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CALIFORNIA ENERGY COMMISSION
IEPR LEAD COMMISSIONER WORKSHOP

In the Matter of:	)	Docket No. 18-IEPR-05
	)	
	)	
	)	JOINT AGENCY
	)	WORKSHOP
	)	
2018 Integrated Energy Policy Report Update (2018 IEPR Update)	)	Re: Climate Adaptation and Resiliency

NOTICE OF JOINT AGENCY WORKSHOP ON
CLIMATE ADAPTATION AND RESILIENCY

CALIFORNIA ENERGY COMMISSION

THE WARREN-ALQUIST STATE ENERGY BUILDING

ART ROSENFELD HEARING ROOM - FIRST FLOOR

1516 NINTH STREET

SACRAMENTO, CALIFORNIA 95814

THURSDAY, AUGUST 2, 2018

10:00 A.M.

Reported By:
Elise Hicks

APPEARANCES

COMMISSIONERS & ADVISERS:

Robert B. Weisenmiller, Chair, Lead Commissioner for Electricity and Natural Gas

Keali'i Bright, California Natural Resources Agency, Deputy Secretary for Climate and Energy

Ken Alex, Governor's Office of Planning and Research, Executive Director

J. Andrew McAllister, Lead Commissioner for Energy Efficiency

David Hochschild, California Energy Commission, Lead Commissioner for the 2018 IEPR Update

Karen Douglas, California Energy Commission, Lead Commissioner for Siting

Rachel Peterson, California Public Utilities Commission, Chief of Staff for Commissioner Liane Randolph

Ken Rider, Advisor to Commissioner Hochschild

Matt Caldwell, Advisor to Commissioner Scott

STAFF:

Heather Raitt, IEPR Program Manager

Guido Franco

David Erne

PRESENTERS:

David Stoms, California Energy Commission

APPEARANCES (CONT.)

PRESENTERS:

Chris Keithley, CAL FIRE

Russ Henly, California Natural Resources Agency

Jason Ko, United States Forest Service

Timothy Tutt, Sacramento Municipal Utility District

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Guido Franco, California Energy Commission

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Susan Wilhelm, California Energy Commission

Jason Vargo, California Department of Public Health

Michael McCormick, Governor's Office of Planning and Research

Jana Ganion, Blue Lake Rancheria

Pam Doughman, California Energy Commission

Brian D'Agostino, San Diego Gas & Electric

Kevin Dasso, Pacific Gas & Electric

Bill Chiu, Southern California Edison

APPEARANCES (CONT.)

PRESENTERS:

Bill Herriott, Los Angeles Department of Water and Power

Terry Crowley, City of Healdsburg

PUBLIC SPEAKERS (* Via telephone and/or WebEx)

Edith Moreno, Southern California Gas Company

I N D E X

I N D E X (CONT.)

I N D E X (CONT.)

P R O C E E D I N G S

AUGUST 2, 2018 10:03 a.m.

MS. RAITT: Good morning, everybody. Welcome to today's joint agency IEPR workshop on climate adaptation and resiliency. I am Heather Raitt. I'm the program manager for the IEPR, the Integrated Energy Policy Report.

So I'll just quickly go over our housekeeping items. If there is an emergency, please follow staff out the doors and across the street to Roosevelt Park, and just know that today's workshop is being broadcast through our WebEx commenting system, so we will have a written transcript posted on our web site in about a month, and an audio recording posted in about a week.

We do have a full agenda today, so I'd like to remind our speakers to stay within your allotted times, and we'll be providing timing reminders as needed. And, also, since we do have folks on WebEx, if you could please identify yourself each time you speak, it's very helpful for our transcript and for our folks on WebEx.

At the end of the day, we'll have an opportunity for public comment, and we'll limit those comments to three minutes per person, and so you can go ahead and fill out a blue card and give it to me if you wanted to make comments, and we'll also take comments from WebEx. You can just raise your hand to let the WebEx coordinator know, and

we'll just be taking those at the end of the day as well.

Written comments are welcome, and they're due on August 16, and with that, I'd like to open up the dais for opening remarks. Thank you.

CHAIRMAN WEISENMILLER: Yes. Let me start.

As you can tell, the breadth of these issues cuts across a lot of agencies, so this is a fairly significant interagency participation, although I should note Office of Emergency Services is actually dealing with an emergency right now. So, anyway, they were limited on how much they could participate today, but, you know, this is a pretty interesting workshop.

We are getting to the point in the Fourth Climate Assessment of starting to roll out the research, and it's 40 to 50 peer-reviewed papers that will be coming out this month, to the end of the month, and this really combines a lot of activities by a lot of state agencies and a lot of our best scientists on looking at the impacts of climate change on California, particularly on our energy system.

One of the things we're looking at today is a piece of that, which is how that affects the utility system, and the needs in terms of adaptation and resilience, particularly in the fire area. Not surprisingly, we found that was one of the major impacts of climate change.

So it's a good opportunity to connect the science to the PUC's more on the ground, trying to deal with the reality along with the other state agencies. So, again, this is going to be a very interesting conversation today, but just really starting the conversation on the Fourth Assessment.

So we have -- Ken? Keali'i?

EXECUTIVE DIRECTOR ALEX: Go ahead. Why don't you start.

DEPUTY SECRETARY BRIGHT: We're trying to figure out who goes first.

So my name is Keali'i Bright. I'm here in place of Secretary Laird from the Natural Resources Agency, and, you know, I guess all I wanted to say was, I just wanted to recognize the significance of a meeting like this, because we spend a lot of time -- everyone in this room spends a lot of time putting together reports and studies and press releases, and, you know, we're all trying to grab attention around these issues, and really raise awareness about climate change and the impacts that we are experiencing and that we see in our science, that we will continue -- that we will experience in the future, and this is really where -- you know, what we're all working towards, which is where these findings turn into policy and change and real action on the ground. So this is a commendable opportunity

to convert that knowledge into something real and beneficial to the public.

EXECUTIVE DIRECTOR ALEX: Good morning. I'm Ken Alex. I'm the Director of the Governor's Office of Planning and Research. I want to thank Chair Weisenmiller and Guido Franco in particular for the emphasis of the Fourth Climate Assessment on adaptation and resilience, and for working very extensively, cooperatively with many state agencies, but OPR in particular.

OPR, along with the Natural Resources Agency, has specific statutory duties now around adaptation and resilience, and if you go to the OPR web site, you'll see very shortly, by the end of the month, we'll have our full web site on adaptation and resilience, a clearinghouse particularly aimed at resources for local governments.

We work quite extensively with a group of local governments under the rubric "ARCA," and I can never remember what that means, but there will be some discussion of it later in the program today, in the afternoon, but these are regional groups that look at the impacts and the need for adaptation and resilience throughout the state, and, you know, it's very different in the Sierras than it is along the coast. So it's important that we look at these things regionally, although both places, as we are seeing very dramatically, have real fire impacts.

In addition, OPR has been working with Department of Finance and many other state agencies to build resilience and adaptation into all major decisions and investments that the state is making, and that's now part of policy, and there are a series of other things that OPR is doing. There's probably not time to go into a lot of detail.

I do want to mention one thing, however. In conjunction with the Resources Agency and CalEPA and other state agencies, OES, along with Tuolumne County and the U.S. Forest Service, we received a $70,000,000 grant from the federal government to work on resilience and adaptation after the Rim Fire, which is now three years ago, and is on the southern end of Yosemite. Now we're going to have the Ferguson Fire -- sorry, the northern end of Yosemite. Now we have the Ferguson fire on the southern end.

The focus of that is to bring back the forest and the community in a resilient way, and to look at how we finance. One of the biggest questions in resilience and adaptation is, how do we figure out ways to finance the effort, which we know is one of the biggest barriers?

At any rate, the Fourth Assessment has a very big focus on resilience and adaptation, very much appreciated, and I'm looking forward to the panels this morning. Thank you.

COMMISSIONER MCALLISTER: Just quickly, I'm Andrew McAllister, a Commissioner at the Energy Commission.

This is a wonderful opportunity, as Keali'i said, to sort of knit together our various policies and understand how, you know, the puzzle fits together, because we're just all doing a dazzling array of initiatives that all, broadly speaking, are, you know, aligned with our policies goals in the state, and with energy systems, you know, land use, all the way across the board, you know, fire response, emergencies, forecasting, you know, buildings.

It gets overwhelming if you try to, you know, keep it all in your head at once, and I think having sort of a well-oiled machine, as well-oiled as possible, that coordinates this, you know, broad array of efforts is really key, and so this is one piece of doing that in the state, so we can all kind of keep each other up to date at a high level, and make sure that we're listening to stakeholders that can point out things that we can do better, or, you know, suggest initiatives that might complement what we're already doing.

So adaptation and resiliency is sort of an implicit part of much of what we do, but I think making it more explicit and coordinated, and really understanding all the efforts that are happening, is a great sort of basis

for everything that we do going forward. So I'm really happy to be here today.

COMMISSIONER HOCHSCHILD: Good morning. I'm David Hochschild here at the Energy Commission. I'm the lead for the IEPR this year, and obviously the air above us for the last few weeks is sort of all we need to know, because this prospect of entering an era of permanent fire is very real, and does change the game on how we ought to be thinking about our priorities. So I'm happy to be here and be engaged in the discussion today.

COMMISSIONER DOUGLAS: Likewise. Karen Douglas, California Energy Commission. You know, we've been working on and thinking through adaptation and resilience in the electricity sector for a long time, and I think what we're seeing now is that, as much as we have been thinking and planning and trying to get ahead of the curve, the world is moving faster than we are, and the focus we have today is really essential, and this takes all of us working together.

We're actually really good at collaboration and innovation and finding solutions here in California, and we're going to need to be, because these issues are going to be hard, and they are hard. So I really appreciate everyone's participation today, and look forward to continued work together going forward.

CHIEF OF STAFF PETERSON: Good morning. My name is Rachel Peterson. I'm the Chief of Staff for Commissioner Liane Randolph of the California Public Utilities Commission. I'm a stand-in for her today, and I want to start by saying she very much wished and planned to be here today, but a major oral argument is occurring at the Commission that she needs to attend.

So I just wanted to mention some of the climate change adaptation activities that the CPUC is undertaking right now. As many of you know, we just opened significant new rulemaking to establish frameworks and guidance for electric, gas, telecommunications, and water utilities to think about how they can incorporate climate change and adaptation into their long-term infrastructure investments, and to that end, it is a collaboration already with the CEC staff, and we're holding our first workshop ourselves next Monday at the Commission to start taking a look at the Cal-Adapt tool and the data that's going into it.

We're very excited about all the new science that's being rolled out and published this month, and we'll be looking at guidance and frameworks and definitions for the utilities, when they submit their general rate cases to us, to think about how their infrastructure can be resilient and adaptable in the face of wildfires, wildfire risk, sea level rise, severe weather, heat storms, et

cetera, and you're going to hear more about that from our staff this afternoon.

Kind of closer to the present, sort of along the lines of kind of raising public awareness, we've passed a couple of resolutions recently that address what utilities can do right now. The Commissioners just approved a resolution that extends some de-energization standards to all electric utilities.

These were established after the 2007 wildfire seasons for San Diego Gas and Electric, but now the Commissioners just approved a set of standards for all electric utilities to de-energize their lines when public safety is at stake. They have pretty hefty public notification and mitigation requirements attached to them, but it is a step that the Commissioners felt was necessary.

Then, last, there's some consumer protection steps that the Commissioners are taking. There were two emergency resolutions that they passed last fall after the wildfire season to ensure that consumers are protected when the declared disaster did something to their utility services, things like requiring the utilities to forego a deposit to reconnect utility service. Something as simple as that can make a really big difference for the public, and so those were a couple of emergency resolutions, and President Picker is now in charge of a new rulemaking to

examine whether to make those kind of protections permanent for all utilities across California.

So thank you, Chair Weisenmiller, for putting today together, and I'm very excited to be here. Thank you.

MS. RAITT: So I'm moving on to our first panel, on risk management for natural and working lands, and David Stoms from the Energy Commission is the moderator.

MR. STOMS: Good morning, everyone, and good morning to the audience. As was mentioned a couple of times, wildfire is one of those cross-cutting issues that affects almost every sector of California, including natural and working lands, which is the focus of our first session this morning.

These lands are essential for California's economy, our ecosystem services, and the quality of life, more generally, and wildfire is a natural and very important ecological process in those lands, but, as Commissioner Hochschild mentioned, you just have to look at the sky to realize how that's changing so dramatically, and including the impact as those fires spread from the natural and working lands into the built environment.

The state also depends on those natural and working lands to sequester carbon, as part of our climate strategies, but these large fires also are emitting very

large pulses of greenhouse gas emissions. So today our panelists, we are going to hear from -- some folks from state agencies and the U.S. Forest Service about what's being done, and what we're doing in terms of assessing the wildfire risk, and how to manage that risk.

Our first speaker, then, will be Chris Keithley from CAL FIRE, and, Chris, I'll let you and those speakers introduce themselves.

MR. KEITHLEY: Thank you, David, and thank you to the audience. My name is Chris Keithley. I'm the chief for CAL FIRE's Fire and Resource Assessment Program.

I'd just like to take a moment, also, to recognize the hardship that many people in communities are going through during the severe wildfire episodes that we've had. I certainly hope, with the slight moderate temperatures we've having over the next few days, that we'll get a better handle on some of the active fires that we're facing, but, you know, I'd just like to express my sympathy to the people who are going through that.

Thank you for bringing this panel together. The Assessment Program that I manage, we provide a periodic report on environmental conditions on forest and range lands. The slide that you're seeing is our assessment report. We're hoping to release it publicly by the end of this week, and it has within it both a chapter on wildfire

issues and also renewable energy, which the Energy Commission staff, Holly, David and others, helped review that, and refined that chapter to its betterment, much appreciated there.

Just a couple slides that are embedded within that report, in the wildfire chapter. We collect, really, pretty comprehensive information on wildfire activity, and the slide on the left, the fire return interval departure, you wouldn't think it, given the extensive wildfire activity we've had this summer, but there still are large portions of our forested landscape that have a deficit of fire, and those are shown in the colors on this map, where they're darker blue.

Others are areas that missed fire cycles, and, correspondingly, in the southern part of the state, we have areas, largely in chaparral, that have been burning more frequently than historically would be thought normal. Then the other slide there, of course, shows fire activity, and it's increasing with each decade.

Just a couple other slides. Here we also keep track of the effect of wildfire on our built environment, and number of structures lost, unfortunately, as part of that, and it's increasing. The bar graph on the left shows that.

The other bar chart, we do collect information on

the burn severity. So, if you think about what portions of a wildfire burned at either low or moderate or high severity, our information on this goes back into the 1980s, and there doesn't appear to be a starkly increasing trend in severity, but since our data collection in the 1980s, the proportion of fire that we are seeing in the higher-severity classes is well beyond the historic norm or expected range.

The expected range is somewhere between maybe five to 15 percent, and we're seeing more like a third of the area, 25 percent to a third of the area, being in higher-severity burn classes. There certainly are implications both to the built environment and the ecological effects of that.

Let's see. These are also just looking within -- this one does show, actually, the structures that are lost, and the community planning that we're doing across the state. California actually does have very active local community groups for fire-wise communities, and that certainly is something that -- as we learn to try to live and adapt with fire, making better use of those local planning programs will be essential.

Well, that's all the slides I have, but I would like to make one comment. I think Ken made a very nice observation about regional differences that appear in the

state, and one comment he made was about bringing back the forest, but, when we look across the south Sierra, at least in our assessment report here, based on the forecasted climate that comes out of this Fourth Climate Assessment, we expect to see a loss of commercial timberlands across the south Sierra, maybe up to a million acres, a fairly substantial portion.

I bring that up partly in that, as we bring back the forest, the question that follows that is, you know, what will the composition of that forest be? What that is showing in our assessment is that there's large acres of forest land that may not have a suitable climate in the coming decades for conifer species. As we plan to restore that area, we might have to have a different vision of what type of forest can be supported in this community.

A couple other things I'd like to mention, just briefly, is some of the efforts that CAL FIRE is undertaking. We are starting dedicated prescribed burn crews to increase the pace and scale of prescribed burning.

The program that I manage, FRAP, is beginning to develop monitoring for prescribed burning, so looking at what the effect of -- both ecological effect and what the carbon dynamics are, by monitoring both before and after a prescribed burning, and we're starting to develop that program with this.

Another thing we're starting to look at is, we're currently recruiting a position in my program to hire, really, a climatologist with expertise in fire weather, to get a better handle. We're definitely seeing a lot of wind-driven fires, and we're trying to build our capacity. We hope with that position we can work more closely with the utilities and the Energy Commission on areas that cross that. And with that, I will --

MR. STOMS: Any questions before we move to our next speaker?

CHAIRMAN WEISENMILLER: Yes, actually a couple questions for both of you. First one for you, David, is, do we have a sense of how much we -- I mean, obviously, we've always viewed the forest more as a sink. So, at this point, the concern is, is it a source? Do we have a sense of how much in, say, 2017, greenhouse gas emissions or criteria pollutants keep in the fires, and what that means, generally, for us?

