Gross profits is gross.

MR. TRUJILO: They allow deductions for expenses.

MR. SHEER (PHONETIC): Okay, but when you start —— after —— I'm just trying to get this in my —— in my thick mind, folks. Because gross profits is gross profits. Gross profits after expenses are net. You can put in de—— depreciation, all kinds of things. So, ju—— this is a good thing. What this gentleman right here said about the other —— mining in other countries is true. They can destroy your water tables. Here, I think, first you're going to take the water and pump it back down into the ground?

MR. TRUJILLO: Yup.

MR. SHEER (PHONETIC): For the most part. And that's going to keep our water table somewhere close to where it should be, I guess, I'm assuming. Is that correct, sir?

MR. TRUJILLO: It'll actually go back into the geothermal reservoir.

MR. SHEER (PHONETIC): That's right, yeah.

MR. TRUJILLO: So, we want to balance that reservoir and make sure that the reservoir stays healthy.

MR. SHEER (PHONETIC): Okay. Alright. Now, as we get more and more —— you want to build geothermal plants, is that correct, sir?

MR. TRUJILLO: That's correct.

MR. SHEER (PHONETIC): Now, I was in a meeting where Warren Buffet said that —— him and Charlie Munger, they said that these are very costly to build. That true?

MR. TRUJILLO: Yes.

MR. SHEER (PHONETIC): And you said, what've we got —— thank you, sir. I think you said something about six percent of energy comes from geothermal? Is that —— is that the figure that you gave out?

MR. TRUJILLO: For California.

MR. SHEER (PHONETIC): Yeah. And, Warren Buffet said they're —— they're just aren't hardly —— hardly worth it. Now, so what my question to you two gentlemen is, if something goes haywire here, and we don't go on with lithium, is Charlie and (INDISCERNIBLE), are they going to go ahead and build more geothermal plants?

(Pause)

MR. TRJUILLO: I can answer (INDISCERNIBLE).

UNIDENTIFIED SPEAKER: Okay.

UNIDENTIFIED SPEAKER: Yeah, I——

UNIDENTIFIED SPEAKER: Would you like to answer for CTR?

(Laughter)

CHAIR PAZ: (INDISCERNIBLE)

MR. TRUJILLO: I —— I, I will happily say that —— that, that our development plans right now —— our attempt to align our geothermal interests in development with lithium. However, if there is of —— a, um —— a misstep or an issue on the lithium side, we still have an opportunity to pursue geothermal. And —— and vice versa, I would say as well. So——

CHAIR PAZ: Time is up.

(Pause)

MR. SHEER (PHONETIC): Thank you.

CHAIR PAZ: I see no other speakers here in California. Do we have anybody in Sacramento, with Commissioner Reynolds?

COMMISSIONER REYNOLDS: This is Commissioner Reynolds, and no, Madam Chair, we have no speakers here in Sacramento.

CHAIR PAZ: Thank you. Do we have any speakers at the Natural Resources Agency in Sacramento, Commissioner Flores?

COMMISSIONER FLORES: Hi. No, we have no one here, thank you.

CHAIR PAZ: Thank you. Do we have any one on Zoom?

(Pause)

MS. LOZA: —— hands raised. The first is going to be Nikola Lakic, you should be able to unmute yourself.

MR. LAKIC: Hello, can you hear me?

MS. LOZA: Yes.

MR. LAKIC: Good afternoon, Chair Paz and Commissioners. Good afternoon, everyone. Thank you for this opportunity to say a few words.

This is very interesting meeting on —— and, I would like to say a few words. I am graduate engineer, architect. I'm inventor of several breakthrough technologies in energy industry, hydro, solar, geothermal. About over 30 patents.

I notice serious fundamental, actually, disconnect between what you doing at two projects. Harnessing —— trying to harness the lithium, and at the same time, restoration of the Salton Sea. What's

missing there, is really architectural design to unite those projects. And that's what I'm providing.

As architect, yes, I —— I have interesting proposal, it's under review by the state at this very moment. I hope will be accepted. Because, it's generates about $500 million and between high 500 and billion in revenue. In addition —— so just from energy. You know, in addition to what you're doing right now with geothermal and extract much more lithium.

I would be glad to speak with any of you separately —— it needs a little time. I hope in future that we will work together, because I do have solution and ignoring me and my proposal is —— it's not very wise. It's ignorance so —— so far happens since 2013. And, I hope that will not happen —— will not continue.

So, yes, I'm offering my service, and I hope to work with all of you soon. But, we have to meet, and we have to deflate that arrogancy a little bit, you know, not wanting to see other projects and knowing everything —— I, I studied architecture, nine semester, 38 exam, plus graduate work five, six months extra, and I'm proud to say I graduated with ten out of ten, it was very rare.

Great. So, I hope that we will work together.

Interesting, nice proposals, a lot of information, and I will try to reach you, some of those presenters that I have seen today, and let's hope that we can go forward together in future, because with my proposal, we will have plenty of water for extraction of lithium, for replenishing geothermal reservoir, for farmland. And, uh —— yeah, but that's not for two minutes or three minutes presentation, we need one afternoon, few hours, just for me.

But, thank you very much.

(Pause)

MS. LOZA: —— Reyes.

You should be able to unmute yourself.

MR. REYES: Yeah, this is Eric Reyes, Los Amigos de la Comunidad, Imperial Valley Based CTO. And in hearing all of the presentations, it's a very clear there's a disconnect between what the community wants, what industry wants, and even what our government —— local government agencies want.

