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IEPR JOINT AGENCY WORKSHOP

BEFORE THE

CALIFORNIA ENERGY COMMISSION

In the Matter of:	)	
	)	
2021 INTEGRATED ENERGY POLICY REPORT (2021 IEPR)	)	Docket No. 21-IEPR-04
	)	
_____	)	RE: Reliability

JOINT AGENCY WORKSHOP ON

SUMMER 2021 ELECTRIC AND NATURAL GAS RELIABILITY

REMOTE ACCESS WITH ZOOM

THURSDAY, JULY 08, 2021

10: 00 A.M.

Session 1: Hydro Resources and Drought

Reported by:
Marlee Nelson

APPEARANCES

Workshop Leadership

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Karen Douglas, CEC
Patty Monahan, CEC
Marybel Batjer CPUC President
Marth Guzman Aceves, CPUC
Clifford Rechtschaffen, CPUC
Elliot Mainzer, California ISO, President and CEO

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Heather Raitt, CEC Program Manager
Delphine Hou, California ISO
Ed Randolph, CPUC

Presenters:

Angela Tanghetti, CEC
Drew Bohan, CEC Executive Director
Eric Van Deuren, Pacific Gas and Electric
Mark Cook, Lower Colorado Dams Office, U.S. Bureau of Reclamation
Ben Kujala, NW Power & Conservation Council

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Public Comment:

Robert Perry, Synergistic Solutions
John White, Center for Energy Efficiency and Renewable Technology

I N D E X

P R O C E E D I N G S

JULY 08, 2021 10:01 a.m.

MS. RAITT: All right, good morning, everybody. Welcome to today's 2021 IEPR Workshop on Summer 2021 Electric and Natural Gas Reliability. I'm Heather Raitt, the program manager for the Integrated Energy Policy Report, which we referred to as the IEPR. Today's workshop is being jointly held by the Energy Commission, the California Public Utilities Commission and the California Independent System Operator. This workshop is being held remotely consistent with the Executive Order N-08-21 to continue to help California respond to, recover from, and mitigate the impacts of Covid-19 pandemic. The public can participate in the workshop consistent with the direction in the executive order.

To follow along today, the presentations that will be presented have been docketed and are posted on our website. All IEPR workshops are recorded, and both the recording and written transcripts will be linked to the Energy Commission's website following this workshop. Attendees have the opportunity to participate in a few different ways today. For those joining the online womb -- Zoom platform, excuse me, the Q&A feature is available for you to submit questions. You may also upvote

a question submitted by someone else. Click the thumbs up icon to upvote. Questions with the most upvotes are moved to the top of the queue. And we will reserve a few minutes before the end of the morning to take questions submitted through that Q&A feature. But we likely will not have time to address all questions submitted.

Alternately, attendees may make comments during the public comment period at the end of the morning and afternoon session. Please note that we will not be responding to questions during the public comment period. Written comments are welcome and instructions for doing so are in the workshop notice. Written comments are due July 23rd. And I should clarify that this morning is the beginning of a two -- of this two-day workshop, so we will have this morning session and the afternoon session today, and then tomorrow there'll be two sessions and each one has a separate Zoom logon. So with that, I'll turn it over to Commissioner Andrew McAllister to begin the opening remarks. Thank you.

COMMISSIONER MCALLISTER: Thank you, Heather. First off, thanks, thanks to you and your team for putting together this two day workshop. And for those of you interested in both reliability and building decarbonization, we have actually packed four days ahead of us today and tomorrow on electric and natural gas

reliability and then Monday and Tuesday on various aspects of building decarbonization. So these are two of the major themes of our time in terms of energy system planning and decarbonization of our state. And they, you know, we have a lot of activities, and a lot of successes that we have to generate over the coming years. And we really can't, but we can't skimp on any of them. We have to succeed on really the, I call it the triumvirate of activities of goals that we have.

Number one is, we all know, is reliability, and what we are here to talk about today and tomorrow, decarbonization, and the third is equity. We have to do all this in a way that is equitable and inclusive across California. So those three legs of the stool really all have to be there for us to consider our long term transition of our energy sector to zero carbon to have been a success. Right. Reliability and equity have to be there. So with that, I want to just thank my fellow members of the dais. Really, I think that the fact, the importance of the reliability discussion is reflected in the fact that we are really locking arms across the agencies, the energy agencies, to educate ourselves and sort of level set and gather information and really make sure that the -- that we are providing the leadership and that really everyone has a voice to help inform this

discussion.

And so we have our lead on Reliability, Commissioner Gunda, who I'll hand off to presently, Commissioner Karen Douglas from the Energy Commission, that will also be with us shortly, as will I think, Commissioner Monahan, perhaps. And then we have -- we are blessed to have President Batjer, Marybel Batjer from the California Public Utilities Commission, along with her colleagues, Commissioner Guzman Aceves and Commissioner Rechtschaffen. So thanks to both of you, or all three of you. And then we have the present CEO of the California Independent System Operator Elliot Mainzer. So thank you, Elliot, for being with us as well. I think the fact that we have, you know, leadership across the three agencies here is really indicative of the importance of this topic. And I'm Chair Hochschild would be with us if he were in the office, but he's out on vacation. So I think that we really this is the utmost highest level priority for our three agencies.

So you know, we're here basically to talk about a number of themes over the next couple of days. And I think the overarching topic here is you know, weather is front and center. Climate and weather, you know, the interrelated things are what we have to work to, you know, deal with. The facts of climate change that we're, we know it's upon us and we're seeing it every day and it's

impacting our electric system, you know, as we speak, really. It'll be 103 in the central northern Central Valley here. And we're seeing heat waves over and over again earlier and stronger than we ever have. So you know, we have to work together to control what we can to prepare for what we cannot. And so, you know, the planning of our energy sectors, our electricity and natural gas sectors are that's what we have to do to mitigate and deal with the impacts of climate change and optimizing investment such that we do it in an equitable fashion, as I said.

So I'm really gratified to be leading the IEPR this year. This is, you know, highest priority topic. The -- we have a limited number of themes in this year's IEPR alongside the Forecasts, the Natural Gas system, Reliability, and Building Decarb. Those are the big four this year and they're all important for us, for our energy future in California. So I'm really glad to welcome all the attendees and again, my colleagues on the dais. And with that, I'll pass it over to Commissioner Gunda, who's the lead on Reliability here at the Energy Commission.

COMMISSIONER GUNDA: Good morning, everyone. And Commissioner McAllister, thank you so much. First of all, I want to just thank you for your leadership on this years IEPR also just your thought leadership on building decarbonization, as well as, you know, the analytics that

we do, both the data and the assessments we do. So thank you so much for your leadership across that idea of items that we need from the state.

So it is going to be an action packed two days, as Commissioner McAllister noted. I do want to recognize and thank all the commissioners. I want to confirm that Commissioner Monahan is on the dais with us. Really glad to see her too. So just, you know, I want to take a few minutes to set the stage, provide an overview of what we're trying to tackle here. At the very top, as Commissioner McAllister noted, just want to take a moment to recognize the leadership of President Batjer, Chair Hochschild, and President Mainzer in really setting the stage for all of us to collaborate and recognizing this fact that while we all have very distinct roles and responsibilities, our individual success as agencies, it really is a collective success. You know, so it relies on the collective success. So we have to bring together everything we can to support the state in the liability, but long term planning. So just want to key that up. It's just a great collaboration that we have right now.

So for today's workshop, just highlights the really, a term that Commissioner McAllister has been using, the interconnectedness of the electric grid. So we have the interconnectedness to the water system as we discussed

the impact on the drought on hydropower today. We have the interconnectedness to the rest of the western grid as we talk about role of imports, particularly net peak hours, and our dependence on that today, and interconnectedness to the gas system. We have a whole day workshop led by Commissioner Guzman Aceves tomorrow to really think through the interconnectedness between Electric and Natural Gas Reliability. So there is -- the central theme for reliability is emerging to become this interconnectedness and how we need to think about, you know, the work together, both you know, between the agencies, but also California and the rest of the west.

In May, IEPR workshop, with our partner agencies, again you know, the same leadership that we have today, we discussed the outlook for the summer. We are continuing to carry out the recommendations in the Root Cause Analysis. And we'll have a presentation today to just kind of go over the revisions to what we observed as the outlook for the Summer and how the agencies are collectively preparing to get through that. So the June heat wave was the first test of our planning since the last year. And I think I just want to commend the kind of relationship we all have and the partnership to get through that. And I think the agencies were successful in navigating through that and then kind of test some of our strategies that we planned

for navigating what we expected to be potentially a tough summer.

The early and repeated heatwaves that we see around the west, along with the drought conditions, really highlight the importance of adapting how we look at reliability in the face of climate change. And I'm just, you know, want to recognize how hard all the agencies are working to ensure that we think through this cohesively and collectively to put the state on the path of reliability for all Californians?

We have a panel specifically looking at the drought conditions this morning describing historic trends of hydropower and what do we anticipate moving forward. Mark Rothleder from CAISO will lead the panel. In the afternoon, we'll be looking at the midterm reliability, specifically looking at 22 through 26 time frame. You know, what are some of the actions that the CPUC is taking and what are some of the things that we are teeing up as the next steps to really think through this?

And for tomorrow, led by Commissioner Guzman Aceves, we'll be discussing the interconnectedness of the natural gas and the electric system and potential impacts and extreme weather conditions on both systems, and how do we plan that together and what a hot summer might look like to the natural gas system and what the impacts of a hot

summer could be on the winter. And we'll try to highlight the lessons that we've learned from the polar vortex that we experienced in Texas.

In the afternoon tomorrow, we'll have presentations from CPUC, CAISO, and LADWP, to really think through this interplay of Electric and Natural Gas Reliability, specifically in the L.A. Basin and how it all ties to the Aliso Canyon use.

So, again, in summary, it'll be -- a it'll be an important to day conversation. And I'm incredibly thankful for all the leadership that are here to think this collectively and in a coordinated fashion. And I also want to close on the same remark that I opened with, which is we cannot do this alone. No agency can do this alone. And I am incredibly thankful for President Batjer, and President Mainzer, and Chair Hochschild for, from the top, setting the stage of let's work together, and their collective success is imperative to make sure California meets climate goals. So with that, I'll pass the mic to President Batjer.