MR. STOMS: I don't have those numbers handy. I can't remember if the ARB inventory includes fires or not.

CHAIRMAN WEISENMILLER: Chris?

MR. KEITHLEY: ARB does estimate it. I don't know it off the top of my head. It will be a substantial number. But I would also encourage you to look at -- within the Board of Forestry, we have an AB1504 report that

estimates carbon sinks from field-based forest inventory data, and that report is updated annually. It currently does show forest retaining a sink of carbon, but you're right in that the emissions from wildfire is substantial, and in a year like this, a very active wildfire year, it will be dramatically high.

I guess that I would posit that it's hard to look at -- there's such great interannual variability that it's hard to take one year as being the definitive signal. From my familiarity with the scientific data in that area, it does vary quite a bit from year to year as well, but I guess I would point out that we still do have various -- our field-based inventory data does suggest forest still operating as a sink, and not a source.

EXECUTIVE DIRECTOR ALEX: I might note that this is an issue that the governor has raised on a number of occasions, and the ARB numbers have, in each of the past few years, been too low. Their estimate has been too low, and they've had to change it, and right now, at least, the fire numbers have overtaken the sink. So I know the Resources Agency -- maybe Keali'i will comment -- is working on an overall program on inventories and how we respond to that as well.

DEPUTY SECRETARY BRIGHT: I mean, I guess I would first comment on the 1504 report, because one of the

challenges is measuring the carbon. You know, like Chris said, it changes so frequently, and the way that the process is set up for 1504 is that it measures over a 10-year, I think -- let me know if I get this wrong, but it measures certain pieces of the forest over a 10-year period, and then pulls that information together to give us a "This is the state of the forest now" picture, and what's really needed is a more real-time analysis to understand that question because, over 10 years, we've seen the forest conditions change considerably.

Additionally, we're working at the Natural Resources Agency on a model, as folks at the table know, but folks in the room may not, first on a model that can be used to forecast carbon sequestration and emissions over time on the natural and working lands, taking into account climate change impacts.

So that model will provide us with kind of a policy-framing tool to understand how our actions impact the forest, but then, alongside of that, we're using that model to frame a program around reaching a carbon sequestration goal that is included in the state Scoping Plan, preliminarily set right now at a 15- to 20,000,000-metric-ton cumulative goal for 2030, but the real horizon line is ensuring that we're managing our natural and working lands to be climate-resilient carbon

sinks, because I think we can claim "carbon sink," but we want to make sure that carbon sink is actually resilient over time.

CHAIRMAN WEISENMILLER: That's good. You know, I was going to say, certainly, if we can get anything in the record on what the numbers have been, the annual variation, that would help.

I guess, Chris, my questions for you were -- you know, thanking you for being here, but, obviously, you've got how many people out in the field now today fighting fires?

MR. KEITHLEY: It's definitely in the thousands.

CHAIRMAN WEISENMILLER: Yes. I mean, so certainly all of us, you know, sort of applaud their efforts.

One thing I think all of us are struggling with as we go forward is, California has a lot of diversity, so, on the one hand, you have the Sierras. On the other hand, you have a lot of this urban-rural interface, and, you know, particularly, one of the scary parts about the fires at this stage is in that urban-rural interface, and it seems like we have to be thinking of different approaches for those two areas, on the adaptation and resilience and, obviously, firefighting.

MR. KEITHLEY: Yes, I would agree that we are

seeing wildfires, you know, in that WUI interface area, and it will continue to be a complicated issue. It involves both land-use planning, it involves vegetation clearance around homes, looking at, you know, building material and structures used in homes.

So it's a multifaceted problem, but there are, I would say, within -- CAL FIRE currently has a grant program through the Climate Change Investment Program that is providing at least hundreds of grants specifically targeted at the WUI area to promote more firesafe communities through vegetation clearance actions as well, but I would stress that the planning effort really needs to continue, to build safer communities.

It's very likely that communities -- it's hard to envision them being hardened to the extent that they'll never be impacted by fire, and instead I think it's a societal issue of looking at how we can live within a fire-prone landscape, and what measures we can take to realistically reduce that risk.

COMMISSIONER DOUGLAS: So I have a question for Chris. I'm just looking at the graph you put up on indicators, you know, burned area by vegetation type and burn severity, and, you know, the really striking pattern here that is easy to see is the risk -- you know, the acreage numbers, acres burned, going up for evergreens. I

mean, it's like this parabolic curve. You know, the other ones, it's a little harder to see much pattern.

I was wondering, you know, if you could speak to that in terms of, you know, what are some of the particular issues? I know we've got the bark beetle. I know that we've got some legacy of fire suppression. I know we've got a whole set of issues around evergreens, climate change, and the question of long term, whether some areas will be suitable for certain kinds of trees.

MR. KEITHLEY: You kind of hit on all of them, but I do think that, that increase into the forest vegetation, it does, to a large extent, focus on kind of the mid-elevation mixed-conifer belt, and those are areas where the risks are increasing. If you looked at just natural tree mortality over the last couple decades, it's increased across that area. Certainly, in many of those forest types, the stand density is too high.

But I liked what Ken said, honestly, earlier, that you kind of need a regional focus. If you paint that broadly across all forest types, there are so many different ecosystems in California that it is hard to generalize, but, for that particular graph, I do think it's largely driven by that mixed-conifer belt.

CHIEF OF STAFF PETERSON: Chris, can you talk a little bit more about the changes you're considering for

the prescribed burn program?

MR. KEITHLEY: Well, this came, I believe -- and Russ probably will be able to elaborate a little more on this, but through the governor's executive order that he released earlier in the year, and calling for an expanded use of prescribed burning, in response to that, CAL FIRE is creating six dedicated burn crews. I believe each crew is 10 people, and those crews should allow us to expand our use of prescribed burning.

There certainly are barriers to overcome in terms of windows of opportunity to burn in, and education and outreach is another piece of the executive order, in terms of educating people on the use of prescribed fire. We need to have better acceptance of that as a procedure.

I mentioned that we also will be introducing a monitoring program along with it, and, in fact, ARB has started working with us in putting air quality monitoring on site for some of our initial burns that we've done.

EXECUTIVE DIRECTOR ALEX: Can I add a couple of things? Building on your last point, I know there's extensive discussions with ARB and some of the air districts about, you know, there is a tradeoff here. The prescribed burn has a short-term impact on air quality, but if you can avoid what we're seeing this year, for example, then you have a long-term gain.

So there's extensive discussions going on around that, and for those interested in this issue, the legislature is looking at SB 1260 as kind of an overall approach to some of this, and there will, I'm sure, be more hearings and work on that, and worth following if you're interested.

MR. KEITHLEY: If I could also elaborate a little bit on it, I think, as those crews start to implement their program, we'll get better and more effective at doing these burns. It's actually -- there is a lot in terms of conducting an effective burn and a quality -- like, the prescribed burns you do in the WUI area are much different than if you're in more natural landscape, the type of techniques you use and the considerations that come into it. I think, as these crews get established, they'll become better and better at doing it, both to make communities safer and to try to reach ecological goals and benefits as well.

MR. STOMS: Okay. Thank you, Chris.

Our next speaker is Russ Henly from the California Natural Resources Agency.

MR. HENLY: Good morning. I'm Russ Henly. I'm the Assistant Secretary of Forest Resources Management at the California Natural Resources Agency, and today I'll be focusing on the California Forest Carbon Plan, and a number

of elements relating to implementing that plan.

So the Forest Carbon Plan is very much about climate adaptation and mitigation. For forests, adaptation and mitigation go hand in hand, since these are active sinks of carbon, and along with this, as Chris has indicated, the work we're talking about is very important for reducing the threats of wildfire across these landscapes, both for our natural resource benefit, ecological benefits, as well as for the human infrastructure that is embedded within these landscapes, including, of course, utility structure. Switch. Great.

So I'll just correct one factual thing. It was the 2014 Climate Scoping Plan that called for the Forest Carbon Plan to be developed, and so it was put together by the Fourth Carbon Action Team, which was led by CAL FIRE, the Natural Resources Agency, CalEPA, and the Air Resources Board, with many members from state and federal agencies. The Forest Service was a major participant in FCAT, in working in developing the Forest Carbon Plan, with the Forest Service managing, responsible for the bulk of the forest lands in the state, and they're a very important partner in this work.

So the plan focuses on actions to achieve healthy, resilient forests that are better adapted to our changing climate, including the fire risks that we are

facing and seeing very much today. It seeks to protect and enhance forest carbon and other resource benefits, and, as Chris also mentioned, we're looking at a significantly increasing the pace and scale of forest and watershed health improvements on federal land and nonfederal forests as well. This includes thinning, fuel breaks, fuel reduction activities.

Prescribed fire has had a lot of attention here today. As Chris has indicated, our forests are -- ecosystems are naturally adapted to fire, and returning that fire process to our forest landscape is very important for both ecological reasons and human reasons, and activities also include sustainable commercial timber harvest as a means of treating and maintaining these forest lands in healthy, resilient conditions.

We also discussed the need prevent conversion of forest lands to other uses, particularly those that tend to be carbon-emitting, greenhouse gas-emitting uses, and we looked at innovating solutions for wood products and biomass use, recognizing in particular that long-lasting wood products is a form of carbon sequestration.

To do this work, the report very much focuses on working collaboratively at a landscape or watershed-level scale. We need to work at this scale just because of the scope of the problem we have to address, and working at

this scale also helps to regionalize the problem. As Chair Weisenmiller indicated, we do have a lot of both ecological and social variability across the state for our forest land, so we need to be organizing to do this work on a regional basis, so that our social institutions as well as our technical methods for doing this work are appropriate to where we are.

So one of the elements for -- the Forest Carbon Plan that was released by the governor's office in May, and along with it came a number of things, including the governor's Executive Order B-52-18, and in concert with the Forest Carbon Plan, this identifies the forest management threats and needs to support implementation of the Forest Carbon Plan. It calls for a doubling of forest improvement treatments on nonfederal lands from 250,000 acres a year to 500,000 acres a year.

It seeks to reduce the regulatory barriers to prescribed fire and other forest improvement activities, already has been mentioned some of the air quality permitting issues for prescribed fire, for example. It supports wood product innovation, include a joint institute for wood products innovation that would be led by the Board of Forestry and Fire Protection, and it requests the Utilities Commission to review and update its procurement program for small renewable energy bioenergy generators.

Again, along with the EO and the Forest Carbon Plan, the governor released a revised budget proposal to help support this work. As Chris indicated, one of the important elements of that is the six prescribed fire crews at CAL FIRE.

CAL FIRE certainly has experience with prescribed fire and other fuels management work, but increasingly they've been limited, with their current staffing, to do that work, because our fire season has gotten so long, you know, virtually year-round in Southern California and other places.

So what was once an off-season activity for these crews, these staff, since there's no off-season anymore, they have fewer and fewer opportunities to do this kind of work. So, by having these dedicated prescribed fire crews, who will not be dispatched for fire suppression, CAL FIRE will be able to maintain higher levels of accomplishment with that work.

The May revised proposal also included $50,000,000 in Prop 68 and California Climate Investment funds to support collaborative landscape-level forest sequestration projects throughout the state. It provides $15,000,000 in Prop 68 funds to state parks for forest restoration work, and, finally, several million dollars to support work in the forest products innovation area.

As Chris indicated, CAL FIRE has had substantial funding, California Climate Investments funding, to support forest health projects, fuels treatment, firebreak projects, $220,000,000 last year, $160,000,000 in the current fiscal year, so clearly some very substantial resources to bring to work, and CAL FIRE is putting that work across the entire forest landscape, including activities on federal lands, because we recognize that we need to take care of all these forest lands across the state, because they all fit together both ecosystem-wise and socially.

Then the final piece that I want to mention is the governor's Forest Management Task Force. This is established to help guide Forest Carbon Plan implementation, address barriers that may arise, and address our forest management/forest health issues generally. The governor first called this out in his January State of The State Address, and the state has now -- governor's office has now morphed the Tree Mortality Task Force into the more broad-based Forest Carbon Plan goals.

You know, I want to recognize that utilities were major participants with the Tree Mortality Task Force, given the hazards created by all these dead trees for powerlines and other utility infrastructures, so they've

been really major players in the way they have stepped up, really going above and beyond what their nominal responsibilities might be to address these issues. So I think they deserve recognition for that.

The Forest Management Task Force is led by the governor's office, the Resources Agency, CalEPA, and CAL FIRE, and has broad composition of state, federal, and local government members. Underneath it is a collection of 10 working groups to address specific issues and regions of the state, again coming back to that regional issue, regional difference issue, plus it will be putting together a science advisory panel. The group had its first meeting on June 11th, and its next meeting is scheduled for August the 13th, and they will be meeting monthly.

Then, finally, before I wrap up, I just wanted to note some recently initiated engagement with PG&E as related to their new Community Wildfire Safety Program, and this is related to their proposals to substantially expand the kinds of vegetation clearance they're doing along their powerlines in forested Tier 3 areas, and one of the roles I play at the Resources Agency is coordinating policy and program work related to forest management across CAL FIRE, both state water boards, Department of Fish and Wildlife, and Department of Conservation.

So I've reached out to PG&E so that we can learn

more about this program, and engage with them to discuss how we can work with them collaboratively and effectively to deal with permitting and resource protection issues related to this new enhanced work. So we have a meeting set up at the end of the month for that, and looking forward to that opportunity to work with PG&E on that.

That concludes my comments. I'd be happy to take questions.

CHAIRMAN WEISENMILLER: I guess I'm going to ask the proverbial question of, you know, at least at this point, how much are we spending on fighting fires versus forest restoration? It seemed we've had a substantial increase, but it's probably good to get the sort of numbers out for people.

MR. HENLY: Yes. I don't have those numbers off the top of my head, but clearly there are expenditures for fire suppression, and when you add in the damages and costs and losses related to that, you're certainly talking multiple orders of magnitude and differences between those expenditures.

So, again, I'm really pleased with the way the state has been stepping up to fund this work, particularly the California Climate Investments funding that's been coming forward, CAL FIRE and other places, enhanced funding coming through Prop 68 to do this kind of work.

The Forest Service has been rather hamstrung to do this work because of the so-called "fire borrowing" problem that they've had as a part of their budgets, where financial resources they have to do this kind of work ends up getting pushed towards their substantial costs for fire suppression. But there has been a budget fix that is going to help address that over time, so, hopefully, they will have more of their own funds to put to work on the ground to do this.

So things are definitely looking up, but, obviously, you could spend a whole heck of a lot more on this than what is cued up right now. But, again, I think we are moving forward with some very substantial investments. Hopefully, they can be sustained over time, and that will make a difference.

CHAIRMAN WEISENMILLER: That's good. Just so you know, we had invited Terry O'Brien to be here today, the governor's new appointee in this area, but he's not available. I'd certainly encourage folks generally interested in this area to connect with Terry.

COMMISSIONER DOUGLAS: You know, I have a quick question, and it's probably better addressed to a panel later in the day, but, in terms of resources that we're making available to communities to reduce their fire risk and increase their resiliency, you know, it seems to me

that there are always outreach challenges in terms of getting community engagement, you know, and I have spent a lot of time talking to Native American tribes. They're major players in public services in a lot of our rural areas.

We've had meetings and met with people in unincorporated rural communities where, you know, they don't have an incorporated government, necessarily, a city government that can even apply for a grant, or someone who's necessarily in charge to be the one to apply for a grant, unless there's a network through the county or some other network.

So I'm sure that there are people, you know, working on this, and figuring out the outreach, and then, of course, there's the challenge of the almost inevitable siloing of funding, because different agencies have different resources available, and there are certain eligibility criteria, and, you know, you can fund one thing and not another. So, you know, how do we bring this all together so that the people on the ground who have good projects that we would like to be able to fund are able to take advantage of the resources that we want to make available?

MR. HENLY: That's a great question, because there definitely are some challenges in these areas, and it

varies throughout the state in terms of the level of, call it, institutional capacity to pull together, coordinate this landscape-level collaboration at the large scale. In some areas in the Sierra Nevada, you know, I think we're in great shape, with the Sierra Nevada Conservancy.

The state agency that covers that whole realm, the Forest Service, which is responsible for management of a substantial portion of that area, works very closely on this. The Watershed Improvement Program that the Sierra Nevada Conservancy and the Forest Service jointly work on is very much focused on doing these kinds of things to bring the resources, bring the people together to work at this landscape level, using both funding that the Sierra Nevada Conservancy has, getting grants through the Forest Health Program that CAL FIRE has, and things like that.

So things in the Sierra Nevada are in great shape, and that can also provide the sort of structure where you have agencies, entities like some of the tribes, who might not be able to accept a grant themselves, who need somebody to act as a fiduciary for them, having places where that kind of support exists.

Other parts of the state, I think we're less well set, institutionally, for that kind of work, and part of the funding we got with that May revised proposal is $20,000,000 in grant funds to the Resources Agency to use

for establishing and building that capacity where it's lacking. So, you know, what do we need in the North Coast, what do we need in the Central Coast, Southern California, et cetera, where there are existing entities that, with a little bit of help, can pick this up and really run with it?