Some of the issues we feel are —— are obviously water, it's not being addressed, and how are communities going to meet our future water needs where we'll be taped in the —— by the industry as well. And also, the mechanism for the fee, and how that's going to be

distributed after has not either been fleshed out or properly discussed with the community. We have our own desires as to how that money should be reinvested in our community, and we're not having that discussion dialogue at the same time. We feel that should be going on at the same time as you discuss with what they will be charging the industry, the levy and the tax.

Also, we feel there should be a tired levy, in many ways. You can start them off beginning, but at the end when they're making their billions, as Ms. Nova said, they should be paying their fair share and the community should be benefitting from it. I hope we can have this type of dialogue honestly, and openly with all stakeholders at the table. Thank you very much.

CHAIR PAZ: Thank you.

(Pause)

MS. LOZA: We have one comment from the question and answer box, and I think this was during the first workshop, by Crystal Warden. And it says, "How will Bombay Beach be affected?"

(Pause)

CHAIR PAZ: Thank you.

MS. LOZA: And those are all of the comments on Zoom. Back to you.

CHAIR PAZ: Thank you. Well, seeing that we

do not have a quorum and it is almost five, I am going to defer all the remaining items on the agenda for the next meeting. But, I do want to provide a little bit of housekeeping for the next meeting, and I might need to ask Silvia to remind me, but we have our next meeting scheduled for June 30th, and it will be here at Calipatria High School, and we are going to be starting that meeting at one, similar to today. During that meeting —— so I get —— we have as —— as of today, covered all of the topics, and some additional, that we were interested in, that we've been required to cover for the reports. So, we're in a good place with our timeline.

There are still some topics that we want to discuss further. That is the environmental impacts, so we are going to continue the conversation on environmental impacts, as we discussed last meeting. And that is going to include topics, or speakers who can speak to the waste streams, the role of the regulatory bodies, the mitigation strategies, and I do want to continue in that meeting, hopefully, the conversation on water, which started today.

And, I think there needs to very good clarity around, you know, when we're talking about the water table, when we're talking about the geothermal reservoir, and when we're talking about ideas like

Commissioner Ruiz talked about, are we going to have to get to the point where we have to create water budgets, and how do we ensure that the water that people need to drink gets prioritized. So, I think there's a lot at stake when we're talking about water. So, I would like to see if we can continue that topic in our conversation of environmental impacts. What is next?

We also are developing a —— with Commissioner Scott and Commissioner Ritchie, we are going to be hearing from the Tribal perspectives, and that is expected to be —— to happen at the July meeting. The July meeting will take place on the 21st. It will be a full day meeting, and it will take place at Westmorland Elementary school.

So those are just, again, some housekeeping, what's coming, so, I will now just open the meeting for general public comments before we adjourn. So, this is a time for anyone in the audience who wishes to speak on items that were not on the agenda. And you can come to the podium and state your name.

(Pause)

UNIDENTIFIED SPEAKER: (INDISCERNIBLE) My name is (INDISCERNIBLE). I'm just trying to request a (INDISCERNIBLE)——

(AUDIO FEEDBACK)

— from the —

(Pause)

Thank you. I wanted to request an update from the community engagement subgroup led by Luiz Olmedo, Frank Ruiz, Chair — Vice Chair Kelley, and Chair Paz. I would like to request (INDISCERNIBLE) an update to be submitted either to the docket, or to be, perhaps, part of an agenda item for the next meeting on June 30th. And, in that update, if — and I'm wondering if there are any upcoming workshops to be held in person, especially as the draft report is coming up next month, I believe.

But, I haven't heard from the community engagement subgroup, or subcommittee, in quite a while, so I'm just wondering if there are any developments that can be shared in an update, either written, or as part of an agenda item next time if the Commissions. Thank you.

CHAIR PAZ: I don't see anyone else here in California. And, I don't know if I have to call if I already know that there's no one in Sacramento? Or do I need to?

(Pause)

MS. PALMA-ROJAS: Yes.

CHAIR PAZ: Okay. So, Commissioner Reynolds, is there anyone in Sacramento wishing to speak?

COMMISSIONER REYNOLDS: No, there is no one here.

CHAIR PAZ: Thank you. Commissioner Flores, is there anyone at the Sacramento Natural Resources Agency wishing to speak?

COMMISSIONER FLORES: No, there's no one here.

CHAIR PAZ: Thank you. Commissioner Dolega is not there, and neither is Commissioner Castaneda, so we will now go to the CEC staff to see if there's anyone on Zoom wishing to speak?

MS. LOZA: Don't have any hands raised on Zoom, and there are no questions in the comment —— in the Q & A box.

CHAIR PAZ: Thank you.

MS. LOZA: Back to you, Chair Paz.

CHAIR PAZ: Thank you. So, we will adjourn at 4:58, and we'll see you June 30th.

(Meeting adjourned at 4:58 P.M.)

CERTIFICATE OF REPORTER

I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were reported by me, a certified electronic court reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

And I further certify that I am not of counsel or attorney for either or any of the parties to said hearing nor in any way interested in the outcome of the cause named in said caption.

IN WITNESS WHEREOF, I have hereunto set my hand this 6th day of July, 2022.

MARTHA L. NELSON,

CERT**367

CERTIFICATE OF TRANSCRIBER

I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were transcribed by me, a certified transcriber and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

And I further certify that I am not of counsel or attorney for either or any of the parties to said hearing nor in any way interested in the outcome of the cause named in said caption.

I certify that the foregoing is a correct transcript, to the best of my ability, from the electronic sound recording of the proceedings in the above-entitled matter.

MARTHA L. NELSON, CERT**367

July 6, 2022