PRESIDENT BATJER: Thank you so much, Commissioner Gunda, and thank you to Commissioner McAllister for your remarks. I would just really underscore everything you've said. I am so pleased that we are -- we have such a full dais today. And I would also

add that you are so right, Commissioner Gunda. We cannot do this alone. It's going to take all hands all the time, 100% of the time, and with good thinking, collaborative thinking and innovative thinking. So and as you said, I and my colleagues, we all have been very focused on reliability of this summer, laser focused ensuring in this time, as you also, well said, of unprecedented climate change driven heat events. I think we were all shocked, as were the scientists, of the heat dome that consumed the Pacific Northwest. I mean, to hear of temperatures of 121 in British Columbia, and 117 in Portland, 108 in Seattle, and terrible temperatures in Montana and Wyoming. It's quite nothing short of frightening. And I think it gave us all a scare. And even for me personally, I need to redouble our efforts to make sure we're doing all we possibly can for good ol' Mother Earth and our fellow Californians, if not indeed all of -- all of the people of our country and the world, frankly. It's nothing short of that important.

So this workshop, these couple of days are very, very important in terms of informing us, helping us think through. I'm very pleased we're having some of the presentations and some of the discussions that we will be having today and tomorrow. So I really thank the CEC for doing all of the hard work to put this workshop on. And I

thank all of those who will be presenting today and tomorrow, including my fellow commissioner, Commissioner Guzman Aceves. So thank you all very much. And I think the good thing is that we stop talking and we get doing. So thank you all very much.

COMMISSIONER GUNDA: Thank you, President Batjer. Just wanted to acknowledge that Commissioner Douglas is also here with us. Now she joined. I want to just ask if any other Commissioners would want to say anything before we jump in. I don't see any kind of request. Oh. Go ahead. Sorry.

COMMISSIONER MONAHAN: Thanks, Commissioner Gunda.

COMMISSIONER GUNDA: Yeah.

COMMISSIONER MONAHAN: Yeah. I'm going to -- I'm going to be very fast because as President Batjer said, we really want to get down to the conversation at hand. But I really appreciated the opening remarks of both you and Commissioner McAllister, this theme of interconnectedness and the framing of the priorities of reliability, decarbonization, equity, I think are spot on. Last year's IEPR focused on transportation, really highlighted the opportunity for zero emission transportation to take off, as battery electric vehicles in particular are, you know, sweeping the world globally. It's an unstoppable

transition. The question is how fast it will occur and the reliability of the group that is critical to us being able to make progress. What is the major, biggest source of emissions in the state of California? Half of all greenhouse gas emissions come from transportation. We need to zero out those emissions. The grid is critical to that. The stability of the grid is critical to that, that I would say, you know, transportation is the camel's nose under the tent when it comes to electrification we see across the whole state local cities, starting with my city of Berkeley, the first one, and now we've basically taken off with every major municipality, most of the major municipalities in the state requiring that new buildings be electric in some form. So this, just this issue is central, is central. How do we make sure that, as we electrify more and more the grid is stable and our particular lowest income families are protected? And I think the fact that we have so many participants today highlights how we are all taking this very seriously. We all need to work together. And I'm really looking forward to the conversation over the next two days.

COMMISSIONER GUNDA: Thank you, Commissioner Monahan. Commissioner Monahan, just noting that your audio was a little choppy, but we could hear the message just flagging that for future comments. I don't know if

President Mainzer, you wanted to add anything before we jump in.

PRESIDENT MAINZER: Yeah. Thank you, Commissioner Gunda. I do have just a few comments, just briefly. This is a wonderful opportunity just to address so many of my colleagues and so many of the folks in the energy sphere here in California and abroad. First of all, I wanted to really echo the theme of collaboration. I think it's just been incredible this last, you know, eight or nine months since coming back to California, working with all of you. And I want to particularly express some appreciation for President Batjer's bringing that tremendous sense of focus and urgency. I think the procurement order that came out a couple of weeks ago from the PUC for 11,500 megawatts, that really is a monumental step forward for California in terms of procurement of clean energy and capacity. And at the ISO, we see that as such an important step.

And I just want to highlight a couple of things that are a function of feedback that I have received in the last several months, and just observations. I think, first of all, at the ISO it's, we are going to do everything within our power to make sure that our transmission queuing, processes, and that the transmission system is able to provide deliverability for these resources. That

includes network upgrades, that includes working with utilities on substation infrastructure. We know what's ahead of us in the next several years in terms of resource retirements and that deliverability for both local and system RA onshore/offshore is going to be really, really important.

I've really appreciated working with the CEC, and the CPUC and many stakeholders across California, so that just has to be an absolute laser focus for all of us. And we're going to really try to bring some creative problem solving to that equation. I would also encourage all of us, you know this is a very dynamic time nationally with what's happening with the Biden administration and the infrastructure bill potential. I think it's also a time for us to really think deeply about what out-of-state transmission needs for California -- means for California in terms of both access to diverse portfolio of resources, as well as strengthening the economic environmental value of our regional electricity market.

I do think just a couple other quick observations. You know we know all of us right now, we know that we're in a very challenging transition moment for the state as we -- as we move through the first chapter to maybe the second or third chapter of our decarbonization trip. And so it's really important that as we think about

the procurement, that we also, I think, want to think about what are the resources that we can bring online in the next several years that can really take us off the edge. We're living on the margin. We have a relatively tight reserve situation right now. What's going to be the best set of resources that we can get in to really help us out with that net peak and those strains on the system in the next several years? So we're not in such a choppy situation. So I'm really looking forward to hearing more about that, and then sort of the timing and the sequencing of the resource acquisition.

And then finally, I just wanted to add, I know there's, we've been -- a lot of focus recently on the supply side, but you know the demand side of the equation is obviously so important. Load flexibility. I know we all know, all of us in the planning and operations here in California recognize just how critical flex alerts and demand response the new LRP program are going to be to getting across this summer, while minimizing the probability of rotating outages. And so I'm really looking for and appreciate the leadership in multiple spaces within the state apparatus to make sure that we continue to make those changes to the demand response framework in California to better align and rationalize economic incentives, dispatch time frames, capacity determinations

and performance metrics. I see this is really urgent work so that we're working on both the supply side and the demand side with equal urgency.

So thanks for the opportunity to offer just a few comments. I really appreciate all the effort that's gone into this session. My team, we're just super inspired to work with all of you and continue to really lean in the next couple of years to help the state maintain reliability and meet these just really important clean energy objectives. So thank you.

COMMISSIONER GUNDA: Thank you, President. Mainzer. Before I pass the mic back on to Heather here for kind of moving through, I just want to note that I might have to step out towards the end of the morning session briefly. And I have my advisor, Liz Gill, who will kind of be there to answer any questions that might come for our office. But we will have Commissioner McAllister lead that part. So with that, to Heather.

MS. RAITT: All right. Thank you, Commissioner. So our first presentation this morning is on the Summer 2021 Reliability Outlook Update and Angela Tanghetti will be presenting. She's the staff lead for Power System -- the Power System Modeling Group with the Energy Commission in the Energy Assessments Division. And I'll just note that after Angela's presentation, we also have

Delphine Hou, who's the director of California Regulatory Affairs at the California SO, to help address any questions. And also, Ed Randolph who's the deputy executive director for Energy and Climate Policy from the CPUC, who's available to help address questions. So with that, go ahead, Angela. Thank you.

MS. TANGHETTI: Good morning. Good morning, stakeholders. And thank you all on the virtual dais for your real leadership, your direction and asking some really hard questions. It's honestly motivating for me as staff. So with that, I'm here to get us started by presenting updates to the supply staff the CEC presented at the May 4th Joint Agency Workshop. Quite a few things happened or changed since our last workshop. So let's see what we've learned. Next slide, please. Oh no, you're on the right side there. Thank you.

Today we'll briefly go over the recent June weather event. There are also changes in not only supply, but also projected demand since the May 4th workshop where we shared the Energy Commission's Summer Supply Stack, considering both average and extreme weather scenarios. In addition to the Stack Analysis, we'll share our most current information on wildfire risk to the instate generation portfolio. Next slide, please.

During June, California experienced some near or

some record setting temperatures. At the same time, our neighboring states experienced a heat dome that also kept temperatures at or near record levels. During this heat event, the California ISO issued a flex alert due to this above average weather, drought conditions, and also some unplanned outages. During this heat event, the energy agencies in California were able to implement the Joint Agency Contingency Plan to help ensure grid reliability. The flex alert and other contingency efforts avoided outages and the need for a Reliability Demand Response Resources Event. Next slide, please.

As you can see from this chart of projected and actual demand from June 17th, consumers responded to the conservation call, reducing electricity demand during crucial evening hours to keep from overtaxing supply. Next slide, please.

At the last workshop, stakeholders questioned how batteries may perform given a heat event. This chart is also for June 17th of this year, showing battery operations in sync with net peak load demand. It has been interesting to watch the evolution of this chart from a few hundred megawatts to now displaying a thousand megawatts on the left axis. We look forward to what the next few months and years will show for the battery category of resources. Next slide, please.

As a reminder, the purpose of the CEC Stack Analysis is a Near Term Simplistic Reliability Outlook. The California ISO NQC list is used because it contains a dependable capacity accounting method that is vetted publicly, the list is regularly updated, and represents basically steel in the ground. Last week, the California ISO presented a Stack Analysis of the CPM Significant Event Stakeholder Meeting to provide context for the solicitation. For those following closely, we thought it was important to clarify the differences between the two analysis and capacity counting methods used in resource adequacy, also known as RA and the Net Qualifying Capacity, NQC. Next slide, please.