I think there's some on the North Coast, for example. Other areas, it may be a little more starting from scratch, but we've got this funding available to help get that momentum going, provide them some support for planning the kind of work that needs to get done to address these issues. So it's not all there right now, but we do have some new resources to approach that.

COMMISSIONER DOUGLAS: So it's really encouraging that you do have the resources to approach that, and that you're thinking about approaching it, because I agree with you that the institutional capacity, the ability to apply for grants, hold grants, you know, administer, carry through with them is just really different, and you've got areas where there's just really nobody who can do it, and you've got other areas that are pretty well situated.

You know, as we think about -- you know, we face similar challenges, of course, in outreach for some of our programs. Everybody does. So this may be an area to think about working together and leveraging some of our

collective capacity and outreach and so on, because it is important that we find ways to cover the state more broadly, especially the areas that really need this.

CHAIRMAN WEISENMILLER: I was just going to note that, as part of the roll out of the Fourth Assessment in October, as the Fourth Assessment, one of the biggest advantages relative to the third is, the science has progressed enough on downscaling that, instead of just looking statewide at what's happening, it's much more disaggregated.

So we're going to have 13 workshops throughout the state in October, including, you know, one tribal, so 10 regions, one tribal, one environmental justice, but basically allows us to really home in on some of these areas.

We're, you know, dealing with diversity, as you indicated, on the regionwide side, and use that to connect local governments and CBOs to what they can do in each of those areas. You know, it's pretty ambitious, what we're trying to do on that, but I think it's really a significant step forward to the science, allowing that disaggregation to really take that to the people in the different areas where the variation exists.

COMMISSIONER DOUGLAS: I think that's great, and it's another example of an opportunity for synergy here, if

the Resources Agency is part of that, and we're, you know, really kind of coordinating on this outreach and capacity building, so that we're really providing that kind of support.

DEPUTY SECRETARY BRIGHT: Yes, and I'll just underscore, you know, the regional groups of the task force are meant be like the, like, "get into the weeds and develop the plans" phase. So I think coordinating into that space as well is going to be essential for actually getting plans in place to do the work that we need to do.

I wanted to take time to just really recognize the importance of the Forest Carbon Plan, which is often -- I mean, I see it as a pretty poorly named document for what it is, but really what it is, is the state's policy on how we want to manage our forests, and from Russ's presentation, you know, it started in 2014, and then was finished in 2018, and that's a pretty clear indicator of how challenging it is to come to consensus around these types of issues. It should be recognized that the Forest Carbon Plan was a product of 15 different -- I can't remember the --

MR. HENLY: It was a lot.

DEPUTY SECRETARY BRIGHT: It was a lot.

MR. HENLY: Fifteen is probably in the right range.

DEPUTY SECRETARY BRIGHT: Around 15 different agencies, with different policy mandates and different goals, and in the end of the day, they were able to reach consensus around the recommendations and the findings, and that really set the stage for the success we experienced in the budget process this year, going for cap-and-trade funds, but it was also released on the back end of multiple other reports from other organizations like the Little Hoover Commission, the Legislative Analyst Office, Public Policy Institute, that essentially were kind of coming out with the same findings from different vantage points.

So the Forest Carbon Plan served to kind of consolidate all of those findings, and really, you know, we're one of the few states in the West Coast in kind of the temperate forest realm that has this unified policy on forests. So it's a pretty great example of California leadership.

MR. STOMS: I just wanted to make a note of another resource and capacity related to this issue of our staff workshop last week on fire research needs. The Office of Emergency Services presented about their program, a hazard mitigation grant program, and they'd like to expand more into wildfire hazard projects. They're somewhat limited because it's FEMA funding, and so they're somewhat limited currently in what they can fund, but they

were looking to the research programs to help make the case for on-the-ground mitigation of fire hazards, and so there's fairly substantial funding there, too, as well, that could support local communities.

COMMISSIONER DOUGLAS: You know, it's really -- it really is -- there's so much opportunity to take action here, you know. We'll hear later from the Blue Lake Rancheria about the Ethic Project there that put solar in a small microgrid on the gas station out there. We had a couple people from Cal OES at the ribbon cutting. We had people from the Red Cross.

They were really excited about it because, if the gas station stays energized, you can still run the pumps and the cash registers, and keep the food cold, and it's a big deal to have that kind of resource in key areas, and so they were pretty excited about it. So it's kind of another example of how we can be creative and think about synergies between our different programs.

MR. STOMS: All right. I guess we're ready for our third and final speaker, then. For a federal perspective, we have Jason Ko from the U.S. Forest Service.

MR. KO: Good morning. So yes, my name is Jason Ko. I work in the State and Private Forestry Staff within Forest Service, and I'm managing the Ecosystem Service and Climate Change Programs, so I do a lot of work with state

and private partners on those two topics, and some of the things I'll talk about today will be focusing on those program areas, but I also have some notes from other staff areas.

Even though we're all focusing on one, you know, particular segment here, as someone mentioned, this cuts across a lot of different areas, and there's discussion like, you know, "What would be the most useful person we could provide here from, you know, fire staff to program staff to policy?" And the fire in the state made that decision for us, as well as the impending fire borrow situation coming up, probably, in the next two weeks. So those are very real situations that we are facing.

I also wanted to also -- it was mentioned in our meeting earlier this week, and I thought it was really interesting and telling of the situation that we are facing, is that I think, nationally, any given moment in kind of the throes of fire seasons, we have about 10 to 12,000 staff -- that's cross-agencies -- fighting fires, and I think earlier this week we had about 30. So, you know, every year we are seeing new thresholds crossed.

So, saying that, I think, you know, we've touched a lot on kind of the challenges we are facing with climate changes in terms of disturbances. You know, at Forest Service, we recognize that, you know, climate change, and

shifting hydrology patterns, and the increasingly dense and unhealthy forest that we have, combined with the growing populations, are major challenges that we need to address, and so focusing on ecological resilience and restoring our forest and that resilience is kind of the over-arching goal.

We do have ambitious goals to work towards that, but, as others have alluded to, we have constraints that we are faced with in terms of staffing and resources, and so I think I feel very fortunate that our leadership here has been very supportive of moving towards new, innovative ways to addressing and moving towards those goals, one of which, I would say, is kind of looking at partnerships across different ways, with new authorities, and maybe reemphasizing older authorities that we haven't used as much, to look at a tree in landscapes (sic) at an all-lands level, so both federal, state, private, tribal, all lands together, and, you know, larger landscape approaches really are the way to approach, you know, making a larger forest resilient against climate change and disturbances.

Some of those -- you know, I'll just mention, you know, the Good Neighbor Authority is something that we are continuing to learn how to use in California, where basically the state can help scale treatment on federal lands. So it's a one-way (indiscernible).

We also have the Stewardship Agreement or Stewardship Authority, which has been traditionally applied in contracting, but we are also doing more and more stewardship agreements with partners, such as Tuolumne County was mentioned earlier, on a lot of local foundations, and our resource conservation districts as well, to do treatments across lands, including federal lands. And so, rather than the traditional model of Forest Service doing work on federal lands, with federal money, it's becoming much more all-encompassing.

This is a learning curve for us. There's a lot of, you know, both legal, bureaucratic, cultural kind of adjustments to make for, but we are moving in that direction. We have support from our leadership, and in my program, Ecosystems Services, it really is kind of -- it's related because we are looking at trying to communicate, both quantitatively and qualitatively, the benefits that communities and downstream people in the state of California and the region receive from Forest, not just federal forests, but all forests.

So that, you know, includes carbon, water benefits, as well as kind of value of recreation, and so I'm trying to get those talking points out, trying to strengthen and build partnerships around those, bringing new partners, strengthening old partners, and bringing new

resources into approaching treatments across landscapes through those ecosystem services.

A few things that I'll mention that we are working on right now, kind of within this larger subject, is, so, we are working on a number of different, I'd say, pilot projects across the state, and trying to figure out ways to bring new partners to the table, and new types of financing, and, again, working outside of that model of federal money, federal staff, federal land, and, you know, in the Ecosystems Services Program, we try and follow and support those, so I can talk about some of those in more detail if you'd like.

In the next year, we are starting up a climate change vulnerability assessment for infrastructure and recreational resources on Forest Service lands. You know, there's a lot more work and research done on the ecological and biological vulnerabilities, and so we are trying to crosswalk that over to some of the social programs, which will include roads, you know, developed campsites, et cetera.

I think, for utilities, some of those will be very interesting, and it will be interesting to see if, you know, there are ways we can collaborate with kind of the Commission and other partners on, you know, making sure that what we're doing is useful for us, and our internal

programs across these, but also for other partners. We're coordinating with Caltrans, for example, and I think they're doing some vulnerability studies on state highways, and so, you know, trying to make it consistent on that.

Let's see. We have currently a national program to work on NEPA, and on the efficiency of NEPA, and making it more cost-effective and robust where it needs to be and concise where it can be. That's an ongoing process that I'm not involved with personally, but I think there are some -- there's been a lot of good discussions and recommendations made, and I think we'll probably do some more public results, outcomes soon on that.

Let's see. Another thing that we are moving towards currently is the "one region, one program of work" idea, which some of you may have heard of. It's basically trying to be more effective in how we use our limited resources in the region across the state. So, rather than having each national forest operate on their national forest and we prioritize within that area, looking at across a few groups of national forests, or zones, and forest supervisors working together to prioritize and share resources, prioritize projects and share resources, and that's a new process for us.

Some more specific things towards utilities to highlight. So we did have the recent, in 2016, the

emergency hazard tree and pole replacement permits that were issued, and that were renewed in 2017 and 2018, to expedite maintenance treatments along the corridors. The staff that works on that said it's likely that it will not be renewed in 2019. It does require some emergency/extraordinary circumstances to be invoked.

I think PG&E and SoCal Edison will be aware of the standardized operation of maintenance plans that we are working on with them across 16 national forests. There's 18 in the state, so that excludes the Modoc climate, where I don't think they have, maybe, consolidates interests, but that's basically to kind of consolidate or combine a lot of the different special use permits and easements that have accumulated with new powerline corridors into kind of a more cohesive standardized maintenance and operations plan. So that will include everything from access to, you know, hazard treatment processes and how to, you know, engage with the forest service on that.

Lastly, and larger, far more widely applicable, is the omnibus that was recently passed a few months ago. There is language in that legislation that addresses veg management along, you know, utility company corridors, and we're still waiting for policy interpretation of that from Forest Service leadership in Washington, D.C., so I can't say what, exactly, that will mean for us specifically, but

there is the leadership intent to support -- you know, facilitate, you know, maintenance of and expansion of the vegetation treatments around the corridors.

So, with that, I guess, you know, I can take any questions.

CHAIRMAN WEISENMILLER: Thanks for being here. A couple questions. One of them is, we talked a little bit earlier with Russ about sort of the split between responding to fires and basically more, you know, getting on the ground doing the restoration do reduce fire hazard, and Russ alluded to prior budget problems for you there, saying there's a fixed comment (sic), and I'm just trying to understand, where are we at dealing with that issue?

MR. KO: So, yes, the fire fix. It won't happen until 2020, and it does have limitations as well. It's not an unlimited kind of fix. So, basically, as fire season progresses, we have a certain amount of funding that's set aside for suppression costs, and as depleted as it usually is, we usually have to -- there's decisions made way above me about what's taken for where to pay for those suppression costs, and the fire fix that starts in 2020 basically increases that set amount of funding that's for suppression based on, I think it was, a three- or four- or five-year average, not including last year. Last year was exceptional. Yes.

So it puts a higher level, but, like I said, it's not an unlimited fix in terms of -- so, if we have a larger year, there will still be a funding debt that will be transferred to special costs, and just for perspective as well, I believe California and Region 5, as we designate it, accounts for about half of the fire budget nationally for the Forest Service.

CHAIRMAN WEISENMILLER: Do you have an order of magnitude for the overall budget?

MR. KO: Sorry?

CHAIRMAN WEISENMILLER: It's about half of -- what's the total?

MR. KO: I don't know that.

CHAIRMAN WEISENMILLER: That's fine.

MR. KO: Yes.

CHAIRMAN WEISENMILLER: No, I was going to say I was at an event recently where someone was trying to argue with Kip (phonetic) that the thing we should do is be providing hundreds of millions of dollars to the Forest Service to deal with that backlog of issues, and it was not a very successful conversation, obviously, but trying to understand the problem.

MR. ALEX: Kind of following up on that, do you know the number of acres that are treated annually in California on U.S. Forest Service land?

MR. KO: So our goal is to work towards 500,000 acres a year for restoration treatments. I should mention that that does included managed wildfire for natural resource benefit. On average, every year varies, largely a lot because of that managed wildfire for natural resource benefit aspect. On average, our treatments are about 150 to 250, on average, acres, or fuel reduction treatments, and so we are well short of the 500,000. That's what we consider conditional.

MR. ALEX: And when I used to do more work on national forest issues, I remember there was a watershed needs backlog as well. Does that still exist? Do you still think kind of in terms of watershed areas and what's needed for those?

MR. KO: Well, there is a -- what's it called? -- the watershed condition framework, which basically assesses each watershed as to its relative state of degradation. So there's a number of different ways that we assess, kind of, and prioritize, and I think, you know, one of the advantages, that I'm hoping, to the watershed improvement program for us to work towards is helping us look at what we have and what we need across the landscape to prioritize what should be done for different benefits. There is also a reforestation need, or kind of considered a gap or something like that, that we are also behind on.

CHAIRMAN WEISENMILLER: I'm just going to ask a question, a permitting question. I know, at one point in the last year, I think it was PG&E had a (indiscernible) trying to deal with a permit, and their concern was that, to the extent they have transmission corridors and they saw dangerous conditions, they were trying to get the permits in a timely fashion, to actually go in and address those. So I'm just trying to understand what you're doing now on the permit, expediting permitting for that type of transmission corridor issue.

MR. KO: So I believe that would be addressed in the Standardized Operations and Maintenance Plan, and that's one of the reason for, probably -- and all the PG&E folks probably can speak to this better than I can -- is that there was a lot of variability in how each forest, and even on a forest -- for each line, how that process was rolled out, due to kind of the multiple special use permit, as we call them, for the corridors, or easements, and how they kind of accumulated, because you would basically have to get a new one each time a new line was set up, and so there was basically a -- it was very confusing to -- you know, it wasn't a standardized way. So the Standardized Operation and Maintenance Plan will be consolidating those, and we will address that, in addition to whatever comes down from the omnibus.

CHAIRMAN WEISENMILLER: And when do you expect the Standardized Operating Plan to be in place?

MR. KO: I don't know. I think it's fairly soon, within the next year, I'd say. The first people I was speaking with that were working on that were really far along, I believe. It's a new -- it's definitely a big -- it's a big beast for us, on undertaking (indiscernible).

CHIEF OF STAFF PETERSON: And on that same note, when would you expect the policy guidance to arrive?

MR. KO: Yes. I can't speculate when Washington, D.C., will send that to us.

CHIEF OF STAFF PETERSON: Within a year?

MR. KO: Hopefully.

CHIEF OF STAFF PETERSON: All right. Thanks.

DEPUTY SECRETARY BRIGHT: So you mentioned partnerships in your -- I think it was the opening of your remarks, and one of the challenges that I've seen is that, you know, we have a pretty good consensus around the types of projects we want to do. We have a decent pipeline of getting projects, you know, developed and thought through, but then what we don't have -- and we brought this up in Russ's presentation -- is we don't have robust funding to fulfill all of these different landscape-level plans.

So I just wanted to get your insights into, what

have you experienced as being helpful, kind of, strategies to bring in additional beneficiaries to this work? Because there are many beneficiaries to forest health, but there are very few, kind of, partners funding the work, and that's always been a gap that I struggle to figure out how to bridge.

MR. KO: Yes. I mean, and so it depends what you're looking at. I feel like, in the carbon area, from our perspective, there's a lot of money right now, especially with the CCI initiatives, and I think, you know, if that level continues, I think we're very soon going to run out of NEPA ready projects that are competitive for that based on federal lands.

From the water, kind of, benefits side, I think that's a more difficult question. There's a number of different, I think, pilot partnerships and discussions that we're having around the states with utilities, with communities, that I think are more easily engaged on when there's a very much more direct connection, where the community or the utility is directly below the watershed. I think, in California, it's very complicated and complex, you know, on how water is moved around and who benefits from it, and so I think that's going to be more difficult at a larger scale.

Going back to the discussion about capacity, I

think there's going to be a lot of interesting things that come up in the next year or few years as we kind of move away from this kind of, again, federal land, federal funding, federal staff, in terms of how projects get done. I do think there is a gap across the state in terms of how -- being able to handle tens of millions of dollars, and, you know, even if you're subcontracting or just managing that, there's a gap, and I think a lot of organizations that don't traditionally do that are looking to scale up, which is good, but it's going to take time.

It's going to take time to build the trust and the institutional capacity, and I think working across lands, too, is also a complex subject in terms of -- I know the El Dorado RCD, for example, that got a CCI or a GGRF grant, first round, it took a long time for them to put together 41 landowners to do, you know, the work, and that was only like -- it was a very small amount of acreage, relatively, but it's a lot of -- it takes a lot of engagement to kind of do that. So I think there's a lot of -- there's just going to be a lot of patience needed to kind of build towards these, you know, multi-partner, multi-landscape projects. I don't know if I answered your question.

DEPUTY SECRETARY BRIGHT: Thank you.

MS. RAITT: If we don't have any more questions

for this panel, then we can go on to the next set of speakers. I'd like to thank our panelists very much for being here today.

Again, this is Heather Raitt from the Energy Commission, and so next we have two presentations, staff presentations, from the Energy Commission. The first one is from Guido Franco, and this is an update on science and technology.

MR. FRANCO: Good morning, everybody. Thank you for this opportunity to give a brief presentation about the (indiscernible) of California's Fourth Climate Change Assessment on this topic, but, also, we're going to summarize a staff workshop that Davis Thomas (phonetic) organized last week, on July 25th, looking both the research needs with respect to impacts of climate change to the electricity system, but also how to reduce the potential source of ignition from the electricity system in creating wildfires.

David Erne is going to be -- he's going to talk about the technology part. I'm going to talk -- my presentation will be about, like, what I call the "science." Okay. So the underlying presentation is, first I want to talk about the wildfires and aerial stuff we use for California's Fourth Climate Change Assessment. Then I will briefly talk about some of the studies looking at

impacts of those scenarios, and then summarize some of the main findings from the science -- from the July 25th workshop, and then our vision of the future.

So, to start, the Fourth Assessment used a common set of climate projections, how temperatures, precipitation would change, et cetera, et cetera. We also used a common set of land-use change projections, how urban areas will grow and things like that, and those were developed by the U.S. Geological Survey. That information was taken by Professor Westerling. He developed a statistical model, trained using thirty years of historical data on weather conditions and wildfires, and the thirty-year period ended -- and there's a mistake. It's not 2016. It's 2013. Okay.

The bottom line is that, as you can see in the maps in the bottom, is that wildfire risk will increase substantially. So the maps show the areas burned in three-year period. The first period is incorrect. It's 1961 to 1990. So, sorry about that. Yes. So the bottom line is that, by the middle of the century, we will see the number of acres burned will double, and the same thing will happen, will double again, by the end of the century, according to this model.

So one of the studies used the wildfire projection, was a project by Lawrence Livermore National

Lab, looking at the potential impacts of wildfires to the electricity infrastructure, mainly, transmission lines, distribution lines, and the units associated with them.

I think the most interesting part of the study is the historical analysis that the researchers did. So they combined data sets from CAL FIRE, data sets from Cal ISO, data from the CPUC, et cetera, et cetera, to look at the -- I think it's about the last 20 years -- how things has been changing, what are the -- and the main finding -- well, some of the finding was that only five percent of the wildfires actually affect transmission and distribution lines in California, but that even a tiny fraction of that are the ones that actually cause most of the damages.

So there's a rich data set there that should be exploited, and the combined damages from 2000 to 2016 -- so it doesn't include 2017 -- is about $700,000,000, but this is just to the utilities, direct cost. This is not potential liabilities or impacts and costs to others, like homeowners, and the bottom line again is that, increased wildfires will increase the risk of disruptions and damages to the transmission and distribution lines in California.

The second study was a study that actually was requested by the California Department of Insurance, and it was conducted by Rand Corporation, and the Department of Insurance wanted to know what would be the impact of

wildfires to the insurance market in areas that are prone to fire, or they are exposed to fires.

To make it brief, the bottom line is that the Rand Corporation found that the premiums for insurance will go up by the middle of the century, 28 percent -- I mean, 18 percent, so it doesn't sound like a lot to me -- but that also the uptake of insurance will go down, in part because of the cost.

The next study has to do with the California transportation fuel sector, namely, the petroleum sector, because that's what we use mostly for transportation, is petroleum-based products, and the study was conducted by Professor Radke from UC Berkeley, so I think he did a marvelous job.

So he used a holistic approach, so he first tried to understand the transportation fuel sector as a system, how its different parts are interconnected, how different groups manage different parts of the system, how they communicate, not only that, how the transportation fuel sector is also connected to the electricity, natural gas, and how cascading effects may materialize or impede rapid action or adaptation options.

With respect to wildfire, his finding is that refineries, antennas are not that exposed to wildfires, and the main area of exposure for the transportation and

fuel sector are roads and railways, trains, I suppose, railroads. So that's an area where you see the expectation is to see increase of vulnerabilities.

Now I'm going back to the study by Professor Westerling, so remember that he used data to train his model only to 2013. So, after 2013, more or less after here, everything is simulations with the climates and areas developed for the assessment and land-use scenarios. So the average conditions, the red and blue, the dark red and blue, I mean, they go up, and that's what's reflected in the map that I showed before.

I think the most interesting thing for me are the extremes, so we have -- these are the extremes, the 95th percentiles, and it just happened that we have one -- I think it's more or less after 2010 -- in the model. So this is not calibrated, you know, to match what happened in the last few years. It's something that came out of the model.

So the other thing is that the frequency of these extreme events will go up, so it's like going to be breaking records in the next few decades, in the next few years, you know, with this type of wildfire events that will be burning more and more acres in California.

So now I will give you a test. It's a one-second test. So the test is, where do you think the 2017 wildfire

year would fall here? So here is the number -- I mean, the areas burned, so you mentally have your answer ready, and the answer is that it's about here (indicating). Okay? So, basically, we may have -- we could have seen things worse under current conditions.

Okay. So the main findings from the climate science workshop on July 25th, I'm not going to go in detailed discussions about each one of them. I think the main one for me is that projections of how wildfires will change in the rest of the century are all over the place. It all depends on what type of wildfire model you use. There are some models that actually suggest -- that use wildfire risks. I think they are totally wrong, but they are there in the peer-reviewed literature.

In addition, I mean, we don't know how tree mortalities will affect wildfires. They are hypotheses, one of them put together by Professor Stephens from UC Berkeley, suggesting that surface-based wildfires will go up to unprecedented levels, something that we haven't seen in California before, what they call "massive" type of wildfires in the future, and the problem with those type of system, we don't have enough data information to inform the simulation of those type of models.

The other major research issue has to do with relative humidity. I mean, we need to better understand

how relative humidity will change. We have now results from the downscaling that was done for the Fourth Assessment. We need to examine them.

The big issue has to do with winds. So I didn't realize that the long-term database for wind is very poor in California, so it's very hard to validate models when you have a very poor data set to use for validation, but the other thing is that, depending on what model you use, you get totally different results with respect to wind fields. So this one is the one that was recently produced for the CPUC. It's a 10-year simulation, so two kilometers, using whatever search forecasting model was done for DRI, but one would think that we need to tackle this high discrepancy between different modeling approaches.

So, the future. So, in between climate assessments at international and national level, we always find the foundation at work involving is developing (sic) the next-generation regional climate models. So we already have a contract developing the next generation of regional climate models that will be used to downscale the outputs for the next generation of global climate models, that are being run right now for the next IBCC (phonetic) climate assessment I think we'll be releasing about 2022.

Okay. So the good news is that a new downscaling

technique for regional climate model would have better information about wind regions, about relative humidity, and information and data that will be very useful for future simulations of wildfire regions.

Of course, this is not going to happen overnight. I mean, we're in the process of developing the model, and later on we'll have to develop the climate scenario. So this will take three or four more years, before we have new climate scenarios.

There is also an EPIC solicitation that is planned by early next year or sometime in 2019, you know, trying to address some of the science issues that I discussed before. Hopefully, the work that we're doing now and plan to do will be foundational work for the next California Climate Change Assessment.

So, with that, thank you very much.

CHAIRMAN WEISENMILLER: Yes. One question, Guido. As I understand it, the Rand study was looking at residential insurance?

MR. FRANCO: Yes, it was residential insurance.

CHAIRMAN WEISENMILLER: One of the ways I was going to encourage the utilities was to provide some of their insurance information into this record, also, to strengthen the understanding of both parts of the insurance market.

MR. FRANCO: There's no other questions? Okay.

MR. ERNE: Good morning. As Guido mentioned, the workshop we had last week had really two pieces to it, but the first half was on the science, and the second half was on technology, mostly around fire safety. That was the primary point of discussion, although we did add a discussion of resilience in that conversation as well. So I'm going to walk through the summary of the conversation that we had during the course of that workshop.

As you can imagine, this was, I think, about an hour and a half associated with this topic, which was a very complex topic. There's a lot to discuss. So I think, as part of that meeting, can scratch the surface on this, and I'll give you that overview.

Not to say there isn't work going on in this area. More broadly, there's a fair amount of research that has been going on, particularly with the IOUs (phonetic), and, actually, in their previous EPIC plans, and in their most recent EPIC III proposal, they have a number of projects that are related to that, and you'll see them wrapped into the overall conversation here today.

So we started the session with a panel discussion, again talking to the folks that you likely see to be able to address or identify the most significant research opportunities, with the CPUC and the utilities.

We also added -- as David Stoms mentioned, we added Cal OES, which was a great addition, because we want to think as broadly as possible about, ultimately, adoption and deployment of technology.

So, clearly, the utilities are a strong source of deployment, but, also, are there other ways that we can get broader deployment of technologies? And the Cal OES Grant Program is one way that communities can think about how they can deploy solutions that might make their communities more resilient. So they gave an overview of their grant program, and we'll look at ways that maybe the outputs of the research that's going on and will be going on could be deployed more broadly.

The CPUC has a great way of helping to digest all of the options associated with fire risk and fire safety, and they put them into three different categories, which I think is great to talk about, so I'll mention a little bit about each one of these.

As you can imagine, fuel management is pretty much the most obvious, and there's many traditional ways of handling this, clearance requirements for vegetation management, and there are other technologies that are being deployed in the early phase, that could possibly be growing using unmanned aerial vehicles, using lidar to help identify height and density of vegetation on the outskirts

of the -- on the clearance areas, so you can start to see whether there are opportunities to address problems in advance of them coming in contact with the system.

Ignition control, that's clearly the broadest area of -- or the deepest area of technology opportunities. I'll get into a lot of details there, but there are a lot of work that's going on right way, exploratory work with new kinds of fire poles, or new types of fire-resistant poles, and also sensor technologies that can identify faults or possibly deenergize lines before a line hits the ground.

Lastly is monitoring and prediction. Quite a bit of work is going on right now in the utilities to add more weather stations, to get better data about the weather conditions, be able to use predictive models, try to assess where the biggest challenges are going to be, but clearly there are areas that we need to continue to work to improve that.

One thing that's well represented by the diagram is the overlap in these. So you can't really, truly bucket these into three different areas. They all overlap, and so you'll see some of that as we go through the conversation.

So, fuel management. A quarter of our (indiscernible) ignitions come from vegetation, and so it's clearly an area that we need to continue to work on. The

biggest challenge here is not so much the obvious, but it is the less obvious, the trees that look healthy but may not be, and may impact the lines, and how do you get a better sense of ways to assess their conditions?

As I mentioned, there are things like using lidar to help get a better sense of what the risks might be remotely, so you can cover more area more rapidly. This is a critical area that we want to continue to look at.

Ignition control, as I said, is one of the larger areas, with a lot of ideas that came out, and it's clearly an issue of making the system -- improving the equipment to make it more resistant, stronger wires or better fire-resistant poles, those kinds of things, as well as better fault detection, and also quicker response when there is a fault detected, so sensors that can detect a fault and actually deenergize a line before that line ever hits the ground.

Those are currently being tested. It's at the IOUs, but is there an opportunity to expand that and look at that more robustly? But ways to address the ignition control is a pretty important area. There are many technology options on the horizon that could be demonstrated, and I think some advanced research that could be applied to make those opportunities better.

Lastly in the three areas is monitoring and

prediction. As I mentioned, there are a number of -- the utilities are adding a number of weather stations, to improve the data collection and be able to use that information in a predictive manner, to look at where they might deenergize lines and they might take action more quickly.

One of the areas of concern always is, as you get more data, how do you analyze that data? How do you use that data in a better way? So data analytics is a pretty critical part of this particular portion of monitoring and prediction, and one of the topics that came out in this particular area that actually relates more broadly is really the challenge around communications.

So, in most cases, the biggest challenges are in remote areas, where maybe communication opportunities are not as great, and so how do you improve the communication pathways to be able to get that information, and be able to utilize that information, either back at headquarters, or can you set up approaches that will have the opportunities to address the issues remotely, so have automated response more locally, rather than having them back at headquarters?

The last issue that came out, which was obvious, but was not a direct line of inquiry going into this discussion, but certainly there's a lot of dialogue about resilience, and the opportunities around resilience

associated with fire in the electric grid.

So the topic areas that primarily came up were things about community solutions. Can you make homes more fire resistant if you can identify certain critical loads that you can focus on? Can you make resilient zones, or larger, broader resiliency in the communities? Those could be helpful in the resilience aspect.

Microgrids, one of the areas we've spent a lot of time talking about, and actually doing a lot of research on, and the value of microgrids to resiliency on the grid, and the last thing was mobile energy. Are there ways that we can utilize mobile batteries or mobile storage in a way that we can have it charged and available to be able to use in emergency situations?

For example, we have a project right now at Port of Long Beach that will be looking at how they can use mobile energy batteries on the back of a truck, where they can charge and have charge ready, and in event of emergency, they can use those for powering pumping stations or powering refrigeration on the port, to be able to keep food and medical supplies safe. So are there more opportunities to take that mobile energy and apply it into grid space?

So, overall, the most prominent recommendation out of the event was that this was a successful first

event, one of what should be many conversations to further delve into the specifics, and be able to look at, for example, a gap analysis of what the IOUs are currently doing and the utilities are currently doing, and what's not being touched, and where are those areas that we can focus our research on.

So our process is to set up this working group, make it a very broad collection of stakeholders, include community representatives so we get that perspective as well as the other perspectives that we've mentioned, and identify those near -- utilize those working groups, that working group, in structured public meetings to prioritize future research in this area, initiate GFOs, and then put it all together for deployment options.

Any questions?

CHAIRMAN WEISENMILLER: Yes. I guess a question I'd like to ask you and Guido both is; do you have a sense of whether we have the right order of magnitude for the research dollars in these areas?

MR. FRANCO: Well, for the science part, obviously, no. We will need more. But, I mean, but we know that, in practice, there are limits. I mean, there's too much, a lot of things that could be done to improve the science. I mean, for example, with respect to tree mortality and the impacts on wildfires, I was talking to

Professor Bellows (phonetic) from UC Berkeley. I was telling him, "Do we need to wait 20 years or 10 years to find out what's going to happen?"

We were discussing, and we came to the realization that we could actually have physical simulations, the same way that you test an airplane and wind fuel. I mean, there are facilities that will allow -- you know, simulate things that would happen with tree mortality, you know, dead tree with a lot of surface fuels, and just, you know, perform physical experiments, and find out how -- and, actually, that's how some of the process-based wildfire models are developed, you know, with this type of controlled experiments, and I think that would be one area that would be very costly, but I think it would be extremely useful.

MR. ERNE: So my response is, I'm not sure of that, and only because we really only started to talk about the breadth of the possibilities, and we didn't get into a conversation which I think we need to get into, which is, what are, specifically, the utilities doing now, and what is not being done? And until we do some more of that gap analysis, we won't really have a sense of what we would need to actually address those additional challenges.

CHIEF OF STAFF PETERSON: I have a related question. So, kind of before the CPUC opened our rule

making on climate change adaptation, we did ask the major IOUs to perform vulnerability assessments, and I know, if Kristin Ralff-Douglas was here, she'd be speaking on that on that next I believe.

So I can tell that probably some of the ideas from the panel came from those assessments, I would believe. I'm curious about the POU side of things. Have publicly owned utilities conducted vulnerability assessments? What's the state of their awareness about their gap analysis?

MR. ERNE: Yes. So the only one that we talked to is Trinity, so I won't speak definitively on their behalf of all that they have done, but I know that he did present quite a bit about the issues that they're currently having, specifically in their rural areas, where they cover a lot of densely forested areas, and their challenge that they primarily are focusing on is the clearance requirements, and, you know, the clearance requirements do not address the fact that they have very tall trees that could easily fall on the lines, and ways to be able to help prioritize how they handle that situation.

So they have started using unmanned aerial vehicles, drones, to help monitor the lines and look at vegetation, look for vegetation issues, but, in terms of their particular area that they brought forward, it was

really about some of those challenges.

CHAIRMAN WEISENMILLER: Actually, since we have Tim here from SMUD, I was going to encourage you to go to the microphone and either fill us in or promise a report later, or a filing later.

MR. TUTT: On (indiscernible)?

CHAIRMAN WEISENMILLER: No. This is on the question of, what research is SMUD doing on fire issues?

CHIEF OF STAFF PETERSON: Or has SMUD conducted a vulnerability assessment of its infrastructure, and not just to wildfire, but perhaps to other climate change forecasts?