At the May 4th workshop, CEC staff presented our first set of Supply and Demand Stack Analysis Charts for Summer 2021. Two scenarios were presented for the months of August and September. Based on new information surrounding the California drought, plant outages, and procurement delays, we are updating not only supply, but also demand projections. CEC staff not only updated the Stack Analysis Charts from the May presentation, but also added the month of July, even though as a long term planner by including July, and breaking one of my research rules, which is never project the timeframe you are currently living through, we find it necessary to share what we know

and are projecting for the month of July. CEC staff is projecting a net decrease in monthly peak hour demand of approximately 200 megawatts for July through September due to changes in water agency pumping loads. Supply side updates include an approximate 1,000 megawatt derate to hydropower plants due to projected lower reservoir levels and water availability, beginning in July. The CEC's May 4 Supply Stack used historic average RA showings for imports. However, the California ISO was able to provide the aggregated actual RA imports showings for the month of July and August, which are slightly higher in July but then slightly lower in August compared to our historic average projections. Also, since the May 4th workshop, the Russell City plant experienced an unplanned outage, and the CPUC was - notified of a few delays in improved Summer procurement. Next slide, please.

Even though the May 4th Workshop Slides did not provide outlook for July, we're still calling as revised. Please note also that the May 4 Stack Analysis only included a 15% Planning Reserve Margin Demand Curve. For this Update Analysis staff added a 17.5% demand curve for the Average Weather Scenario. As you can see, under Average Weather Conditions and considering the revisions mentioned on the previous slide, July is considered reliable under both the 15 and 17.5% Planning Reserve

Margin Demand Curve. Next slide please.

The Revised Stack Outlook for August under Average Weather Conditions is also still considered reliable under both the 15 and 17.5% Planning Reserve Margin Demand Curve. Next slide, please.

For September, the updates do not trigger any contingency using the 15% Planning Reserve Margin Demand Curve. However, including a 17.5% Planning Reserve Margin Demand Curve, the updates do trigger the use of contingencies. These contingencies are projected to occur during the 6:00 to 7:00 p.m. hour and also the 7:00 to 8:00 p.m. hour. Remember, the May 4th figure did not include a 17.5% PRM Demand Curve. Next slide, please.

July updates, under the Extreme Weather Scenario, caused four trigger contingencies. Again, there was not a Supply Stack provided for July during the May 4th workshop. This slide represents the difficulty the energy agencies must tackle if California experiences extreme or weather events in July. Next slide, please.

For August, the updates under the 13.5% Demand Curve caused an increase in the amount and also duration of trigger contingencies when compared to the May 4th figure. Trigger use of contingencies under the 13.5% PRM, now appear in the 5:00 to 6:00 p.m. hour and extends to the 9:00 p.m. hour. The amount of contingencies also increases

depending on the hour when compared to the May 4th figure. Next slide, please.

September updates, under the Extreme Weather Event, also caused an increase in not only the amount, but also the duration of trigger contingencies when compared to the May 4th figure. Updates now trigger contingencies in the 8:00 to 9:00 p.m. hour, while the May 4th, 21 figure showed no contingencies in this hour. The amount of hours -- the amount of trigger contingencies also increases, again, depending on the hour when compared to the May 4th figure. Next slide, please.

Here's some of the measures available to the energy agencies in the event of trigger contingencies. Some of these contingency measures were drawn upon during the June heat event, namely the flex alert. Also in June, energy agency staff contacted large consumers to ask if they could shift consumption to nonpeak hours or to reduce their load. And the California ISO was able to secure additional imports from other balancing authority areas. Emergency load reduction programs developed by the PUC are in place and designed to pay back generators if requested. Next slide, please.

Wildfire threat is also a potential risk to the electric system assets in California considered in the CEC's Summer Stack Analysis. While many CEC jurisdictional

plants are in lower wildfire risk areas, 12 of these jurisdictional plants are located in higher fire threat areas, namely the Geysers, Geothermal area, and a few in San Diego County. Generally, hydropower plants are located in rural areas, and most of the hydro fleet are in higher fire threat areas. At this time, CEC staff projects no decrease to Summer 2021 peak capacity in the Summer Stack Analysis due to fire threat. Next slide please.

These maps are provided to simply complement the text I provided on the previous slide. The left map displaying California's hydro fleet, and the right map displaying the CEC jurisdictional power plants in relation to fire threat regions. Staff will continue to monitor statewide fire conditions to evaluate risk and impact to electricity supply throughout the fire season.

With this, this summarizes the changes from the CEC May 4th, 2021, Stack Analysis, again, from a California perspective. I look forward to our next panel of experts in Operational Planning for perspective from other areas of the WECC. With that, I'm open to questions from the dais with the help of Delphine Hou, from the California ISO, and Ed Randolph, with the PUC. Thank you.

COMMISSIONER GUNDA: Angela, this is -- just want to thank you for your presentation and want to make sure I acknowledge the careful kind of considerations of all the

things that are happening and ensuring that we're tracking this carefully. I have been intimately familiar with all the work that you're doing, so I don't have any questions. But I would really like to make sure there is a opportunity for the rest of the commissioners on the dais for any clarifying questions that they might have.

PRESIDENT BATJER: Commissioner Gunda, This is Marybel.

COMMISSIONER GUNDA: Yeah.

PRESIDENT BATJER: I just want to add my thanks to Angela and the team. We all have, we, the Commissioners, we all have been living with these numbers 24/7 recently. So I, like you, have been pretty intimately aware, acutely aware of the numbers and some of the challenges that we have. So I have no questions. I just want to thank you, Angela, and very good presentation and look forward to any of the other questions from the dais.

COMMISSIONER GUNDA: Thank you, President Batjer.

COMMISSIONER GUZMAN ACEVES: Commissioner Gunda.

COMMISSIONER GUNDA: Yeah. Please, Commissioner.

COMMISSIONER GUZMAN ACEVES: I don’t know if there's a short answer to this, Angela, but do you know what the issue was at the Russell plant?

MS. TANGHETTI: I don't --

PRESIDENT BATJER: There was a fire.

COMMISSIONER GUZMAN ACEVES: Thank you.

PRESIDENT BATJER: Martha. There was a fire.

COMMISSIONER GUZMAN ACEVES: Okay.

COMMISSIONER GUNDA: Commissioner Guzman Aceves, there was a -- it's a two stage plant and we had a fire and explosion in the second stage boiler. And so that's something that we are actively tracking.

Any other questions? Commissioner Monahan, or I don't see any other questions. With that I think we're back to -- back to Heather. Thank you, Delphine and Ed, for being here.

MS. RAITT: Great. Thank you so much. Thanks, Angela. So we'll move on to the first panel on Hydropower Performance and Drought, and the moderator is our very own executive director, Drew Bohan from the Energy Commission. Go ahead, Drew.

MR. BOHAN: Good morning, everyone and thank you, Heather. Ever since the first dam started producing electricity in the late 19th century, hydropower has been a reliable, flexible and pollution-free electricity resource. Over the years, we've learned about some of the negative impacts from hydro generation to people, to wildfire, and -- wildlife, excuse me, and other resources. Nevertheless, hydropower is a critical electricity resource here in California. In the CAISO territory, hydropower is

one of the largest sources of electricity, typically accounting for about 14% of summer peak capacity. Statewide installed hydro capacity totals just over 10 gigawatts. So this is a big resource.

In our first IEPR Workshop this year on Reliability on May 4th, Tuan Bui, from the California Department of Water Resources, described the starkness of the drought impacts to their operations this year. Tuan's Department estimates this year's hydro generation will only be 35% of their 2020 levels. And we just heard an update from Angela on how those figures impact Reliability. This morning's panel takes a little broader geographic look at drought impacts to hydropower, how it affects plant operations, and what this might mean for hydropower availability in future years. We got a great panel this morning and allow me to provide brief bios of our speakers before we begin.

First up will be Eric Van Deuren. After working at Mead and Hunt for over 22 years, Eric spent the last 8 at PG&E. He currently serves as PG&E's senior director of Power Generation. Next, we'll hear from Mark Cook. As an electronics engineer, Mark started his career with the Bureau of Reclamation at Hoover Dam and began overseeing the large capital projects and much of the long term planning of the facility by 2012. In 2015, Mark was

promoted to his dream job, manager of the iconic Hoover Dam, a job he holds today. And our final panelist will be Ben Kujala. Ben is the director of Power Planning at the Northwest Power and Conservation Council. He leads a dedicated team of experts planning for an affordable, reliable and productive electric grid that serves the needs of the residents of the Pacific Northwest. Each of our speakers will have 10 minutes of opening comments. Eric, you'll hand off to Mark when you're done, and then Mark to Ben, after which we'll have a Q&A session. Eric, the floor is yours.

MR. VAN DEUREN: Okay. Thank you, Drew. Just a quick sound check. Assuming I can -- can't be heard you'll speak up. So if you go to the next slide. I'm going to talk today a little bit about Pacific Gas and Electric company's hydro fleet and what we're expecting from generation and water supply this year.

So this map here shows that the bulk of our fleet is in northern California on the western slope of the Sierra Nevada Mountains. If we go to the next slide, it talks a little bit about statistics. So we have 62 power houses and over 90 reservoirs in our system on 15 major watersheds. When you look at our total capacity, we have 3,836 or just shy of 4,000 megawatts of capacity. 2,600 of that is conventional hydro power. And then of course we

have the large Helms Pump Storage Project, which makes up 1,200 plus megawatts of flexible generation. So to the next slide please.

So taking a look at the precipitation and what that means in terms of storage and water availability for our hydro system, we see received within the area where our hydro power exists, about 45% of normal precipitation year to date. So that's as of July 1st, the water year. So and, you know, our combined large reservoir storage is currently at its second lowest storage in the last 40 years of record. So that's very significant. Only 2015 was slightly lower than this year. If we move to the next slide, this this slide is, I'm going to take a little bit of time and sort of walk through this because it provides a pretty good demonstration of what those numbers I just talked about mean.

So when I'm looking at this slide, this is really only 16 of our large reservoirs. However, those 16 largest reservoirs make up 95% of our total storage capacity of 2.1 million acre feet throughout the system. The black line on top is the 30 year average that we see in the course of a -- of a year. And as you can see, almost all the lines below that are below that 30 year average, which is showing 2020, which was a dry water year. And that is significant because that dry water year provides an impact on how the

drought year of this year is perceived because of the carryover storage, or lack thereof, when we have a drier year. It the -- the red dotted line is the 2015 year, which I talked about earlier, which was a very dry year, and you can see we're tracking in the 2021 water year in the last month or so, pretty much on the same line as the wet, dry year from 2015. Onto the next slide, please.

So given that, where we are with the amount of water we have, as you might anticipate, we track pretty closely to the amount of water availability in terms of the total generation we are forecasting for our system. So we're forecasting approximately 45% of historic annual generation, which is, as I said, pretty much the same number as the percent of precipitation or water that we saw within the hydro area. And the critical consecutive dry and particularly dry years that reduces that availability to help support generation. So onto the next slide.

And here is -- here's the interesting thing. So how we operate our facilities and when we generate our electricity, because of the ability of hydropower to be a very flexible resource, we have the ability to store water in times of year when the -- when the generation from the hydro facilities is less, less of a demand. And so what that -- what that has positioned us to be able to do is to forecast approximately 70% of the average annual June

through September hydro generation. And that's excluding Helms, and I'll talk about Helms in a minute, because it's actually quite unique. And you know, the reduced springtime generation is how we -- how we achieve that to be able to maximize the amount of storage we were foreshadowing or forecasting the dry year as the winter went on, and so we reduced the generation out of facilities and how much they were -- we used for those purposes.

Another interesting fact is that of all of our reservoirs, only one reservoir spilled water. Now when I talk about spilling water, that's water that bypasses the powerhouse through spillway gates at the dams and is not used for generation. And when you have larger water years, you typically have to spill at most of our reservoirs. And so this was extreme year where only one of the reservoir spilled. And I think that may be the first time we've only had one reservoir spill. Onto the next slide.

So the Helms Pump Storage Plant. So we're actually anticipating to be able to have full flexibility of this plant to be able to provide the full ramping and pumping capacity as needed on a day to day basis. And the reason for that is we're essentially recycling that same water up the hill when we pump as we're using to come down the hill and generate electricity when the demand is high. And so, although our reservoirs are lower, the volume of

water that we move back and forth is much -- is much less than the total available water that we have in the two reservoirs. So it provides us a pretty good amount of flexibility with this reservoir. And just for reference, during a normal water year, we typically have between four and five days of generation capacity, which means that if needed and not that we would ever do this, but if needed, we could run that Helms Plant, that full load for four to five days with the amount of water that's available in those reservoirs during a normal year. So with the drought year, although that duration is less, the plan is not operated in that kind of capacity. Right. And so it gives us the ability to be able to weather these drought seasons and provide at Helms, to its -- to its full capabilities throughout the -- throughout the summer. So I just thought that was important note to spend a little more time on.

So if we take a look at the next slide on the challenges of lower generation. I think the key here is, despite the fact that we have the Lower Generation Forecast, you know, we can still provide that quick response to meet peak loads and we're still at quite a bit higher total generation capacity for those peak loads than in that 45% in the total generation megawatt hours capacity. So that's a -- that's a real positive. And we are able to focus on the critical days, those critical

hours. And it -- and it's not that abnormal from what we do in most summers. We just have to manage the water in the wintertime when it's there to be able to have that capacity available. So to the next slide, please.

The other thing to keep in mind as we take a look at hydro are our operational constraints. So there are a number of factors that we have to take into account in terms of how we operate in our reservoirs. And some of those are what I like to call constraints in terms of when we can offer certain ramping, the rate at which we can ramp and other things. And some are some things that we're going to see in terms of curtailments a little bit later this year. So the first bullet on here, the low lake levels that we're seeing, eventually we reach a point on some of our reservoirs where we're near the bottom of the intake and you have the ability to potentially suck in silts, which can damage and sometimes severely damage the turbine and associated equipment. And so we end up having to move into a curtailment of some of those facilities. And we see some of that coming up in the September timeframe. It's about four facilities right now and we're taking actions to address that appropriately. Our licenses, our FERC licenses for all of these facilities have required minimum flows within the streams that we actually have the bypass from the dams and into the

streams. And so those minimum flows are water that we can't generate with. And that's necessary for environmental purposes.

And we, you know, do have variances on some of those flows to reduce the amount we have -- we put down the streams relative to what we would have done during the normal water year. But there still is a benefit to the environment to be able to provide at least that small water flow throughout the summertime to support the aquatic habitat. So it's very important that we keep that in mind as we look through this. And also looking at things like ramping rates, also, how fast we can turn units up, how fast we can slow units down. We do have licensed conditions around those and that's built into how we operate the facilities. Recreation flows are something that occur, and the Pit river is a great example of this, where the white water rafting community has built in with -- we have built in within our licenses, the ability to, or the requirement to provide, instream flows greater than the smaller flows that we would put in the rivers just to maintain the aquatic habitat for whitewater rafting. And so it's something we have a requirement to do and has to get sort of fit into how we operate during the summer.

And then finally working collaboratively with the partner agencies. So much of our water has dual purpose,

right. It's not only used for the power generation, but it's also, there's also a fair amount of it that's used for consumptive use. And so we have those consumptive water contracts and requirements on those that dictates when some of the hydropower facilities are allowed to generate. So onto the next slide.

In this slide there's a, it really sort of shows the -- how we manage the outages associated with our facilities. So they can't be available 100% of the time, right. You have to -- you have to be able to plan time to take units out of service, to perform maintenance, to perform capital upgrades. That's true, not only for hydro, but for the entire portfolio of generation. So we really spent a lot of time this year working on moving those outages out of the June through September timeframe, that summer peak period, to absolutely minimize the number of units we have off. As you can see, we have, you know, less than 300 and in some cases, less than 200 or even 100 megawatts of the total portfolio planned to be out of service during that peak period. The couple of spikes that you see down at the bottom, those are the recreation flows that I talked about earlier, where we have a license requirement to provide those recreation flows. We do have the ability if there's a no touch day to basically postpone or reschedule those recreation flows. So we work with the

recreation community in order to be able to manage that to the best of our ability and then on the next slide.

So talking about moving forward, I think the key moving forward here is, you know hydro really does play an important part in the entire energy portfolio, not only for California, but I think throughout the United States. And so, you know, continuing to capture that storage is important and necessary. And there are multiple uses for the water that gets captured within that storage so that that's important. You know, it has the ability to adapt to the changing energy needs due to its flexibility. And so I think that's really important. It also, it can be thought of as an integrator of the other renewable energies that are not dispatchable. And so that's an important thing to understand.

And you know, the last thing, it's really not stated in here, is that is the life of a hydro power facility really is quite long. You know, if you look at battery technologies as having a 20-year life, well many of our hydro facilities are over 100 years old. We continue to maintain and upgrade those facilities as we move forward, but they really are long term assets that add a lot of benefit to us and the grid, in my opinion. So I think that wraps up my presentation. So any questions? Or I guess we're moving straight to Mark. Is that correct or

is it the questions first?

MS. RAITT: This is Heather. Yeah. Let's go straight to Mark. We'll hold questions until the end.

MR. BOHAN: Okay. Thank you.

MR. COOK: All right. Yeah. I appreciate the opportunity to be here today. I'm going to talk a little bit about what we've got going on here at Hoover. And a couple of the other plants downstream of us, Davis and Parker also controlled out of this region here. Hoover is -- it consists of 17 main generators, that's ends up being 2,074 megawatts of capacity. So when I kind of think about that, that's not huge when you think of in the. you know, grand scheme of power generating any more, power stations. But it is pretty significant when we consider it being the renewable resource. So I did a quick Google search yesterday and the best answer I could find is that it's worth about 10,000 acres of solar. So I'm like, that's quite a bit of real estate that we're good for there.

The way Hoover operates is we've got water targets as kind of our primary driver, but quite a bit of flexibility in that. So we have a monthly water target that end up being broken down into weekly targets, but lots of flexibility when we deliver out our water. I like to think of Hoover as essentially the, pretty much the ideal

resource. We've got a -- we've got a large lake behind us in Lake Mead, and a large lake in front of us, and so that gives us a lot of flexibility when we -- when we release the water and move the power.

We also have the benefit of that we don't have any migratory fish that have to get up and down across this dam. So there's no salmon here. And so that allows us and also it allows us to be able to have essentially no minimum flows and no maximum flows. And so we get this really nice flexibility in dispatching. The units themselves can move quickly so Hoover, we can move like 100 megawatts a minute up or down, without any restrictions. We also have the ability to be able to put units on, and motor them and have that available as spinning reserve for capacity needs.

We're also a blackstart plant. So we're able to start out without having to have outside power, in that event. It's one of the things that I hope I never see in my career, but we're a -- we're a FPB. If we move on downstream down to Davis Dam. So Davis Dam is the next damn down river. It has five generators, for -- and 255 megawatts of total capacity, not as flexible as Hoover, but we do -- more dependent on water deliveries, being able to make sure that we do that. But we shape the power delivery and the water delivery around market values, essentially. So we, we're able to do that and kind of, you know, fight

the duck, as I like to say, and be able to do that big ramp in the evening hours.

Parker Dam, downstream of that, is four generators, 120 megawatts at that facility. Pretty similar type operation to Davis Dam where we kind of shape the -- shape the load around it the best we can. But the further downstream we get, the less storage we have and the less ability to be able to have those flexibilities. We have had quite a bit of buzz here this year with the low lake. We're seeing some lake elevations that we haven't seen since the filling of Hoover Dam. So we're getting quite a bit of attention for that and a lot of concern about the about the ongoing drought and what that means for water and power.

So I mentioned the Hoover is rated for 2,074 megawatts. So as the lake has come down, we're derated now down to about 1,500 megawatts, so it's seen about a 25% decrease in our -- in our ability to generate instantaneously. It ends up being fairly linear. So it's about with every 6 feet, or excuse me, with every foot of head that we drop, every foot that the Lake Mead goes down, we lose about 6 megawatts of capacity. From the energy standpoint, so Hoover typically generates 4,500 gigawatt hours a year. In the last year, it was more down to like 3,500 gigawatt hours, and so it's, you know, in the

neighborhood of the 22% decrease of our total energy output over the course of a year.