MR. TUTT: Good morning. Tim Tutt from SMUD. I do believe SMUD has been doing some research on that area, and has participated in the wildfire proceeding at the CPUC. I don't have that at the top of my head, but I can bring that back to the record later.

CHAIRMAN WEISENMILLER: That's great. That's great. Thanks, Tim.

MR. TUTT: You mentioned earlier getting insurance information into the docket. I'll see what we can do on that. You saw (indiscernible) today.

CHAIRMAN WEISENMILLER: Yes. We seem to be motivated in this area. I guess the other question for both of you is, obviously, one of the things that we've

looked at is for essential facilities that are in high fire risk areas, and there's a large number in the state.

So I assume a subset of those are general services facilities. Do we know if they're really starting to come to grips with resilience issues? I mean, it would be good if there's some experimental technology. We could at least try it in those facilities, or military bases, you know.

MR. ERNE: Yes. I don't think we have an answer for that. We'll bring it up in the working group.

CHAIRMAN WEISENMILLER: That would be great. You're obviously encouraged to have them on the working group, if they're not already. Okay. Thanks.

MS. RAITT: So, sounds like we are ahead of schedule, should we go ahead and break, and we'll plan to get back here at 1:15?

CHAIRMAN WEISENMILLER: Why don't we say 1:00 o'clock.

MS. RAITT: Okay. 1:00 o'clock it is.

CHAIRMAN WEISENMILLER: So back at 1:00. Thanks.

(Off the record at 11:50 a.m.)

(On the record at 1:04 p.m.)

MS. RAITT: So we'll go ahead and get started again. So welcome, everybody, back to the workshop, the IEBR Workshop on Climate Adaptation and Resiliency, and we

are going to start with two speakers from the CPUC to tell us about their climate activities, and the first is Kristin Ralff-Douglas from the CPUC.

MS. RALFF-DOUGLAS: Thank you. So I am Kristin Ralff-Douglass, and I am going to talk a little about the new rulemaking that we have on climate adaptation.

How do I move the slide forward? Okay.

So this rulemaking was opened to consider strategies to integrate climate change adaptation matters into relevant commission proceedings. It was voted out on April 21st, and it was issued on May 7th, and in the first phase, we are just looking at the electric and natural gas utilities. There will be potential subsequent phases that will look at other utilities.

The reason that we were looking at adaptation is that it's obviously a time of worsening in climate impacts, and it is the prudent next step to ensure the safety and reliability of all investor-owned utilities, and one of the things that we highlighted in the OIR was all the work that has been done by all the other agencies in California. There's a lot of thinking that's been done in terms of climate adaptation that we will be relying on in this rulemaking, and so I've put just a few of the things there that we're looking at, including Cal-Adapt.

It's also seen that we started with the electric

and natural gas utilities, because this really is a continuation of the work, in some ways, that they've been doing with the Department of Energy's Partnership on Climate Resilience.

All of our utilities, the investor-owned utilities, are members, as is SMUD, and as part of that memorandum of understanding, they have all agreed to produce vulnerability assessments and resilience plans. They're also working with the DOE consultants on the definition of a "resilient utility" -- I understand this is a document that will be coming out later this month -- and also a cost/benefit analysis of investments in adaptation. So, again, these are great documents and resources for us to be considering.

In the OIR, we asked parties to consider five specific questions, and these are the questions that we asked them. So the first one was "How should the commission define 'climate adaptation' for the IOUs? What climate-related data sources, scenarios, tools, and other resources should be used to inform the commission activities and utility planning? What climate parameters should the commission use to determine climate-driven risks and resilience for electric and natural gas? How should climate scenarios, climate-relevant parameters, and resilience metrics be used, and how can the electric and

natural gas utilities identify climate impacts specifically relevant to disadvantaged communities and address those impacts?"

We got several respondents to these questions, and I thought it would be interesting to just go through some of the highlights of the responses, because I think that they really show that there's a lot of thinking that's been done on this topic, and a variety of really complex and broad issues are brought to bear in this rulemaking.

First, the first set of highlights is "Mitigation prior to events, response during events, and restoration after events." Obviously, it shows that the utilities are thinking about this in a very broad perspective of timing, also a broad variety of things that will be impacted, including the structure -- sorry, the infrastructure -- and the system, as well as their operating practices, and also outreach to communities, so really thinking about how the customers are going to be impacted.

Then, on the vulnerability assessments that several respondents thought that we should be doing or adding to, they're looking at supply chain issues and energy production risks for the supply side and the demand side. So I think that there's a lot of different issues that are going to be raised in this proceeding.

I won't go through all of these, but these again

talk about how the utilities could or should be held accountable, or what they could or should be thinking about when they are planning for the future, so everything from "Do you do a resilience metric, or do you look at a measurable objective?"

I should say that these are not being put up here because the commission is in any way endorsing these issues. These are simply issues that were raised by the parties that responded.

One issue that came up several times were flexible adaptation pathways, classification systems for hazards and risks as extreme, cascading, and compounding or gradual, the climate parameters. They're looking for things that are specifically related to the utilities that are going to be using them, and one of the themes that was fairly consistent was the standardization of both the data that they're using to make these planning documents, but also the standardization of the tools behind which they're basing that information.

Another good question was whether or not we're planning for the averages or the extremes. So you could see from Guido's presentation this morning on fire hazards, you know, there are some very extreme years. Do we plan for those, or do we plan for the averages, and what would be the benefits or the drawbacks from each of those?

Another concept is, obviously, this is going to be an iterating process, after we continue to get more information, more data coming in, and we learn more about how we should be dealing with it.

Just this third highlight is, in terms of the methodology to review and reconcile tradeoffs, I think that's an issue that again was covered in many people's responses, because you're going to have to be looking at mitigating the climate risk versus affordability of those mitigations, and between the different risk factors. So do you focus on one area, like wildfires or sea level rise, or do you try to look at these events in tandem?

Another important aspect brought up was the cross-sectorial coordination, that is, to share responsibility amongst many stakeholders, including state, local, federal governments, private-sector entities, the POUs, the IOUs, as well as community-based organizations, and, finally, that there needs to be a lot of communication and partnership and robust engagement with the communities and the local governments.

I just wanted to point out that we're holding our first workshop and prehearing conference on this rulemaking on Monday, and you can call in or participate in the webcast if you can't be there in person.

Do you want to do questions now or after?

CHAIRMAN WEISENMILLER: Yes. I had just a couple. One is, it was encouraging that you mentioned that SMUD was part of the DOE effort. I think last year, as you recall, I nudged LADWP to also join in, apparently without any success, but one of the questions going forward is indeed how to -- just putting a lot of focus on safety issues with the IOUs, and some degrees of standards. We have 43 POUs, and the question is how to pull them in, either voluntarily or legislation, or what? How do we do that?

MS. RALFF-DOUGLAS: Well, they're not our jurisdiction.

CHAIRMAN WEISENMILLER: Yes.

MS. RALFF-DOUGLAS: So I would imagine that even -- you know, when we have had proceedings in the past where the POUs have been interested in what the topic is, they have certainly participated voluntarily in the meetings and attended the workshops. Some have submitted comments. So there's definitely an opportunity for participation in the process.

CHIEF OF STAFF PETERSON: Yes, Chair. I would ask your expertise, the same question. Kristin, can you remind me, does the partnership offer resources for those who are -- utilities that are just starting off on the path of vulnerability assessment and resilience --

MS. RALFF-DOUGLAS: Yes. They have a really great web site, where they have several documents that give guidance on how to do a vulnerability assessment, how to do a resilience plan. There's a lot of really good examples that they have gathered from as far as England and across the U.S., of plans that have been put together.

I think the resilience -- yes. The definition of a "resilient utility" is going to be a very interesting document, and, again, this is a collaboration between 18 utilities across the country. So it's fairly broad in terms of that perspective.

CHIEF OF STAFF PETERSON: I'm sure that Guido will have that document when it comes out, so sending it out to your network sounds like a good idea.

CHAIRMAN WEISENMILLER: Yes, definitely. We can send it out to the network, and, again, when we get to the local events, we may be able to -- again, obviously, probably have some overlap with the POUs, to encourage their participation, and I think we do have -- one of the next steps is the National Academy of Sciences event, midmonth, on the rollout, and we will have some POU participation there.

MS. RALFF-DOUGLAS: I think the other opportunity is that we're talking a lot -- we're trying to bring in the local communities, and, obviously, those POUs are local

community organizations as well. So I think there's an opportunity to, if not directly engage with them, to engage with the people that they are also engaging with in their community, and through the Arco (phonetic) groups as well, which many of them participate in.

CHAIRMAN WEISENMILLER: Yes. This is probably too tough to get -- obviously, you know, the Dodd bill has, basically, some degree of standards for the utilities, and so the question at some point will be how this intersects with assessments in your proceeding. Obviously, it's not passed at this stage, so it's hard to speculate. Okay. Thanks.

MS. RALFF-DOUGLAS: Thank you

MS. RAITT: Thank you, Kristin.

Next is Elizaveta Malashenko from the CPUC.

MS. MALASHENKO: Hi. Good afternoon. Elizaveta Malashenko. I'm the Director for Safety and Enforcement at the CPUC. I'm happy to be here this afternoon. Thank you very much for having me here.

I'm going to start off by talking about the data of fire ignitions that the utilities have been submitting to the commission since 2015. We have a total of about 2,000 fire ignitions that have been reported to date, so that's for the three IOUs, and they are required to submit all instances of where --

CHAIRMAN WEISENMILLER: That's 3,000 since when?

MS. MALASHENKO: Two thousand, since 2014, yes.

They're required to report on an annual basis all instances where their equipment ignites a fire. So the majority of those are small, less than a quarter of an acre, go out by -- fire can go out by itself, but some (indiscernible) to this data that I can get into later, in Q and A, if you're interested, but it does have some strong trends.

The two main ones that I want to call your attention to is that the primary cause of ignitions is contact with vegetation, and so that's instances where vegetation is coming into contact with the electrical equipment without the underlying failure of an electric asset, and those account for a quarter of all ignitions that have been reported to the PUC.

The second leading cause is wire down, so it's wire failure, either the conductor coming down or failing at the splice. That accounts for another 20 percent of all of the ignitions. So, in combination between wire failure and vegetation contact, that's almost 50 percent of all utility-related ignitions.

There is quite a bit of variation across the territory, and, also, PG&E, you see an even heavier shift to where vegetation is the primary cause. In Edison's

territory, you see a heavier representation of equipment failure as the leading cause of ignitions, but overall the trend is still the same, that the primary cause is vegetation. Secondary is the wire splice failure.

I think that these numbers are very interesting. I try and highlight them on every opportunity I have to speak, because I think we really have to be looking at how these utility fires start and how they spread, which ones turn big, under what circumstances, and what is really causing them, and we do have this data. I don't know of any other state that tracks it, and we wish we had more, but, you know, we do have this data, and I think we need to keep improving on this effort to get even more data-driven in our analysis and our policy development.

So David did a good job introducing the framework this morning, so I'm not going to go through it in great detail here, but the idea here is that you really need three things to create a wildfire. You need fuel to fuel it, you need an ignition source, and weather conditions. So all these three elements need to be present.

As we're thinking of policy and mitigation measures, it helps to think of them in these three buckets, I think. They do all link together, but that is a way to organize our thought around what we can do for utility wildfire prevention or wildfire prevention in general.

Just a quick recap of what the commission has been doing in this area, and it's been quite a lot. We've had a fire prevention rulemaking that went on for more than seven years, and it has more than 25 decisions, I think, over that period, of adopting different regulations to strengthen, you know, fire prevention measures across the state.

The latest decision out of that came out in December of last year, and it adopted a whole range of fire risk-based requirements for safety of overhead electric and telecommunication facilities. So it amended what is the main regulation for electric safety in California, which is commission's General Order 95. They made quite a range of changes to it.

One of those notable changes is requiring even more strict vegetation clearance requirements. California is already leading in the nation in terms of its clearance requirements on the distribution side. This decision made them even more stringent in high fire-threat zones for high-voltage distributions, 10 feet, so that's kind of rule of thumb of how big the clearance is required.

Now, some of the other things around fuel management that the decision did was add a provision for a utility to be able to disconnect service to a customer if they're preventing vegetation management activity in the

area that poses a high fire threat.

It has been historically a challenge for utilities to perform vegetation management activities, especially outside of their immediate right-of-way, which is a bigger problem in distribution, where your right-of-ways can be pretty tight.

I have personally been involved over the years in quite a few instances where local communities in what's now mapped in high fire-threat districts were taking measures to prevent utilities to perform vegetation management, what they deemed to be too aggressive, and they would come to the commission asking us to say that what they're doing is more than what's required per regulations, to basically tell them to stop.

So it has historically been a challenge for utilities when managing outside of just strict clearance requirements, especially in distribution, when maintaining vegetation outside a right-of-way, so just something to flag. So this decision expanded the clearance requirements, and also added this additional provision to give utilities an extra tool in case you have a very high-threat safety condition, to disconnect service if needed for public safety.

The decision also introduced stricter utility maintenance program requirements, and minimum inspection

cycles for overhead communication facilities. Up until this point, the communication companies were not actually required to inspect their facilities at all, so some progress being made here.

Then what else? And then the wildfire maps themselves got adopted earlier this year, so those were two separate actions the commission took, as well as passing the regulations at the end of last year, and then the final staff action was to review the maps and approve them, which was done at the beginning of this year.

Then the commission also recently adopted the de-energization policy, which introduced the expanded requirements for coordination of utilities with communities that may be impacted by de-energization and holding public workshops and things like that.

So, moving forward, priority future actions. What should we all be doing, and what is my group focused on? In the fuel management domain, our biggest issue, in my opinion, is that you max out the benefits of expanding clearances. They are 10 feet. If you have a 30-foot tree, 22 feet away from the powerline, it poses a fire risk. Under wind conditions of, you know, about 50 miles per hour, healthy trees fail, healthy branches fail.

We have wind speeds recorded of 90 miles per hour. In those kinds of conditions, you have vegetation

flying from a quarter of a mile away or more. So having this focus on compliance and clearances, you just reach your limits where nature doesn't cooperate. So we need to be making -- rethinking of how we do vegetation management at a utility site, in my opinion, and those are a few things that I think we can be doing.

You know, the way the utilities have traditionally done vegetation management is that they break the territory into sections, into these "polygons," as they call them, on their maps. They give it to a contractor. The contractor, on a specific schedule, goes out, surveys, usually foresters and arborists. These people walk around. They look and visually see dead trees, things that don't look right, note them down, then, in the back end, you know, contract with tree trimmers, who then go out, do it. It gets recorded, and then you do it again on a cycle, maybe a year later.

It is very labor intensive -- we spend, across all of the utilities in California, easily a half a billion dollars of operational maintenance costs just on this activity that I described. What we can be moving towards is learning from how vegetation management has done the transmission. You can't just sort of apply transmission of operations to distribution and expect it to scale, but they have some really good lessons learned of what works.

Lidar is one example, so using advanced imaging to perform your patrols and your surveying. The cost of lidar has gone down significantly, and the equipment itself is becoming smaller and smaller. We don't have any requirements right now to do lidar sorting and distribution, but it's technologically feasible.

Data analysis is an issue right now. To crunch all the data that comes off from a lidar survey can take a couple of months. I mean, it depends on the vendor and what you're looking for, but, of course, if you're trying to identify immediate safety hazards, it's not fast enough.

Second issue has been that, typically, the way that I know that utilities do lidar contracts with vendors is they really look for right-of-way and for clearance violations of things that can go into clearances, right outside of right-of-way, in this kind of expanded look.

So that's just a shift in approach, and, again, from a utility point of view, I think you get into this question about, what do you do about all this stuff that's in people's back yards that you may pick up in your lidar survey, and now you kind of -- you know about it, so it's a risk that you know about, and you may not be able to do something about. So there's kind of incentive not to look beyond your immediate asset.

So there's opportunities with this lidar

surveying to have a broader risk assessment, because we don't have a method right now, I don't think, as an industry, to kind of figure out what you do with these wider risks. You can't just expect the utility to, you know, address every single tree that can potentially fall into the lines. You can have a 100 foot pine tree, 75 feet away from their line, and, you know, it just never ends.

So I think one of the ways that we can be really looking in this area is, how do you use good data paired with the surveying to be able to crunch a lot of this data a lot faster, and do risk assessments, and then pair the sort of manpower and the people with the technology, so you're doing these more frequent), surveying, and analytics, and then pinpointing the areas where you have a high-risk area, and then sending your foresters and arborists out there to have a look and come up with a mitigation plan, so pairing people and technology.

The kind of technical aspect of this that needs to get developed is that there's still some improvement that can be made on the lidar side, especially with, actually, autonomous vehicles. There's some crossover, because they've been using some of the same things as far as I understand that you can use on the survey side, in terms of sensing, getting them smaller and cheaper, but then the analytics needs to be there as well, and the

computing capacity to actually be able to take all of this data, not just necessarily lidar. You can also introduce some infrared imaging and other things, and cameras as well.