A couple of things that hits us on that is, I mentioned that we can ramp up pretty well, and so to be able to do that, we can ramp from zero megawatts all the way up to our maximum load, which is about 1,500. To do that, we end up juggling units around a little bit. So all of our units have a rough zone in them. There's a band in the region, or a middle -- in the middle of the operating region where we're, we don't like to operate very long because it's rough and vibrates and kind of hard on the equipment. So to be able to serve a load, particularly down at the lower levels, you know, 100, 200 megawatt requests, we end up having to serve that load with multiple generators, set point and below the rough zones, which is not a very efficient operating point for us. So as the -- as the lake comes down, those rough zones grow a little bit. We don't have as much wiggle room on the top side of those generators. And so it ends up being more difficult. We still do it, but it takes us more generators and therefore a little less efficient to hit that.

There is also kind of an efficiency hit on the -- on the turbines as well as they come down. As we're starting to push the -- push a little closer to the edges of the capability, of the design capabilities of the of the

runners and get out of the peak operating kind of nice place to be for them. We do have and a point where we do stop generating or where we predict we'd have to stop generating. So today we're elevation 1070, and if we get down to elevation 950, that's where we predict that everything is going to run rough enough, that we're not going to be able to produce any electricity after that. That's not -- that's not our minimum pool, as far as what we can pass through the dam, we can still pass water through the dam for a little bit, we can get down to like 895, but the -- we get out of the kind of at the fine range of our equipment. So that's where we stop producing power and we just pass water with our gates instead.

That drought's been going on for quite a while and we haven't taken it lying down. We've done a number of things along the way to help mitigate some of -- some of these effects. So we've installed some wicket gates on a good number of our units. So these gates are the final gate that allows water into the turbines. And the new design is a replacement of our steel wicket gates and replaced them with stainless steel, with a thinner design, thinner profile and what that allows us to do is that allows us to pass more water through to be able to reclaim some of that lost capacity.

And in that same kind of vein we've, what we call

over stroked some of those. So we used to have 100% gate opening. We looked and said actually there's a little bit more room in the servo, in the stroke. And so we would loosen up our stop nuts and allow more water to pass through on those. And so overall, kind of accumulative with that kind of stuff, with regain, or reclaimed about, well, it's over 100 megawatts of capacity that otherwise would have been gone. So we would have been more down like 1,400 hundred megawatts instead of our 1,500 megawatts.

We've also been overhauling our units over the past number of years. We pick up a couple or 3% efficiency in our units when we do that. We replumb them, redo the tolerances and clearances on them. And then we have seen some really good success with that. And then one of our bigger things that we've done is installing new turbines. We've done it on five of our units, what we call white head turbines. So these are turbines that are designed to be able to accept a wider range of heads that we see from the reservoir. The -- they have a reduced rough zone on them and have performed really well for us, and so we're really happy with what we're seeing on those.

We've also added roughening air on one of our white head turbines. And so this is essentially just pushing compressed air into the turbine. And what that does is that smooths out the rough zone for that one

turbine. It ends up using quite a bit of compressed air, particularly these lower lake elevations to do it. But it allows us to setpoint that unit anywhere we need to. And so it really does help out our efficiency at those lower megawatt requests. And we've seen a lot of benefit from that.

Last thing I'll mention is we upgraded our unit controls on our generators. And so we haven't always been able to ramp at 100 megawatts a minute back with our old control system doing quite a bit slower. It was more like 30 megawatts a minute, instead of the 100, and we didn't have near the visibility of the health and status of the generators. And so with that controls modernization, we're able to know what's going on with them and be able to have them respond to us a lot quicker.

So it's been it's been a challenging number of years, but we've done a lot of things to help us out and continue to look for other things to help mitigate these low lakes and these lower outflows that we're seeing. With that, I'll go ahead and close and turn it over.

MR. BOHAN: Ben, you're up.

MR. KUJALA: All right. Thank you. Hopefully you can hear me. So I'm going to have to go to the other end. I'm a long term planner, and since I'm not in the Northwest, I always like to start with just explaining a

little bit about what the organization that I come from does. So in 1980, Congress formed the organization, which was an interstate compact between the states of Idaho, Montana, Oregon and Washington. And each state legislature then passed into law a basically the compact that formed the Northwest Power and Conservation Council. We are council of 8 members. The governor appoints two members from each of the states and predominantly we're funded by rates collected from Bonneville, but the most important thing is that we're a long-term planning agency. So I'm not going to be able to give you the operational sort of perspective that you just got. I'm going to be at a little higher level. So kind of going to the other end of the spectrum. Go ahead and go to the next slide.

So I'm supposed to be here talking about hydro and I'm starting you out with a slide about clean energy, and so I'm going to ask you to bear with me a little bit because I want to kind of take you to a place and I want to give you a little bit of a lead in in what we're seeing in the long-term and where that raises some concerns about dry water conditions in the northwest.

So when we look across the entire WECC, when we aggregate together all the RPS Requirements, the Clean Requirements of which Oregon just passed legislation that brings them into a Clean Requirement in 2040, and that is

included in these numbers. And then what we are calling pseudo clean, which is just adding in the municipal goals and targets and the utility goals and targets. And those can be pretty substantial. We have in our region Idaho Power, that has a 100% clean target. Of course, Xcel Energy is another utility in the west that has a clean target. So some of those targets might not match with current state legislation, but our targets at those utilities and entities are taking very seriously and pursuing as well. The point here is that you get to a amount of power on the western electric grid that needs to be substantially clean and that that transformation happens really rather rapidly as you're going through time. And then we see a real jump starting in 2030, but of course, they're building and preparation to get up to that point. And the RPS also is also increasing through the same period of time. Go ahead and go to the next slide.

If we look at kind of what that projects throughout the entire west, what we see is a build of renewable resources that far exceeds anything that we have ever seen previously. So when we went around and we collected all those Clean Requirements and the RPS Requirements, we ran models and we tried to project how much energy would need to be built to meet all those requirements, and when we look at what that does, you see,

by 2030 we're getting close to basically doubling the current installed nameplate of the western electric grid. Now, that's assuming all of those policies get do basically complied with exactly the amount of time that are on the books and that people build at a very rapid pace. So whether this would actually happen, I wouldn't say that this is our forecast, but it's a sort of, if everything happens as stated in current policy, what would you see. And also, this takes kind of some of the current characteristics of the grid into account. So we're assuming that the different kind of pools, like the Desert Southwest is building resources to meet Adequacy Requirements and Clean Requirements within the Desert Southwest. So you could see this number come down if you had a wider footprint and a more sort of shared target towards meeting these things. But the point for hydro is that what you're going to see is a very large load of renewables, regardless, happening probably through the next decade and continuing on. Go ahead and go to the next slide.

So why I wanted to lead in with that is because that this would be a deeply concerning picture otherwise, and certainly it already raises concerns and has some challenges that we want to understand. This is probably the one slide that really is communicating what we see in

the hydro picture for the northwest. Hydro generation can be anywhere from 50 to 90% of our load in the northwest. It's a substantial part of our generating capacity. And when we look at climate change and the impacts on hydro generation, you can see here in blue, we have the historic sort of flows. And in red, we have a climate change model that we've used to project what might happen with precipitation and with runoff from the snowmelt in in the case of having warmer temperatures. And the most important thing to look at here is the summer months. So as you see, we start getting into lower and lower potential flows, basically starting in June, going all the way through the end of the water year in October. And that becomes a sort of more likely outcome.

And so as we look at the potential for drought and the potential for climate change and the impacts in the Northwest System, we usually look historically at two different hydro years, 1937 being the winter year where we had the lowest amount of water coming through and had very low generation from it, and 2001 being the summer condition that had the lowest generation coming from it. And what we're seeing in the sort of projections is that the likelihood of us having water levels that are similar to 2001 in the summer is getting higher, or at least having water levels that are at or below that, is getting higher

as an impact of climate change, especially because of the shift of some of the water into the earlier parts. Go ahead and go on to the next slide.

That being said, hydro seems to be changing the way that it's responding to the Western System. And so this is just pulling out from the BPA Balancing Authority from the EIA data, some recent operations to kind of show you. And this is, of course, from basically where we saw the heat dome over the Northwest and then leading up until kind of the present day. And what you can see is that more the operations during the heat dome event are probably pretty close to what you might have expected in the past. You have a higher operation even a week after what we see is that you're starting to see hydro shaping really substantially into the evening hours and away from the midday hours. And that's in response, obviously, to the amount of solar on the grid. And when you have an operation like this, the amount of water that you are using as you shape the hydro into narrower and narrower hours, obviously is changing. And so while we might have lower water conditions that will happen in the future if we have and also have a build of renewable resources that goes along with that then the amount of water required out of the hydro system or the amount of water that ends up being used in the generation from the hydro system, could be very

different. And so while we might have water conditions similar to 2001, we are not going to be operating in those water conditions within the same grid as we saw in 2001. And so while that is something that raises concern, it is also something that is not exactly the same problem that we saw back then. Go ahead and go on to the next slide.

So of course, the other side of the climate change is looking at the temperatures and the impact on the load. Having been in Portland during the heat dome, I totally understand that having extreme temperatures will lead to very different load than we projected in the past. And a lot of the planners have, until recently, looked at our historic temperatures as a guideline for extreme events. We recently transitioned again to using climate models to try to understand where those events are. You can see here this is us comparing the historic temperatures that were experienced within July. So not exactly June, but kind of close therein, to what we saw in in the climate change models. And we did see certainly hotter events and a range of events that could get quite a bit hotter than what we saw in the historic record. Unfortunately, if you look at this compared to the heat dome event that we saw recently, even the climate change records did not quite reach the temperatures that we saw during that event. Go ahead and go on to the next slide.

So when we look at kind of the overall uncertainty that we're dealing with in Power Planning, I think that trying to give a 10 minute presentation on a pretty complex problem, you know, we kind of take it down to Clean Renewable Policy Requirements really are showing an unprecedented transformation in how electricity is generated. It's inevitable and it's basically already underway. And so the Hydro System in the Northwest is already responding to the change in the generator mix throughout the West. Certainly we do understand targets for reductions in greenhouse gas emissions could add substantial demand for electricity, and that might kind of move away from some of the dynamics we see now. And that would create even another sort of uncertain condition on the grid. Certainly the recent Pacific Northwest heat wave, it substantially exceeded our historic observed temperatures leading to record setting electric demand throughout the region. It exceeded even our projections on the climate change records. And it's something that we're going to have to be looking at and thinking about going forward.

But the thing that I think is really a focus for us right now is looking at how the existing system, the existing Hydro System and honestly the existing Thermal System to adapt to these changes that are moving us in a

direction where you have a higher penetration of renewable resources, but also have a real change in the fuel of the runoff for the Hydro System and a change in the demand that you see from these types of events. So next slide, and that was it for me.

MS. RAITT: Great. Thank you so much, Ben, and Mark, and Eric, for those presentations. Really appreciate it. This is Heather. And so now we'll move on to questions from the dais.

COMMISSIONER GUNDA: Yeah. Thank you, Heather. And thanks, Drew, for moderating the panel. I just want to really thank the three panelists for providing both the operations side of the equation, both in the short term and the mid-term, but also Ben, thanks for bringing it into the long-term context as well. So I'm going to just tee off at a very high-level question that to all the three panelists. So I think, you know, just teeing off from what kind of Ben mentioned, which is this the need for shaping the hydro resources. Specifically, to meet the net peak hours, the hours of critical need. I just want to kind of have the three panelists comment on both for in-state resources, but out-of-state resources, as we think through the adaptation of hydro, for both meeting the load, but also the ancillary services, how do you see this shaping would impact our ability to import during those critical hours? How do you

see that playing with the current infrastructure that we have? And also, what do you think the future of investment in Hydro as it pertains to rates would be?

MR. VAN DEUREN: Yeah. This is -- this is Eric. I'll take a first shot at it. So the shaping's an interesting question and all hydro is not the same. So if you think about PG&E's hydro system, we basically operate a store and release and have the ability to operate in peaking mode, which means that we can shape our generation to meet the demands with a fairly significant amount of flexibility, not unlimited. And I don't think for any hydro, it is unlimited because there's always a balance between shaping the generation and meeting the environmental requirements, right. You can completely shape generation to what the demands are, and you would -- you would probably have some pretty negative environmental impacts on our streams and aquatic habitat. So we have to balance those things, we have to be good stewards of the environment associated with that.

So but that's not -- but that's the PG&E system, right, which is store and release. As you get into the different types of systems, you know, the other extreme is a Run of the River. So a Run of the River System would be one where you basically have to pass to the flows that come in. Now we have some Run of the River within our system.

It's a smaller amount and you don't really have much ability to shape that. So when you talk about trying to import hydro resources, it depends on where those resources and where they come from and what type of resources they are, as to their ability to be able to meet that shaping to go along with what the market demands are. So hopefully, in a nutshell, that kind of got to what your question was. But that -- that's a general overview from my perspective.

COMMISSIONER GUNDA: So Eric, thank you for kicking it off. And I just will just ask a clarifying question as the rest of the panelists think through this. Just in terms of rewriting the long-term kind of question, too is, you know, how do we think about the availability of hydro in our -- in our planning, right. So with these changes to the kind of way we think about hydro. Do you have any high insights into how should we think about hydro moving forward before the other panelist in the comment?

MR. VAN DEUREN: Yeah. And I'll also go ahead and let the others comment on it. But so, you know, the ability to maintain and make that asset class be a part of the long term plan is absolutely necessary, right. So I also think that the one area that's probably not as leveraged as it could be is pump storage. Right. Because that's the ultimate flexible resource with respect to what hydropower can provide. And so -- and there are some

challenges with pump storage, you know, in my opinion, really moving forward. And one is it's a very large investment, right? You're getting into billions of dollars when you -- when you're talking about single assets from a pump storage perspective.

There's also a very long life cycle from inception of an idea to say, okay, I want to put pump storage here, to actually getting on line. Ten years is, in many cases, an aggressive schedule. In some cases you're looking at 13 to 15 years. And there's a lot of money outlay in the early phases of this that you have to have mechanisms to recover under shorter periods of time for your investors in those -- in those particular assets get channeled. So that's just something to consider and think about is whether or not there's a different model for pump storage as to how it could be incentivized or helped out, for lack of a better word, find a better system by which we can go through the development process to accelerate it, because frankly, the need is there today. And I think, thinking long-term, that that should absolutely be a part of the -- part of the discussion and part of the strategy.

MR. KUJALA: So I would say in the Northwest, the ability to shape the hydro system, it changes depending on coordination. So the more coordinated you are, if you have

Run of River Plants, but they're downstream from Plants for Storage, of course, how you use those plants together can make a huge difference in the flexibility altogether. And you know, when you have different owners and different operators between those plants, it can create some challenges where there might well, it could create some opportunities as well, to see those plants work together to maintain, of course, the maximum flexibility for the system that you can get.

That being said, we have a lot of requirements in the Pacific Northwest about the biological sort of operations that are necessary for fish and wildlife in our system. And those challenges are kind of changing and adapting as we see these heat wave events, it certainly has an impact on wildlife as much as it has an impact on the need for electricity. And so how fish and wildlife managers are responding to those events might be having some impact on how we use the Hydro System. And so I think that there's a lot of considerations going in.

What seems clear to us as we kind of look around the West is that the Hydro Operations are having to change quite substantially already based on just changing economics in the Power System. And so when you have a sort of new way of operating, understanding how economics are moving our operations and understanding what that leaves in

terms of flexibility and the ability to respond to peak events or capacity events is a really dynamic problem. And so I think it's one that we are studying intently and trying to understand more. But I don't know that we have wonderful answers at this point. It's something that that really needs to be explored. And again, we're at the point where what we thought were kind of some pretty severe limits of what might happen are now maybe not looking as severe as we should have been exploring. And so I think there's a lot of work to do.

COMMISSIONER DOUGLAS: So just as a, you know, a question, you know, obviously it's important that the hydro -- we -- I think we all understand that the hydro facilities sometimes operate at times that are not optimal for the electricity system because of other needs, whether it's permit requirements, white water rafting, ecosystems, species, and so on. Is there -- when that happens and you're generating at times that are potentially lower value, has anyone looked into storing that electricity as opposed to selling it at lower value? And does it happen often enough that it would even be worth putting in batteries or something like that? I'm just kind of curious about that.

COMMISSIONER GUNDA: Yeah. Maybe, I want to just give Mark an opportunity to both tie the previous question

and to you know maybe Mark, you want to kick off?

MR. COOK: Sure. Yeah. So just quickly. I agree with Eric on the pump storage. I think that is kind of where it's at. I mean it's the battery that just keeps on giving. We get to reuse the water over and over again. And I think that's -- there's so much value and reliability that comes with that. So that, from the power side, I think that's helpful. Also, you know, more water storage is always beneficial, particularly here in the Southwest and on the Colorado River. When we do get those good years, we really want to be able to hold on to that water. And so just increasing our water storage in general, I think is just going to be a big part of the future.

And then as far as the shaping goes, just quick, anecdotally. It was interesting when I first started and we would be able to do our online power system stabilizer testing, you know, in the heat of the day come, you know, noon or 2:00 o'clock or something. And that's all the push down, and we're having the, bringing our guys at night to nigh be able to do that kind of testing now so that we can have generators loaded up. So that's been kind of fun to see how we've really seen the reshaping over the last few years.

And then as far as -- I just lost my train of thought. I apologize. Maybe I'll duck out here and let

someone else talk for a minute.

COMMISSIONER GUZMAN ACEVES: I know Elliot had his hand raised there, but I do have a follow up for Mark. But Elliot, do you want to go ahead?

PRESIDENT MAINZER: Go ahead first, Commissioner, please. And I'll follow after you. Please.

COMMISSIONER GUZMAN ACEVES: Okay. Well Mark, I was wondering if you had a response. You know, I think we've heard about some efforts, I don't know how true these are about some pump storage, large scale at Hoover. And is that something? Is your feasibility studies happening there or is there anything that you guys are looking at, particularly on Hoover?

MR. COOK: Yeah. So LADWP was doing a pretty big effort and looking to see if there was a pump kind of situation here at Hoover. I just heard a few months ago that that feasibility came back, and it was too costly, essentially, was the bottom line. It ended up not penciling out. So yeah. So that one's not going to go. I understand that they are looking at some other pump storage locations maybe, but it sounds like the one here at Hoover is a no-go for the time being.

PRESIDENT MAINZER: Maybe I'll, Commissioner Gunda, I'll take a -- take a question from me. Yeah. Thank you. This question is to Ben. Ben, good to see you,

and I'm really happy you're able to join us. I was wondering if you could just talk a little bit more your, a little bit in respond -- response to Commissioner Gunda's question and talk a little bit about some of the non-power constraints that have been a big part of the operation up at the Federal Columbia River Power System for a long time and ongoing discussions. How else are you thinking that local utilization of the Hydro System may change in the years ahead, you know, with these coming temperatures and folks putting in air conditioners and of course, coal plant retirements and other changes in the supply stack in California? Are you -- do you think you're likely to see federal and nonfederal hydro capability show up more in the integrated plans of the Northwest utilities and locking up more of that capacity and less for export to California? How is that changing and how can we track that as a key variable in the -- in the months and years ahead?

MR. KUJALA: Thank you. I wish I could give you a really great answer on that one, but I'm not totally capable of predicting where the IOUs are going to go. Certainly, there are rights for utilities in the Northwest to get access to power on the Federal System beyond the utilities that are currently taking power from that, and those rights could be exercised at some point down the road. I think everybody's in a really dynamic place. You

look at Washington having basically a requirement for 100% clean generation by 2045 and now Oregon by 2040. A huge amount of the load in the Northwest basically is not going to be working for thermal resources or resources that have met any sort of greenhouse gas emissions in the future. And so the existing system that is out there that does not have emissions associated with it might look appealing to some parties in our region.