Then the other opportunity, fuel management, I think, lies with really bringing together environmental components of vegetation management with safety, and thus far they exist in these two different worlds that don't ever talk to each other. So an example of this is drought resiliency, and the efforts that have been going on from the water conservation side.

So there's programs out there, usually through water utilities locally, where people can apply, for example, for money to redo their yard so it's more water-efficient and uses need (sic) of plants, and, you know, there's significant amount of resources going towards this area.

Well, that money and those programs don't take safety into consideration at all, wildfire prevention. So, you know, if we actually start thinking in these things together, you can potentially include, I think, requirements for programs that already exist on the water conservation side, to say, "Okay. Well, if you're redoing somebody's yard, also build in defensible space, and make sure that you're planting according to the "right tree,

right place" principles, and are not planting something that might be drought-resilient, but still going to fall into a powerline and cause a fire. Right? There's no technical reason why that's not being done right now, other than the two sides of the house just don't talk to each other. Right?

There's some really exciting things, I think, that have been happening on the transmission side nationally, with bringing the environmental considerations with safety. It's called "IVM," integrated vegetation management practices. One example of that has been seeding transmission right-of-ways with plants that encourage pollinators, so it's using the transmission right-of-ways to help bees, and there have been really successful pilots there.

It doesn't hurt safety, doesn't help safety. You know, you're just planting flowers. But, again, as we're trying to think statewide of how do we manage these major-scale problems, and use our limited funds, you know, if you're already spending, you know, half a billion dollars going out there and inspecting things, if you can also, you know, do other things that are good for the environment, you can potentially increase your benefits and sort of, you know, create cost-effective ways of running these programs. So that's in the fuel kind of management,

vegetation management side of the house, of where I'm hoping that we can sort of move forward to.

There's been a lot of discussions on weather preparedness, so I won't go into that a lot. I think utilities will cover that as well in the afternoon, but it's the real-time situational awareness, deploying weather stations and cameras so that utilities can not only get better prepared and know where the risks are on the circuits, but it really helps in coordination with first responders if you do have a fire, and be able to respond more effectively.

We do need better detailed weather modeling and wind information across the state, and then a fire threat index. We have something along those lines in San Diego area, but, with the conditions that we have right now, I think it makes sense to be learning from how the East Coast, for example, prepares for hurricanes and similar-type weather conditions, so that we can actually have a similar approach in terms of public notification and preparedness and how different entities work together, and, as fire conditions rise, that we have that ability to mobilize.

One of the big issues right now is that the red flag warnings apply way too broadly. It's discussed that last October for PG&E, I think all but like two of their

districts didn't have red flag warnings. So, if your entire service territory is under a red flag warning, I mean, you're not going to turn off, you know, PG&E. So you need more granular information. That's where it really comes in. Yes, we have de-energization policy, but unless you can really get very granular and know at the circuit level of where your problem is, that's not going to help you very much, because of the magnitude of the issue that we face.

Then, in the ignition control, that's really an area where, you know, we need to be driving that number down on the utility side as low as possible in terms of ignitions from failure of their own infrastructure. Yes, this challenges us to more than 200,000 miles of electric lines, 4.5 million poles. Everything is aging, and we have more and more demand on poles. Everybody wants to keep connecting to them, and then we all want the telecommunications technology.

So there's a lot of strain on that system that needs to be recognized and acknowledged, but, again, I think there is absolutely room for improvement in numbers such as wires down that cause ignitions. We need to be looking at reconducting circuits in high fire threat districts, increasing wire to wire spans, doing R and D around wire failure. I don't think that's been a very sort

of hot topic in R and D. I may be wrong, but I haven't, seen there to be a lot of focus on there. How do wires fail? What are some of the materials that, you know, would be better used?

We could consider coating in some areas. I know it's been sort of discussed in different forums. There's issues with that, too, because your coating is going to degrade as well, you know, if you're coating in just some plastic kind of thing. It can also -- if you have a fault, you can set on fire, start dripping. I mean, there have been cases of that sort of happening. So you really want to understand these materials and how they interact with weather.

So I think there's a lot of opportunity for research, but just for utilities, there's a lot to really focus on, and not kind of run these assets to failure, and, of course, making use of the smart grid deployments, and the technologies the utilities are developing in that area with advanced fault detection and analytics, real-time system monitoring, to be able to disconnect really quickly if there are indications of contact with vegetation and things like that.

I know I took up a bunch of time, but, with that, I will see if there's any questions.

CHAIRMAN WEISENMILLER: Thanks. Great

presentation. A couple questions. One is, if I recall correctly, you and Picker were testifying before the legislature when we had the workshop on research, so I'm certainly going to encourage you to give your research needs to the staff in that conversation, so we can really focus the research going forward.

I guess two general questions. One is on the deactivation. I know at times I've talked to utilities who were like, "God. I really would like to cut off a line now, to evacuate in this area so they need traffic signals working," and/or the pumps are electrical. How do we deal with the non-utility infrastructure going forward on the cutoff questions?

MS. RALFF-DOUGLAS: I think the de-energization in general is something that is going to continue to be discussed, and there's a lot more analysis that we need to do. It helps to actually have events, so we can learn from how they work and how they don't work. We've learned a lot from SDGE last year. There's definitely a challenge with the first responder community of performing evacuations of an area.

The conversations that I've had with CAL FIRE and with Cal OES is that they train and they prepare to evacuate in a situation where there's a loss of power, and they generally know kind of how to work around it, but it's

really communicating with the public that becomes more difficult, and then, the longer this goes on, you lose communications, et cetera, et cetera. You also have a lot of critical facilities that should have backup power for at least 74 or 75 hours that don't. It's just a chronic problem in the state, you know, wildfire or not.

There's other concerns as well. One of the things is that, when you deenergize a line, you lose all of the protective equipment, because all of the protective equipment is set up to -- you know, based on how the current and the voltage is behaving in the line. When you deenergize, there's no signal. Everything is just dead. So the wind continues to blow. Right?

So you could have a new safety condition that developed, that would have tripped the line if it was on, but now all your safety equipment is down, and so, when you're starting to bring the line back, you have to be really careful that, you know, you're not going to cause fires doing it, and so the utility has to perform patrols and all of that.

It's easier in service territories where your circuits are shorter, and when you also have networked service, which SDG&E's territory. They have a lot more networked circuits. But, if you're in an area that you have really long radial circuits, and you're deenergizing

really large areas, not only do you have the challenge with the first responders and the comms down, and the critical facilities, you also have an operations and a safety problem with just, how do you bring those lines back up? So I think there's a lot of, generally, questions around, how can this really work, practically?

You know, I think right now it's really supposed to be a measure of absolute last resort. I think we're going to see utilities other than SDG&E using it this year, and learning from how that actually, you know, happens in real life.

The big requirement right now is for them to meet with the first responders and with impacted communities to develop plans around it, but it's really -- I think, for this to work effectively, it's going to need engagement from the community to engage with utilities and talk about where the critical facilities are, develop plans for evacuation, work with first responders so you could think through all of these problems, maybe invest in a backup generator in a critical area, which is, you know, your fire department, and work through that, because it is going to be a challenge.

CHAIRMAN WEISENMILLER: Yes. I have a question. In terms of vegetation management, it would seem -- and I'm sort of curious for my colleagues -- I mean, one is just

trying to differentiate among the types of vegetation, more often, and also, you know, the sort of setting. So the urban/rural interface issues -- you might have a different vegetation policy than along say a transmission right-of-way.

DEPUTY SECRETARY BRIGHT: You know, I would assume you would have different approaches for each type of, you know, regional habitat, and the proximity of those habitats to populations or facilities, but, you know, one thing that was interesting to me was this idea that you have very rigid requirements within this close proximity to the powerlines. Then there are areas outside of those powerlines that pose the same risk to that powerline, that are outside of the right-of-way, in many ways that may pose the same dangers, and how do you address that?

That's one of the main focuses of our forest health drive, is to think a little bit more broadly than just the tight jurisdictions around our interest, to create more landscape level planning for fire resiliency. Treating a hillside so that the fire can't travel up to the powerline would be --

CHAIRMAN WEISENMILLER: My last question is, obviously, the PUC is rolling out resilience adaptation by group, you know, and you're sort of trying to catch up pretty fast, and what is clear from your presentation is,

you know, there is a telecommunications component with the resilience adaptation. I mean, you know, "Press 911" needs to be rethought, and so the question, again, is, how do we start getting our hands around that part?

MS. MALASHENKO: It's not anything that I personally work on. I know that Cal OES in particular works a lot on that issue, in our communications division. So I can make sure we get more information.

CHIEF OF STAFF PETERSON: Yes. I think we also -- our office doesn't necessarily work on that right now, but I would say that the moment is now. As Liza (phonetic) said, we have increased their surveying requirements, so they have to go check facilities, and it really is a very good moment to check on the state of their knowledge of their facilities, as well as their checkups, and then their plans for post-event.

CHAIRMAN WEISENMILLER: Well, it just seems like, with the G5 rollout, you could have a lot more loading on the lines.

MS. MALASHENKO: Yes. So, as far as the safety, sort of the physical infrastructure safety, all that, there was a -- so the communications facilities and electric are all under the same General Order 95. It has some, you know, provisions that apply just to electric or just to telecommunications, but generally it's the same set of

rules, especially when it comes to pole loading. So, when new types of facilities, like for 5G, needed permission to attach, there was a proceeding of the commission that looked at the type of equipment and how we needed to modify General Order 95 to allow for safe attachments. So that has happened.

There's also another proceeding that's going on right now, which is for what's called a "pole management and survey" -- I can't remember the exact name, but the idea now proceeding is, how do we manage all of the pole assets in the state? And it's a combination of safety questions and access. So how do you make a law? Because there's a lot of issues with transparency right now, that you cannot -- nobody really knows what is everything that's attached to a pole. Right?

So the commission is looking at that issue, of how do we increase transparency in that area, and get better data around the poles and the attachments to them? Then there's a separate kind of workstream that looks at 911, and that is something that's led by Cal OES. There is a lot of work, of how do we sort of have a 911 backbone and a system for first responders to communicate? And that's an area that I don't know as much about. I do know it's a very active space as well that Cal OES primarily leads.

CHAIRMAN WEISENMILLER: Thank you. Thanks again.

MS. MALASHENKO: Thank you.

MS. RAITT: Thank you.

So we will move on to the next panel, addressing climate risk for vulnerable populations in critical facilities, and Susan Wilhelm from the Energy Commission is the moderator. And so go ahead and take seats up at the front tables, and we do have one participant via WebEx, Jana Ganion, and we're just trying to get your line, Jana.

MS. WILHELM: I'd like to thank everyone for being here. I'm Susan Wilhelm, and for those of you who are participating remotely, the room is packed. So it really reflects the importance of this workshop.

Our next panel will address actions to address wildfire-related risks, with particular attention to vulnerable populations in California. We'll first hear from Jason Vargo at California Department of Public Health. He'll give us an overview of the types of health impacts that we need to protect folks against.

Then Mike McCormick from the governor's Office of Planning and Research will talk to us about how the state is helping local jurisdictions integrate climate resilience into planning, as well as local hazard mitigation efforts.

Finally, Jana Ganion will join us from Blue Lake Rancheria. She was unable to participate in person because of the fires, but she's going to give us an overview of

Blue Lake's deployment of microgrids and distributed energy resources, which really helps them safeguard their electricity system during wildfires and other extreme events.

With that, I'd like to give it over to Jason.

MR. VARGO: It's difficult to be here today without thinking that many people across the state are suffering. They're nervous. Some people are in the hospital. Some people have died because of the problems that we're here to discuss today. So thank you, Commissioner, for convening this important meeting.

My name is Jason Vargo. I'm the lead scientist for the climate change and health equity program at the California Department of Public Health.

Climate change carries with it a number of direct and indirect health impacts, and effective planning for any of those will require that the vulnerable populations -- and by that, I mean the people who are hurt first and worst by climate hazards -- are identified, understood, and that plan responses be designed to adequately protect them.

Sorry. Thank you.

Within the California Department of Public Health, we have an Office of Health Equity, and within that Office of Health Equity, that's where the Climate Change and Health Equity Program sits. Our charge is to embed

climate change and equity within public health work, as well as to bring health and equity to many of the climate change policies and climate action across the state.

Within that program, we have something called CalBRACE, which stands for California Building Resilience Against Climate Effects. It's a CDC-funded program through which we provide technical assistance for climate adaptation to local health departments to enhance resilience at local levels, and one of the products that I'll be talking more about today, and that the CalBRACE Program has produced, is the Climate Change and Health Vulnerability Indicators. This is a curated list of indicators for the entire state, to help identify vulnerable populations and to assist in local adaptation planning to protect human health.

I'll start by talking briefly about some of the impacts of wildfire. By "direct" in this case, I mean local impacts, obviously burns, injuries related to burns, heavy smoke inhalation, and in the most serious cases, death can occur for residents that live in close proximity to wildfires.

Obviously, loss and displacement are traumatic stresses that residents can suffer and deal with for the rest of their lives, and then there's serious occupational hazards for the people who are trying to protect

communities from fire, in part because of their proximity to the fires, the dangerous jobs that they take on. Obviously, burns, smoke inhalation are part of that as well.

The burden on the healthcare system is another impact that can impact health, so it's a critical infrastructure, the healthcare system, that can be directly impacted by the burden of people reporting to the emergency room to report burns or respiratory problems, for example.

Other indirect impacts related to wildfires relate to smoke, as we heard earlier. Obviously, smoke doesn't stay in one place, so exposures can occur hundreds of miles downwind. We've talked today about particulate matter and carbon, and, obviously, these exacerbate respiratory conditions like asthma, heart conditions like cardiovascular disease, as I mentioned, the burden on the healthcare system.

Other indirect effects relate to the watershed when rains fall on burned areas, as erosion leads to these watersheds. Also, there are toxic exposures that can happen during cleanup of fire-damaged areas.

At the California Department of Public Health, we just published a study of the 2007 firestorm in San Diego. This is a five-day illustration of the pattern of smoke concentrations moving across that county, and you can see

the burn scar in the hatched area there. So, obviously, smoke moves around. It moves from place to place.

In this particular study, we found that 136 percent of emergency -- or we found that emergency room visits, I'm sorry, for children aged zero to four went up 136 percent during the fire period, and this was even higher for children zero to one years old, that is, 243 percent.

Now, when we talk about vulnerability, we usually use a framework that encompasses these three components. The flipside of vulnerability is really talking about resilience, and it's important to consider all of these things together, because they act together, synergistically or antagonistically, to really create greater vulnerability and hazard for certain communities.

Sensitivity relates to -- I'm sorry. Exposure relates to sort of proximity and timing between the climate hazard and population. Sensitivity can relate to factors that make people more sensitive to the hazards that they're experiencing or are exposed to, and then capacity could be the -- relates to the ability for people to cope with those hazards that they face.

This may be access to resources, connectivity to receive protective information, or their ability to retreat or escape climate threats. The combination can really

explain why certain communities face a much greater risk from climate change than others.

We operationalize these components in our Climate Change and Health Vulnerability Indicators with these domains of environmental exposure, population sensitivity, and adaptive capacity. You can see that we provide a web site, and we make these resources available for different geographies across the state.

I'll talk a little bit about some of the data that we have in that indicator set. In terms of exposure, when we look at the population who lives in very high-risk wildfire zones, it's about seven percent of California's population, but, of course, this is not distributed evenly across the state. It's not that every census tract or every county has seven percent of its population.

To sort of describe the concentration of people in high-risk wildfire zones, we looked at the census tracts across the state where a majority of people live in a high-risk wildfire zone. Those census tracts are about seven percent of the more than 8,000 tracts, but they contain about 70 percent of the people who are at risk. I think this is an important point, because it helps to target interventions. It can also be -- it can also suggest that there are probably communities that can come together around collective action to motivate toward ideas

that might help protect them in the face of wildfire.

With regard to sensitivity, we looked at aging populations. Another study that looked at the 2015 wildfire season in California found that those over the age of 65 are particularly vulnerable or susceptible to adverse health outcomes related to wildfire smoke. That study found that a 22-percent increase in coronary heart disease and 42-percent increase for heart attacks occurred one day after exposures to dense smoke related to wildfires.

In these counties -- or, I'm sorry, the census tracts -- that we looked at, where a majority of the people live in a high-risk wildfire zone, those people are 1.5 times as likely to be over the age of 65 than in the rest of the census tracts in the state. So not only is there a concentration of people in certain places that are at high risk for exposure to wildfire, but in those places, we see concentrations of a population that's increasingly sensitive to wildfire smoke.

I don't need to, probably, tell many of you, but California is also aging. Certainly some people in the room probably feel older than when I started this presentation, but this is a population pyramid (indicating) from 1940 all the way to 2060 for the state of California, and, as you can see, the top of the pyramid, which are older ages, from 60 to 100 years old, for both men and

women, is getting wider and wider.

These are growing parts of the California population distribution. So that's not great news, because there's a confluence between increasing wildfire risk, as the climate changes, as well as demographic shifts that may make us more vulnerable.