That being said, they might also have other plans. They might be looking to other resources and to balance those needs within themselves. The Federal System is not the only hydro system. There are a lot of hydro projects in the Northwest that are directly controlled by different utilities. And so there's some options. The one that’s hit the media recently, certainly we know Northwestern in Utopia, Montana went to PowereX to get some hydropower from Canada. That might be power that is, you know, more locked in the region that might not be exported. So it's hard to say for sure. We do, of course, also just have limits on the ability to export. And so oftentimes we'll see during the evening ramps we’re pretty close to hitting that maximum export limit, contracts kind of aside. Do I see us substantially backing off of that? I don't know. I think you would have to see some pretty extreme circumstances.

I would want to say, on the storage side, on batteries as well, clearly that's a very promising technology and something that we have seen some real applications for in the Northwest. And again, Northwestern is proposing to build a battery. Portland General is proposing batteries. So we are starting to see more of those come into our region. That being said, I do think that you also want to make sure that you're using the existing system to its maximum storage capability in a really coordinated fashion to not be spending a lot of capital on something that, you know, is augmenting a substandard operation. And so I guess I would say there's so much uncertainty in what we see coming in the next 10 years. How much load is going to come onto the grid from transportation. How much load is going to come from electrification buildings. To look at today's dynamics might just not be a good guide for what we think is going to happen 10 years from now and a change in the import/export balance from the Northwest to California is certainly one of the things that we need to be thinking about.

PRESIDENT MAINZER: Yeah. I think that's a great answer. And I'll just -- I'll just add one quick point just for those of us here, you know, in California. I think as the -- as the Power Planning Council continues to

do its long-term planning in the northwest, and as the power pool, the northwest power pool starts really developing its Resource Adequacy Program, we've had that, I think the hand of outreach from folks in the Northwest and a lot of interest in seeing our Resource Adequacy Planners in California working closely with the Resource Adequacy Planners in the Pacific Northwest to really exchange data and really understand how our Requisite Supply Stacks and Demand Stacks are changing so we can get really good, you know, almost close to real time understanding of how conditions are changing and how we may need to adapt here and likewise. So we look forward to staying in touch with you and certainly at the ISO, and I know with the Energy Commission, and the CPUC. Really keeping our staffs communicating on a regular basis so we understand what each other is doing. So it's great to see you.

MR. KUJALA: Absolutely. Thank you.

COMMISSIONER GUNDA: Thank you, President Mainzer. We do -- we do have, we baked in enough time here so we can have our questions, so whoever wants to go next.

Yes. President Batjer, please. Then after that, Commissioner Monahan.

PRESIDENT BATJER: Thank you, Commissioner Gunda. I just have a couple minor questions. One for you, Eric, on the Helms Plant. I took that you said that there was,

minimum was not the word you used, the impact from the drought. I was wondering if there's a concern about high heat evaporation and will that affect that which you all can produce out of the plant?

MR. VAN DEUREN: Are you asking about reservoir evaporation?

PRESIDENT BATJER: Yes, yes, yes. I'm sorry. I should have been clearer. Yes.

MR. VAN DEUREN: No, that's fine. I don't. I don't expect that to impact our generation. You know, we will probably see if the temperatures go up, obviously an increased evaporation, but we see that every summer. So the real key with Helms is just the volume of water we have in the -- in the upper and lower reservoirs.

PRESIDENT BATJER: Right.

MR. VAN DEUREN: It's large enough that it's more than enough to meet all of our demands and far beyond that so.

PRESIDENT BATJER: I know it was apparently a bit of a silly question, but it occurred to me when you were talking about the reservoir levels. And to Mark, when I sat on the Colorado River Commission from Nevada, I -- the mark that we used to worry about, now this was before some of the retrofitting, but some had been done by then, the mark that we concerned ourselves with on the lake and what

would happen below that level was 1065. And it interests me that it's lower than, much lower than that now at 950 I think you said. And so is there a prediction in terms of where we're going to be with Hoover being able to pump by the end of, oh say, August, September into October?

MR. COOK: There is. Yeah. So the water numbers that we're seeing in those kind of critical elevations are still pretty significant in the water world. So we're kind of taking the power piece of it and lower the elevation where power is an issue when we get down to the 950. The previous number was 1050 for minimum power generation pool and we've lowered that with the new whitehead turbines and other things that we've done. But when we were getting down to those low elevations there's just not a whole lot of water left in Lake Mead, and so the bigger concern does become, hey, we're just about out of water and we need water for our farms, we need water for our cities. And so those 1060 elevations, those kind of elevations are really concerning to folks in the water world for making sure that we have got adequate water supply for the -- for all the demands. So there's been a number of initiatives over the past few years to help shore up the Lake Mead with water conservation and the state's getting together and putting together a drought contingency plan. And so another reason we've had a lot of press this last year is that we're

projected -- you know we're likely going to project next month that we will declare a water shortage for the first time ever. And so there will be mandatory cuts happening starting in January to help maintain the lake elevation here at Mead. So yeah, definitely still very concerning. Just not as much in the power side for that stuff.

PRESIDENT BATJER: So you don't think there'll be a curtailment of pumping at Hoover by the end of this this Summer?

MR. COOK: No. We're projecting pretty normal operations through this through this calendar year and then next year starts the mandatory water cuts.

PRESIDENT BATJER: Okay. Thank you.

MR. COOK: Yeah.

COMMISSIONER GUNDA: Yeah. Commissioner Monahan. Commissioner, you're muted.

COMMISSIONER MONAHAN: I'm double muted. Am I sounding okay because I know last time it was spotty? So I'm curious about what you see, and I think it's for any one of the three of you, about the barriers for pumped hydro storage to really accelerate. What would you, like what would you advise us, in terms of how we can support this market?

MR. VAN DEUREN: Yeah. That's a great question. You know, the barriers, as I stated earlier, really there's

a financial component to it and then there's just the timing component to it. There's also, you know, I think from the Commission, from the Energy Commission, having a, you know, a request for it basically, I think on a very united front saying yes, we want more pump storage. And I think that exists today. But even making that stronger will help facilitate that to go forward. That's one area I can see it. I you know, some of this is on the federal side. Some of this relies with the, or lies with our, the state agencies and the process it takes to go through to license a new project is a very complicated and time consuming process. So anything we can do on the state level to help. A I don't want to -- I don't want to come across saying we don't want to do the right thing environmentally, we don't want to do the right thing for the state, we don't want to not comply with the regulation. Right. But the processes are very, it's very time consuming and for lack of a better word, very onerous. So anything that can be done from a policy perspective to help make those processes work smoother and align, you know, on the -- on all of the needs, I think would help -- would help that.

MR. KUJALA: So I would say in our region we have a couple of projects that are, you know, pretty far down the permitting path. So there's John Day Pool, Goldendale,

going to be some projects that are basically located throughout the region. I'm sure that's probably true elsewhere as well, but a lot of these people have been working on projects, making sure that they've got through permits. They've gotten pretty far down the path.

The challenge that we see in our region is kind of a similar challenge that you would see for any resource, frankly, is when you have a really highly variable hydro system, you know, the economics of paying for that storage when there might be many years with a lot of water, where it's just not economic and it's not used that much, it's a real challenge. You really have to be looking to send a strong signal for reliability in a system that, you know, has certain conditions that will lead to those reliability concerns much more aggressively than sort of the average operations. And it really comes down to it's not going to be a market solution. It has to be something that is done through other mechanisms, understanding the importance and the application, but that it gets towards reliability of the system. And so I would say the biggest barrier has been money.

COMMISSIONER MONAHAN: Can I ask a follow up question on that one because I mean, I always thought that it was cheaper compared to batteries at scale. Pump hydro is relatively inexpensive compared to batteries and a long

duration storage. I mean, it's one of the few games in town. So can you just elaborate a little bit more on that? It'll never work out. It'll never pencil out.

MR. KUJALA: Well okay. So let me just be clear. I didn't want to say it would never pencil out. I think it's a very good adequacy resource. Now in terms of what it does compared to batteries, batteries just provide a very different thing. The four hour shorter duration batteries. That's one kind of really, it's different than what you might see in these projects. And I will say our pump storage in our region, from one project to the next, the characteristics can be quite a bit different. So you might have anything with a few different sort of pump generator setups where you could get up to 1,000 megawatts or more in capacity, and that's a pretty substantial plant. So of course, you have an economy of scale there, but you also are looking at a bunch of different utilities that might not need that much capability. Batteries are very small, incremental build. So even if they're slightly more expensive and the cost of, of course, batteries is a something that's been on a very severe downward trajectory over time. But even if they are slightly more expensive, the sort of economics and the decisions of building smaller increments has often won out over larger projects just because the risk that is inherent in taking on those larger

projects.

So, of course, whether, you know, pump storage is more cost effective than batteries depends on the utility's need and depends on the particular pump storage project you're looking at. But that incremental sort of build capability of batteries is a real advantage over pump storage regardless of cost.

COMMISSIONER MONAHAN: Thank you. That's Very helpful.

MR. VAN DEUREN: Can I add to that because it's a great point. It's like I said, with conventional hydro right now. Not all hydro is created equal. The same is true with pump storage because when we take a look at Helms, it's by far our best asset, right, from an economic perspective. And so to have another Helms would be incredible. And we also had different ways in which we utilize and what how the different markets need those and how the utilities need those. And so, you know, I think all of that kind of plays into when and where and what size and shape makes sense in what location. So but in California, definitely it's, there's definitely a need for it. And like I said, the beauty always to me on pump storage is, or the real benefit, is it's not a 20-year asset. Right. It's a 50, 100, so-on. It's a long, long term asset and solution that is extremely flexible. So.

COMMISSIONER GUNDA: Thank you so much, Eric. Mark, I don't know if you have anything you want to add. If not, I want to check in with other Commissioners. If anybody else want to ask questions?

MR. COOK: No. I think they covered it really well. I agree.

COMMISSIONER GUNDA: Thank you. It looks like Commissioner McAllister, you're on, would you -- would you like to? Commissioner, you're muted.

COMMISSIONER MCALLISTER: Yes.

COMMISSIONER GUNDA: Yeah.

COMMISSIONER MCALLISTER: I'm double muted again. So yeah. Just following up on that, I mean totally, I think, you know, we're hearing, and I think we agree that, you know, pump storage has a lot of this long term benefits as a -- as an infrastructure that supports reliability. Are there -- and I guess I would just want to drill in the practical, you know, sort of direction if we can glean that from this session. Are there particular sites or particular projects that would, you know, check most of those boxes, say that, you know, will be relatively long duration, be relatively immune to the swings and snowpack and precipitation year to year. Are there any particular projects you would put at the top of the list in terms of policy support needs?

MR. VAN DEUREN: Yeah. That -- it's a good question. There, you know, there are a number of projects right now in various stages in California for licensing, for perspective, right? There's a couple or one in particular, I believe that Eagle Mountain that has its license. Right. And they're struggling to get investment. Now, if when you look at every project, there's some uniqueness to every one. Right. And that's where I think the challenge comes in. And the due diligence, when you take a look at those different projects to decide if that's where you want to invest or not. You know, and it could be anything from this physical location relative to where a utility like PG&E might have our operations, current operations and support facilities for. And so, you know, something that was in Southern California might not be as attractive for a Northern California utility, who's going to own and operate.

And so, you know, I don't know that I've got, I'd be hard pressed to say the specific names that I'd say that yeah, go after this one, go after that one right now. But like I said, if you take a look at what's in the FERC docket for licensing and see what's out there, and you know, there -- there's -- it's not a large number. There's about six or so that really sort of get, the names get recycled over and over again, and I think every one of

those facilities has a-- has a degree of merit to it that, you know, could be supported, so.

MR. KUJALA: Yeah. I think that goes true for the Northwest as well. I will just say, you know, the one detail I would add is some of the plans that I've seen probably are pretty good in terms of everybody has to plan for a dry year and make sure that it's still a feasible project under those conditions. I mean, that's the big part of any sort of project like this. The one detail that definitely would be important when I've looked at these developments is that oftentimes the very first year, they need to draw water from somewhere, depending on where the pool is, depending on the conditions, but it might be a situation where there'd need to be a good year in the kind of first year of operations to really bring the project fully online. And that that would have a certain burden on the amount of water you'd need to go into those projects. But again, it kind of depends on the circumstance of where you are. If you're retrofitting pump generators to an existing pool, you might not have that same issue.

MR. COOK: Yeah. Just quickly for me. I don't know if was of visibility into that, but I do wonder kind of what's out there and what could be supported. but I personally don't have knowledge of them.

COMMISSIONER MCALLISTER: Great. Thanks, very

much.

COMMISSIONER GUNDA: Thank you. I just want to ask Commissioner Rechtschaffen, I think you might have a question.

COMMISSIONER RECHTSCHAFFEN: No. I don't, Commissioner Gunda. No questions from me.

COMMISSIONER GUNDA: Great. I don't if, I mean if we have any other questions from the -- from the dais, checking one more time. Looks like we do not.

I just want to take the opportunity to say thank you so much to the three panelists. I think this is a -- this is an extremely important conversation we needed to have. And then thank you for your thoughts on this. In my mind, it just triggers like a need for some sort of a coordination. There's a couple of things that you three talked about, the importance of coordination, hydro's going to be a part of the uh – equation moving forward. How best to use the hydro resources, talked about the benefits of, you know, investing in hydro, and then ensuring that the investments to date are, you know, optimally used to the maximum level. So really, really thankful for your time on this and I want to give these additional minutes to Q&A, potentially from the public. So with that, I'll just pass it back to Heather. Thank you all.

MS. RAITT: Thank you, Commissioner. Actually,

we don't have any Q&A from the public today, this morning. So.

COMMISISONER GUNDA: Oh. Thank you. Sorry.

MS. RAITT: If you'd like to, we could move on to public comment, so.

COMMISSIONER GUNDA: Oh. Great. Please, please do.

MS. RAITT: Okay. So thank you again to the panelists and to Drew for that panel. Really appreciate your time and expertise today. So we'll move on to public comment and so RoseMary Avalos is available to us from the Energy Commission's Public Advisory Office to moderate that. Go ahead, RoseMary.

MS. AVALOS: Thank you, Heather. Yes, I'd like to mention that please allow one person or organization to make a comment and comments are limited to three minutes per speaker. And if there are several parties interested in commenting, we will reduce the time to a minute and half per person. So I'll start with Zoom raised hands. I'll call on the people with the raised hand on Zoom, and I'll open your line and you'll -- you may need to unmute on your end. Please state and spell your name and affiliation for the record, and after you're unmuted and before commenting, okay. And do not use the speakerphone feature when talking because we may not be able to hear you clearly.

Robert Perry, your hand is raised. Go ahead and make your comment, and please spell your first and last name, and any affiliation, mention any affiliation. So thank you. Robert. Okay. It doesn't look like the mic is on for Robert. I'll go on to. Okay. Go ahead, Robert.

MR. PERRY: Can you hear me?

MS. AVALOS: Yeah.

MR. PERRY: Okay. Great.

MS. AVALOS: We can hear you now. Go ahead.

MR. PERRY: Thank you. Thank you. The sign just came up. Yeah. My name is Robert Perry, R-O-B-E-R-T, P as in P Paul, E-R-R-Y. I'm an energy policy consultant with Synergistic Solutions and this has been a very fascinating conversation. You know, the hydro is a very important part of our overall energy system. And I think that pumped hydro is going to need to be a big part of that. And one thing I would like to, you know, just raise is, you know, we're dealing with drought scenarios, lack of water, but it wasn't too long ago that the Oroville Dam was on the verge of collapse because of so much water in an extreme rainy year. And I think it's just extremely important that we are able to devise systems that can manage that amount of water and in a constructive fashion, preferably through regenerating our aquifers, which are empty and are subsiding, which is threatening our canal system and towns

in the Central Valley.

And I was wondering if anybody has given thought to incorporating aquifers as part of a pumped hydro system, whereas you could, I know that there are plans to kind of open flood plains for natural percolation, but would it be possible to set up some injection well infrastructure so that we could direct excess rain into these empty aquifers so that we could draw upon them as an additional phase of a pumped hydro system? I think, you know, that could serve a number of California's really important goals. And actually, you know, being underground, you wouldn't be subject to any evaporation. And it's a very large capacity resource that could be drawn up.

Lastly, I think we also have to think about, you know, pumped hydro is a gravity system and that, you know, serious consideration should be given to gravity systems that don't rely on water. There's American Rail Energy System and these are large utility scale gigawatt style systems and just raising that point as well. And that's the end of my comment. Thank you very much.

MS. AVALOS: Thank you, Robert. Our next Commentor is V. John White. Go ahead and open your mic, and again, a reminder, please spell your first and last name and let us know of your affiliation, if any. Go ahead, John. You may speak. You may need to unmute. Go

ahead, John. Your line is open.

MR. WHITE: Thank you. I'm John White with the Center for Energy Efficiency and Renewable Technologies. And once again, I want to thank the Commission and your agency partners, the Public Utilities Commission, and Cal ISO for another really good and important workshop.

I wanted to make a suggestion that a subsequent workshop or discussion be held on the question of the State Water Project. There was legislation, SB49, passed by Senator Skinner, which directs CEC and the Resource Agency to take a deep dive in the State Water Project and particularly how its assets can be better utilized for the state's energy and climate goals. As you know, the State Water Project is the largest electricity user in the state, and while they are probably technically in compliance with the RPS, they haven't done much on the system in terms of adding renewables.

Secondly, there is a huge amount of investment getting ready to occur in the State Water Project for subsidence, seismic prevention, as well as simple upgrades on a 60 year old system. And as those investments are being considered and planned, there needs to be a good examination of what could be accomplished on terms of adding hydro to the system, in terms of using solar at some of the pumping stations. And so I'd like to suggest that

as we look at the hydro system and the value that it can provide, particularly the State Water Project, that this interagency process take a look at the State Water Project and get involved and looking at what their future is, could be as well as what we need to do to improve the trajectory that we're on. Thank you.

MS. AVALOS: Okay. Thank you, John. And now that concludes comments for Zoom, those on Zoom. We'll move to the phone lines. And as a reminder to phone users, use the -- dial *9 to raise your hand and *6 to unmute. And let me see if we have any raised hands. I don't see any raised hands for the phone line. So that concludes comments. And I'll turn now to Commissioner McAllister.

COMMISSIONER MCALLISTER: Great. I see Commissioner Gunda still logged in, but I'm assuming he had to leave around 11:50, so. Well, great. So thanks, everyone, for your participation. I think that wraps it up for this morning session. Looking forward to seeing everyone again this afternoon. Just a reminder, 2:00 o'clock, if you can be back. That's a workshop on Imports Demand Response and the Multiyear Outlook. So the second in the four sessions that we're going to do over these two days. Think that was really productive and helpful panel. And I wanted to just ask if any of my colleagues had some brief summary remarks before we adjourn this session until

the afternoon. President Batjer, President Mainzer, anyone? Okay great. I'm seeing shaking heads.

COMMISSIONER MONAHAN: It's a great morning.

PRESIDENT BATJER: It's a very interesting session, this morning. Very Interesting. Really thank all the panelists.

PRESIDENT MAINZER: I'm good.

COMMISSIONER MCALLISTER: I think it did highlight the need for this Westwide planning effort to really, really speaking the same language and having, you know, an integrated conversation really across the WECC, and we didn't talk about it, but perhaps leveraging the WIEB and some of the some of the Westwide resources and forum to dig into some of these topics and make sure we're all speaking the same language across the WECC.

PRESIDENT MAINZER: Great point.

COMMISSIONER MCALLISTER: Great. All right, terrific. So I think with that, we'll call it a morning and we'll see everyone here back at 2:00 p.m. Thanks very much.

(Whereupon the Joint Agency Workshop adjourned at 11:58 a.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 21st day of November, 2021.

MARTHA L. NELSON, CERT**367

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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.

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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.

November 21, 2021

MARTHA L. NELSON, CERT**367