Finally, with regard to capacity, even though capacity -- factors that define capacity, such as mental or physical disability, the ones I'll talk about right now, may be concentrated in high-risk wildfire places across the state, more than other parts of the state. There are pockets where we see those two things come together.

When we look at every county in the state, and we begin to look at the percent of the people in those counties that have a mental or physical disability, and the percent of those people that live in high-risk wildfire zones, we do see some stand out. The orange counties marked on this plot (indicating) show counties that are in the top third for both of those indicators. Here they're shown on the map in the purple areas. These are largely northern forested Sierra counties.

Again, we have a number of resources that we make available through our web site. I would also promote the Adaptation Clearinghouse. We have suggested a number of resources to that, and included in that are some resources

that I can talk more about, such as CASPERs, which are Community Assessment for Public Health Emergency Response.

Those have been done for drought in the state of California. They've been done for other things, like earthquakes in California, but these are things that can be done relatively quickly with the help of CDPH and our environmental health investigations branch, to help communities understand how people perceive risk, how they plan to deal with risk, what gaps exist within their planning, and I encourage people to look at those if they have a chance or are interested.

Surely planning efforts should be taken to protect human health from wildfire risk in California. More effective measures and plans will consider the specific exposure, sensitivity, and capacity to provide for the most vulnerable people among us, but the most effective measures will work to rethink and change the ways that systems create and foster inequities in society, and that's what our office at CDPH hopes to do. Thank you.

MR. MCCORMICK: Good afternoon. I'm Michael McCormick with the governor's Office of Planning and Research. I want to talk a little bit about the General Plan Guideline, some of the guidance that's in that document, and how the state has been working with some of our local partners to address some of the proactive

planning around climate change, and there's been a lot of work that's been taking place over the past few years, for obvious reasons. There's been a lot of interest in local governments in dealing with fire risk, and the drought has certainly added to that, and the flood risk that also comes from both drought and fire.

The General Plan Guidelines is probably the first thing that comes to mind from local governments when it comes to planning guidance from the state, because it really is the guide for how local governments build their local goals and policies and actions around land use and communities, community growth, community development, where things go and why they go there, and in 2017, we published a comprehensive update to the General Plan Guidelines.

We updated all of the mandatory chapters, and added a number of optional chapters as well on health, equity, climate change, and it's now a light, 470-page document. I think many folks asked us to make it shorter. Many folks asked us to make it longer. But, for the most part, people asked us to add more content, but make it shorter. So we had a nice balance.

I think we do a lot of external references, to make sure that we're connecting to the most current resources, and we're committed as OPR to doing a regular linkup date, and making sure that those offline resources

are continuing to be updated over time. So far, we've been hearing it's a helpful document.

There's a couple of significant changes in this document as it relates to wildfire risk and how communities might be able to respond to respond to that, so I just wanted to make a couple points on that.

First is our general plan data mapping tool. Local governments have often struggled with identifying data layers that are authoritative in nature without their consultants actually building those or finding them for them, so one of the things we wanted to do is provide many of the data sets that local governments already need, through a single portal.

This is a -- the state's geoportal has actually allowed us to build this, because of the architecture built into that for APIs and web services, and anybody can use this data to help support their own local tools as well, and we're hearing good feedback on this, and we'll need to continue to update this over time to add more data and more information as well, but this is one place where we're connecting to Cal-Adapt, My Hazards, and the My Plan tool. My Hazards and My Plan are both Cal OES-managed tools looking at hazards.

The safety element. One of seven mandatory elements is the location where most of the wildfire risk

and climate change adaptation discussions are held. Admittedly, climate change and wildfire are subjects that really connect to every aspect of local government planning, and, I think as we've heard with the other presentations, for energy, for example, there's a cascading effect. If energy fails, you have multiple failures throughout the system at a local level.

I think one of the things that's notable here is, that about 10 percent of the jurisdictions in the state have updated their planning documents since the 2015 fire technical advisory was released. So we have about 90 percent of the jurisdictions in the state that have likely not addressed wildfire in accordance with the most recent guidance.

So this version of the safety element, the 2017 update, included updates on legislation, technical advice, including the fire hazard planning technical advice series from OPR, better coordination with local hazard mitigation plans. This has been a goal of OES and OPR for quite some time. So we were able to build some additional content in there, and there's incentives for local governments to provide those connections.

Consistency across LHMPs and general plans is really important, because, when you're responding, and you're doing both proactive planning and responding to

incidents, it's important to have your documents be consistent.

There's a new section on climate adaptation and resilience. SB 379, which was passed in 2015, requires adaptation and resilience in general plans. I'll get to a little bit more on that in a second. There's a number of internal and external linkages and resources that we connect to.

We coordinated quite a bit with internal efforts that were aligned and concurrently being updated, including Cal-Adapt, the Adaptation Planning Guide, the development of the Integrated Climate Adaptation Resiliency Program, the Technical Advisory Council, and the Adaptation Clearinghouse that goes along with that, and then, also, the Safeguarding California Plan, which is a really critical component on how the state sees our work on adaptation statewide.

So a few things on fire safety specifically in the safety element. We added additional narrative on drought and climate change, land use, and other general plan elements that are affected by fire, which is pretty much all of them, one way or another.

Wild land and urban interface. The WUIs, I think, have come up quite a few times today, and our objectives around in-field development, density, compact

growth, all of the state planning priorities, when they come down to these issues, also greatly benefit wildfire risk reduction, at least in new development.

Regional water planning, and making sure we're looking at precipitation and how we're implementing our water planning initiatives, the drought toolkit and other state resources on drought, because those are directly connected to wildfire risk, and the Fire Hazard Planning General Plan Technical Advice Series, which is kind of a mouthful, but the final version of this was adopted in 2015, or moved forward in 2015.

We talk about land-use management and siting in there. We include external references, data, guidance on how to look at wildfire risk, programs in support. We have goal and policy examples from communities across the state, and local governments, counties, and cities that are dealing with fire risk.

One key point on this technical advisory is a response to state responsibility areas and high-risk fire hazard areas, and I think that what we're seeing in the wildfire discussion today is that wildfire is affecting jurisdictions far beyond those two subcategories of local governments, and so, when we think about how local governments should be planning for fire, this guidance should also be used by those local governments that are not

just affected by those two areas.

On the adaptation side of things, climate change adaptation is now required. The safety element is the statutory home for it, but we've included adaptation throughout the entire general plan, to take a look at how adaptation and resiliency efforts affect the various other elements, and we support incorporation across other plans and programs within local governments.

If it's just in your general plan, it's probably not going to happen. It has to be promulgated in zoning codes, in facilities planning, in management programs, et cetera, so really looking at some of the co-benefits and cross-linkages. We tried to make the connection for local governments, to help support some of that work.

Some distinct actions that are required as a part of this is reviewing, doing a gap assessment of what's been done, what's still needed. There's quite a few specific requirements in this legislation on how you plan for the future, assessing community vulnerability, creating and setting goals, policies, and actions, and then developing feasible implementation measures.

So, every five years, five to eight years, depending on the update cycle, the housing element is updated. Your safety element also needs to be updated to address fire and flood every five years as well, and every

time your local hazard mitigation plan is updated, your adaptation discussion also needs to be updated. So we're hoping to see regular updates to this chapter every five to eight years, based on some of these statutory requirements here.

Cal-Adapt and the Adaptation Planning Guide are specifically called out in the statute. So we talk about them, and we've worked with CEC staff and university contractors, as well as OES, on the Adaptation Planning Guide, which is continuing to be updated, with a hopeful draft next year, as we update that to respond to the new mandates. When this was first released in 2012, it was optional, and now, instead of it being something that is good to do, now it's something that local governments have to do.

On the data requirement side, very significant, specific data requirements within the legislation and in the statute lines up very nicely with the same language in local hazard mitigation plans, on purpose, and on the goals, measures, and implementation side, looking at how risks, particularly long-term risks from climate change, affect various aspects of communities.

Just one perspective on local hazard mitigation plans as well. We've worked with OES to help align a number of our initiatives. They also see direct

connections to legislation that applies to general plans, including the SB 379 adaptation requirements, through consistency with the state hazard mitigation plan, and those adaptation narratives in there. They also are requiring local hazard mitigation plans to be consistent with that state plan. LHMPs don't specifically require adaptation and resilience be addressed, but certainly fire is something where you have to have a longer-term perspective on how changes are taking place.

AB 2140, which is the alignment between local plans and local hazard mitigation plans and general plans, provides incentives for communities that are going through that process, and then SB 1241 again revises the safety element requirements of general plans to address fire risk, but also affects local hazard mitigation plans, and LHMPs can both use that information and can support that information in the general plan. So there's a lot of connections there.

The Adaptation Clearinghouse that I think has been mentioned a couple of times, it's a really critical resource moving forward to help align all of these resources and put them in one place. We hear this a number of time from our local governments over the years, that, from the adaptation standpoint, resources were spread across multiple agencies, and there was no single point to

access those, and so this is a fantastic resource emerging from that, in addition to the Technical Advisory Council, which is providing guidance on next steps on adaptation in California.

The Adaptation Forum is providing a venue for adaptation practitioners in California to talk about what comes next and how they can work together on things. It's coming up in a few weeks, here in Sacramento. And then partnerships have been really critical for our success as well. As you may know, our capacity is limited at OPR. We have a limited number of staff. We have a wonderful interagency team working with us at the state to help work with our local partners, but our external partners, through the CivicSpark AmeriCorps program, through the Alliance of Regional Collaboratives for Climate Adaptation, you know, these types of partnerships are really important, so that we are working with locals to understand what they need, and then they're helping us to provide information to their communities.

So some of the ongoing efforts -- longer-term case studies have been really critical. We continue to hear folks want to hear more examples of where things have been done. Many of our communities don't want to be the first one to put their foot forward, so it's really important that we're showing examples of where programs and

policies are effective and actually working.

We need to continue to improve our data guidance and alignment, but I think one of the key things that -- local governments are burdened by a number of update cycles and new requirements that come out of Sacramento. We understand that, but having, you know, 10 percent of local governments only having the newest requirements in place, and guidance in place on fire, is problematic, because that means that 90 percent of the communities in the state probably do not have the proactive planning in place to address many of the risks that they're facing from wildfire, so trying to identify opportunities to support local government plans and programs being updated to reflect the most current guidance is certainly a priority.

So I'll leave it there, and happy to answer any questions.

CHAIRMAN WEISENMILLER: Yes. I did want to just make sure we're giving people a road map of where things are going from here, and you mentioned the Adaptation Forum, and just to draw the connection back to the Fourth Climate Assessment, in that context.

MR. MCCORMICK: Yes. So the California Adaptation Forum is serving as a venue for the release of the Fourth Climate Assessment. There's a half-day workshop on the first day of the Adaptation Forum to release the

findings, the regional reports, the statewide report. It's a really exciting opportunity to have all the climate change adaptation and resilience practitioners in the state, in one place, to participate in this type of really significant workshop. There's a number of other workshops as well, topically focused. Probably about half the session have a significant state component. So there is a significant voice local governments and practitioners have in the discussions that are taking place at the forum, to both inform state policy, but also for us, as the state, to be able to inform and support our local partners.

CHAIRMAN WEISENMILLER: Yes. And, Susan, if you or Pam -- probably this is a good spot to spell out the National Academy event, and also the event we're going to do as part of the Fourth Assessment, looking at the impacts of climate change on the energy system.

MS. WILHELM: I'll let Pam say more.

CHAIRMAN WEISENMILLER: Just, again, more of a road map for people, so they know what's coming next.

MS. WILHELM: It's coming up on August 14th and 15th. It will be webcast, and I'll let Pam speak.

MS. DOUGHMAN: Hi. Yes. On August 14th and 15th in Washington, D.C. My name is Pamela Doughman. I'm an advisor to Chair Weisenmiller here at the Energy Commission. August 14th and 15th, the National Academies

will be holding an event looking at climate change assessments in California, as well as some other national assessments, and there will be some discussion of national assessments as well, and that will be webcast.

Also, on August 30th, we're having a workshop here at the Energy Commission, and we'll be talking about the energy-related impacts of climate change and the findings from the Fourth Assessment, and we'll be talking about the findings, as well as key stakeholder groups and how they might be affected.

CHAIRMAN WEISENMILLER: Okay. Great. Thanks. And one other question for you in terms of PR. Obviously, we've had some communities that have been hard-hit, and they're in the rebuilding process. What sort of activities does the state have, or, you know, OPR have, to help people in that rebuilding mode? Obviously, there's a tension between just doing it fast and trying to build a more resilient community.

EXECUTIVE DIRECTOR ALEX: Yes. This is a huge challenge, and so I mentioned earlier the effort around the Rim Fire, rebuilding the community. We're hoping to use that as a pretty significant example for our forest communities.

We are working -- we've done quite a lot of work with Sonoma, and last year's fire, on a more urban setting,

and working with them on the potential for changing their housing mix and their densities, and some of the CEQA sets of issues that have come up, and I also mentioned the issue around financing, which I think comes into play here in a very big way for communities that need to rebuild. And so all of that is available, documentation related to everything that I mentioned, and quite a lot more, on what Michael just mentioned, at "ResilientCalifornia.org."

MR. MCCORMICK: "ResilientCA.org"?

EXECUTIVE DIRECTOR ALEX: "ResilientCA.org," which is the Clearinghouse for local government, and that's a lot of the focus.

MR. MCORMICK: And just a quick addition to that. I think we're recognizing that if local governments don't have plans and programs in place before a fire happens, typically, the recovery effort that takes place -- you know, there's significant concerns about getting people back in their homes, getting businesses back up and running, and we can see, if folks aren't proactively planning for these disasters, that the recovery efforts -- they slow down, first of all, and, secondly, there's no way to avoid maladaptation. So you're putting the buildings and facilities back in the same places.

There's concerns about displacement and environmental justice. Vulnerable communities is something

that we've been working on quite a bit, and I didn't mention this during the presentation, but Senate Bill 1000, which passed a couple years ago, the guidance on that is coming out this year. We've also recently released a guidance document on vulnerable communities as it applies to climate change, through the Technical Advisory Council.

So these documents -- in connection with the General Plan Guidelines, we are trying to build a better narrative for how local governments should be considering environmental justice and equity in their proactive planning. However, if these communities aren't updating their general plans, and aren't updating their local hazard mitigation plans, they don't have the capacity or the knowledge to be able to move forward effectively after a disaster without really significant help.

I think one example from Sonoma that we found is they've developed a number of emergency ordinances and processes that they have done an amazing job of doing really quickly, but we're looking at using some of those examples and templates, referencing those in the General Plan Guidelines, because they learned the hard way on how to do something really quickly, and we want to make sure we're applying those lessons learned to the guidance that we're providing other local governments.

COMMISSIONER HOCHSCHILD: So I have a question.

I'm not quite sure who it's for -- it may be for you, Ken, or others -- which has to do just with potential changes in firefighting techniques. I was a firefighter for four years when I went to college, at the volunteer fire department in Pennsylvania, and one of the things you see -- residential structure fire is a big reduction over time, because of changes in building design and materials, as well as reduction in smoking, actually, which has quite a big effect on ignition.

For forest fires, I'm just curious, in talking to the firefighting community, are there any changes in approaches and strategies that we can expect? I mean, obviously, they're doing a lot more aerial techniques and so on, but are there any innovations coming that might help us, you know, kind of raise our game? I have not heard anything about this. I'm just really exploring if you're aware of anything that's being discussed.

EXECUTIVE DIRECTOR ALEX: I happened to go into the Inyo National Forest last week, to visit the California Conservation Corps, and, not surprisingly, this was a topic of conversation. There's a training facility in Camarillo that the Conservation Corps uses, and the Forest Service. I guess our Forest Service guy isn't here anymore, but, you know, they're finding with these massive fires that they're creating new weather patterns within the fire system, and

we heard a little bit about that this morning, and there are techniques that are being developed to try to deal with this, and, you know, each fire season now seems to be unprecedented, and my understanding is that they're starting to incorporate new techniques. I am clearly not an expert on this, but I'm just passing along what I heard last week.

MR. MCCORMICK: Well, from the built-in environment standpoint, many new developments and major remodels are required to provide sprinklers, even in residential, in many counties, not all, for sure, and provide excess water storage beyond what they would need for, necessarily, potable or landscaping water that is gravity-fed, and so we're seeing this promulgate through local ordinances, materials that are fire-resistant, and even probably one of the biggest ones, which is making sure there are screens in vents for attics. You know, that's one of the biggest ways that ash and embers get into buildings and create new fires. So something as simple as making sure your screens are repaired properly and quickly in your attic vents is a really important, seemingly, you know, minor issue, but it can significantly affect the risk to those developments.

CHAIRMAN WEISENMILLER: In terms of your guidance, does it differentiate between high fire risk

areas and the rest of the state?

MR. MCCORMICK: It does. So the legislation that required us to do the technical advisory is specific to SRAs in high fire hazard areas. I think, from my point a little bit earlier, the fires we're seeing now are far exceeding those two areas, and we should really think about making sure that we're providing guidance for areas of the state that are outside of those two areas.

In the 2017 General Plan Guidelines Update, we do talk about how you can use that guidance document through other parts of the state as well, to inform decision making, and there are some specific considerations in the fire section, the safety element and the fire discussions and local hazard mitigation plans, that do apply statewide, but some of the stronger guidance is specific to SRAs in high fire risk hazard areas.

CHAIRMAN WEISENMILLER: Great. Thanks.

MS. WILHELM: We do have a third speaker for this panel. Jana Ganion is joining us from Blue Lake Rancheria.

MS. GANION: Hello. This is Jana. Hello, this is Jana.

MS. RAITT: Can you hear us? Go ahead, Jana.

MS. GANION: Hi. Can you hear me okay?

MS. RAITT: Yes.

MS. GANION: Okay. Great. So, first, thank you

all for supporting my remote participation. It saves me 13 hours of driving through wildfire country (indiscernible) south of us. I echo Jason's --

MS. WILHELM: Jana, you dropped off for just a minute after "driving through wildfire country." So, if you could rewind just a moment. Thank you.

MS. GANION: Sure. Is this a better connection?

MS. WILHELM: Much.

MS. GANION: Great. So I do echo Jason's comments that these are tragedies that are unfolding all around us. We thank the emergency responders. We are doing everything we can regionally here to support people who are impacted by these fires.

I am Jana Ganion. I'm the sustainability director for the Blue Lake Rancheria tribe. We work closely with the state of California on a number of climate issues, and we also sit on the National Tribal Energy Working Group with the Department of Energy, and so we are pleased to be a part of this discussion.

Today we're addressing actions to address wildfire risks for vulnerable populations in critical facilities, and I'm going to focus on electricity, but, also, we were asked to provide some recommendations, so we'll get into a couple of those as well.

Could I have you go to slide two, please, "Key

Points."

So I will, during my comments today, highlight how microgrids and distributed energy resources, or DERs, in our experience, have successfully provided electricity during disasters. I will talk a little bit about the two scales of low-carbon microgrids we have at the Blue Lake Rancheria.

We were also asked for recommendations on high-priority actions to combat wildfire and improve our energy resilience, so we put some thought into that as well. So, obviously, at the core, we need to continue to fight the underlying problem of climate change. To do that, we would support rapid deployment of zero-carbon distributed energy resources and microgrids for their proven effectiveness, at least in our community, and increased support for truly zero-net-carbon sources of energy.

For example, even with the most conservative estimates, solar has paid off its entire carbon debt industry-wide as of 2018. So every panel we add from now on is actually reversing climate change, and we are adding 172 panels at the Blue Lake Rancheria this month.

We also need to analyze and perhaps delist sources of power from the RPS to ensure our GHG reduction numbers are accurate, and we can incentivize energy that is

truly the lowest cost, highest benefit. I bring up biomass as something that should be examined, and also addressed with a carbon-intensity life cycle analysis, like we already do in California with the low-carbon fuel standards.

Finally, we'll briefly present one idea for a landscape-level approach to wildfire pre-suppression that could make use of high-hazard fuels and vegetation, and it focuses on biochar.

Next slide, please.

So in front of you should be a map of where we're located. Our location is a big driver in our resilience strategy and planning. We are rural, geographically isolated, in a heavily forested area, and obviously prone to wildfire. We're also five miles inland from the Pacific Coast tsunami zone, in one of the most hazardous seismic areas in the world, and there are multiple and varied vulnerable populations here, including over 10 tribal nations in Humboldt County alone. People are in remote and often impoverished areas, without access to services, and, also, they are in wildfire country.

Next slide, please.

So our localized impacts, amplified by climate change, also drive our resilience strategy. We are experiencing all of the items on this list, and the photo

here is of a very close call for us. This was about a 25-acre wildfire that blew up last October, directly across from the Blue Lake Rancheria and the City of Blue Lake.

Thankfully, due to quick action by the responders, no one was hurt, but it is another data point that the wildfire threat is year-round, costly, and really everywhere in California, and the new normal for us, and I can still see the charred trees from this wildfire from my desk.

We did have an electricity outage during this wildfire event, and our community-scale microgrid performed successfully, so much so that we didn't even know we had islanded until California Energy Commission Chairman Robert Weisenmiller mentioned it in a meeting, and we found out about that, and then double-checked, and, sure enough, we had sailed through this event due to our microgrid and the electricity that it provided to our critical infrastructure.

Next slide, please.

So, moving on to what we have done at Blue Lake Rancheria to, hopefully, inform some things we can do across the state, a couple of weeks ago, I was speaking to a group of utility commissioners nationwide, and I described our microgrids at our fuel station convenience store and our casino and events center, which doubles as an

American Red Cross shelter, and one of the comments from one of the commissioners back East was "You know, I've never thought of gas stations and casinos as providing critical infrastructure before."

Well, we can confirm that they do, and it's important to keep in mind, within a wildfire prevention regime, and for rural and vulnerable population resilience in general, here at the Blue Lake Rancheria, we take a lifeline sector approach. Some of you have heard me talk about this before, but we make our energy, our water, our food, our communications and IT and transportation systems as robust as possible, as a defined and planned strategy.

We always start with energy, because that lifeline sector supports all the others, and we achieve electricity for our critical infrastructure with solar and battery-storage microgrids that can operate in both grid-connected and islanded modes.

Our first microgrid is now complete and operating successfully, and it powers a six-building campus of our critical facilities, our government office, our hotel, our casino, restaurants, event center, which, again, as I said, has a dual purpose as an American Red Cross shelter, and the supporting infrastructure for all those facilities. The main distributed-energy resources for this microgrid are a half-a-megawatt solar array and one-megawatt hour of

battery storage, which we are doubling this year thanks to S-Chip (phonetic).

Our second microgrid, in construction, literally, as we speak, is our fuel station convenience store complex. We also are using solar plus battery storage here, with advance building controls for energy efficiency. This will also operate in grid-connected and islanded modes, and will become a resilience package that's replicable across the 12,000 similar facilities in California. Fuel stations are certainly critical infrastructure, especially in rural areas, where they may be the only infrastructure capable of supporting the other lifeline sectors.

These microgrids, in turn, support the other lifeline sectors in our community. We have a smart water grid. We have onsite food production. We have transportation, and the microgrid powers four of our electric vehicle charging stations. We have robust communications and IT services and infrastructure, including the ability to interact with other emergency responders during wildfires and, you know, the details, like charging those most important emergency radios.

These microgrids are partially funded by the EPIC program, and would not have been possible without our partners, including the CEC, the Schatz Energy Research Center, PG&E, Siemens, Tesla, and local contractors like

Colburn Electric.

Next slide, please.

So I'll just kind of breeze through this fast, so that we can get to questions, but actions and recommendations, I have two slides on this. As we discussed, one foundational piece of wildfire suppression is to reverse climate change, bring down temperatures, decrease drought. These are among the conditions that have led to these massive wildfires burning right now, and, in the meantime, we need to pair zero-carbon wildfire mitigations and adaptations that do not make the core climate change problem worse.

We recommend continued development of zero-carbon distributed-energy resources with microgrids, as feasible, and we have to look carefully at the economics of those. Sometimes you can just put, you know, solar and battery storage in, without a microgrid control system. And we need to support new technology, such as offshore floating wind, that particular technology for its superior capacity factor.

This DER development supports statewide wildfire initiatives under consideration, like periodic deenergizing parts of the grid. When you have these microgrids, and you have communities or specific facilities, or even homes that are able to, obviously, withstand periodic de-energization

of the lines, that's going to be a robust way to get through some of these wildfire events, and we are going to be able to prevent them as well.

DER deployment also creates jobs, and we're recommending supporting that, especially in rural and vulnerable population areas, where we need to build more capacity so local people can solve local problems, including wildfire. We need accessible training programs. I'll give you an example. The nearest electrician training course is a 6.5-hour drive from us, one way. So the tribe is focused on bringing targeted workforce development resources to our region, specifically to support the energy sector.

We recommend using the RPS more aggressively to drive the energy sector to further GHG reductions, using proven zero-carbon sources. I use biomass as an example of an energy source in need of critical review for its RPS eligibility, and just let me take a couple minutes, and beg your patience, to let you know why.

We have a lot of experience with biomass power, and we've researched it carefully, and, based on the findings that we have found, we would recommend removing it, due to lack of carbon life cycle analysis, significant risk that biomass is perhaps muddying California's actual progress on GHG emissions. It may be that these reductions

assigned to biomass energy are partially or even totally inaccurate.

Carbon life cycle analysis requires plant-by-plant calculations that address the extreme differences in types of fuel, trucking distances, emissions, noncompliance emissions, short-lived climate pollutants, and a range of other factors that are not currently being considered. The assumption that biomass energy is carbon-neutral simply cannot be made.

You know, further, many plants are aged. The entire energy sector has difficulty staying in compliance with environmental laws, and biomass plants create air pollution. Their toxic hazards really equate to coal plants and wildfire smoke. So, when we look at these sources of energy, we need to really carefully look at them in the way that we do, typically, in California. We usually bring, or have brought, a carbon-intensity framework to the fuel standard. We need to bring that framework to biomass power, at a minimum.

California and CARB have done this already. There is a lot of expertise in California that can do life cycle accounting for biomass liquids, so we just need to bring it to biomass solids, and because biomass represents only about six percent of the renewable energy mix in California, with about 105 biomass plants in total, we can

get our arms around this, and this analysis can be done.

There are a couple of other points there, that biomass itself is a fire -- you know, these plants themselves have fire risks, including dust explosion risk, but we want to bring attention to this one part of the energy sector as a way we can drive down the causes of climate change even further, potentially.

Next slide, please.

So, turning from a zero-carbon RPS, we have one idea that I think has been -- you know, we have a lot of expertise in this area, too, in California, but maybe it hasn't risen above the fold in terms of, maybe, a landscape-level concept to combat wildfire, and that is this idea of biochar.

So biochar is an ancient technique that has been improved with modern machinery and thinking. Taking biomass, heating it to drive off the volatiles and moisture, grinding the residual material into coffee-ground-sized particles, for example, and spreading and tilling that material into the soil is worth examining for a wide range of co-benefits that will help also address wildfire risk. By adding biochar to soils, the soils hold more water, retain more nutrients. Working biochar into the soil is also a carbon sequestration strategy.

So the U.S. Forest Service, USDA, Humboldt State

University, among many other agencies and entities in California and Oregon, have researched the efficacy of biochar to remediate soils, say, after clear-cutting, and as an economic use for hazardous understory forest fuels. The results of the research is highly promising, in our review of it, and I've listed a couple resources on the slide here, and I highly recommend reaching out to the researchers involved for more information.

Wildfire is clearly for us now a landscape-wide, landscape-level threat, and it requires bold, creative solutions. We envision a public/private partnership akin to the public/private partnership that finally brought the dust bowl under control in the plains, to convert forest fuel to biochar, create buffer zones, sequester carbon, and make us more wildfire-resilient in the process.

Excess biochar could be sold into the ag sector as a soil amendment. Biochar initiatives could be included in the carbon forestry offset protocols. California and Oregon, as I said, are leaders in this industry. We should take advantage of the expertise, like the carbon-intensity life cycle or accounting expertise we have here, and see if we can craft a landscape solution with it.

So, in conclusion, climate change is creating chaos across the state, and California is fighting hard against it, and setting the example for the globe. We

encourage more zero-carbon distributed-energy resources, especially solar plus storage-based critical infrastructure resilience packages.

We encourage a results-based analysis of our RPS portfolio to ensure we are indeed making the progress we claim, and that we're incentivizing the lowest-cost, highest-benefit sources of energy, and we should look to more landscape-level initiatives, and get out in front of the wildfire risk, if we can. We have the expertise we have the will, and we have the public/private partnerships and intellectual know-how to solve these problems.

The tribe looks forward to continuing working with the state and all of you in this room on these issues. Thank you very much, and if there's questions, I'm happy to answer them.

CHAIRMAN WEISENMILLER: Thank you. Let's move on to the next and last panel.

MS. RAITT: Okay. So our next panel --

CHAIRMAN WEISENMILLER: We can check and see if the court reporter needs a break.

MS. RAITT: Okay. So, if I can ask our next panelists to come up to the front tables, and we'll have places for you. Okay. So thank you. So this panel is on risk management for energy infrastructure and operation, and Pam Doughman from the Energy Commission is our

moderator.

MS. DOUGHMAN: Okay. So we have a number of utilities, and we have a local government, and we have a private company here on this panel today. This is our last panel, and it's a fairly large panel as well. So why don't you go ahead. Introduce yourself, please.

MR. D'AGOSTINO: Well, absolutely. Good afternoon, everybody. My name is Brian D'Agostino. I'm now the Director of Fire Science and Climate Adaptation for San Diego Gas and Electric, and what I was going to talk to you a bit about today is, I wanted to get into, you know, some of what has changed at SDG&E, and what we've learned last year.

You know, we've been working almost a decade now on implementing a shutoff program and some of these other procedures to minimize the risk of wildfire, and that went into effect in December of last year, where almost 20,000 of our customers were impacted by de-energizations. One of the things that we are -- one of the things we've done is, we've developed a new group.

We found it necessary to have a department that focuses solely on fire science and climate adaptation. Some of the focuses -- we're going to be looking very closely at the fire science and fire analytics. Another big piece of this group is looking at the community

resilience.

When we just heard about some of what the tribal communities were doing, it was very impressive, and something we're really driving to build, and a lot of what I'm going to talk about here today.

Also, how do we continue to expand the wildfire culture within the organization, and spread it out into the community, as this now is no longer our new normal? This is now the normal that we are operating to, and then continuous enhancements of the community fire safety program. I mean, this year alone, after the wildfire season that we experienced last year that never really stopped into this year, we have dozens of enhancements now that we're making, through lessons learned.

Part of what I wanted to talk about and address the large panel in just a few minutes today is really the community resilience piece. One, our ability to communicate. We found that was extremely important last December. So we're making a lot of enhancements, and what it is, is targeted messaging, being able to really hone in on different areas, and communicate different things to different people as it's needed. So that's something that we're looking at quite a bit.

Another thing is really developing campaigns to get a lot of our customers to update a lot of their

information, make sure that all of our databases and other things are as current as possible, so that we're able to get the right information to the right people. We think that's a critical piece of our de-energization moving forward.

Another thing that I wanted to mention was community resource centers, and, again, this is still striving towards that ability to be as resilient as possible, and what this is, is if we end up deenergizing the back-country community, we're going to be working on bringing a portable generator to an area that we've worked on with the community to establish.

So we've gone out, had those community meetings, and said, "What is the location?" And then we agree, "Okay. We're going to set it up to make sure that, if we deenergize, we're going to try to bring power to this particular location," and then, through partnering with community partners like the Red Cross and community emergency response teams, provide resources, and agreeing with, again, the last presentation, in some cases, this includes gas stations, and other areas of the communities that would be very critical for them, so certainly I think an important piece of this, as we move into the overall resiliency of the communities.

I wanted to talk about the longer-term climate

adaptation piece of this, and some of what we're working on, and I think this ties into last week's talk as well with the RD and D, and looking at kind of where are we going, and what is the vision with some of this, integrating UAVs more and more, partly for lidar inspection and data processing, as we heard earlier in some of the presentation. The mobile battery systems are something that we're looking at in terms of increasing resilience.

Fire-resilient homes are not only in defensible space, but, as we heard, I think, in our mind, a fire-resilient home also includes, in some cases, that ability to withstand a prolonged outage, especially if these homes are in, you know, far reaches of the back country that are extremely prone to wildfire and prone to extreme winds. That's really what constitutes a resilient home, is that ability to withstand a de-energization or a safety power shutoff. And then there's also engineering technology that we're looking at as well, in terms of falling conductor assessments and other things like that.

I'll keep the comments brief, because it is a very big panel, look forward to answering any questions you have, but I'll leave it there.

CHAIRMAN WEISENMILLER: You know, I was going to congratulate SDG&E for its activity. As I recall, you were one of the first ones to have drones to use in fire areas,

and certainly what you've done on the wind measurement area is another one where you've really been a leader for the other utilities in the state, and certainly encourage you to continue to be innovative, particularly in trying to figure out how to help the central facilities near you when you have to shut them off.

MR. D'AGOSTINO: Thank you, Mr. Chairman.

MR. DASSO: Good afternoon, everybody. My name is Kevin Dasso, with PG&E. I'm responsible for the electric asset management part of our transmission and distribution business, and before I get started, I also want to echo Jason and Jana's comments from the last panel about just recognizing and acknowledging and sending our thoughts and prayers to those people that are being impacted by the wildfires today.

These are our communities. They're our customers, and they're our friends, and in PG&E's case, we have a number of employees that are being impacted by that, and we also have several hundred people there in those areas helping with the response, with responders. So it's very real for all of us, and you can't forget about why it is that we're here.

The other thing I wanted to mention is, Brian talked a little bit about what San Diego is doing. I want to emphasize the fact that the three investor-owned

utilities have been working very closely together for some time, and particularly real emphasis since last fall and winters with the fires that happened.

It is our objective and our goal that all three companies are moving together and implementing the same kinds of programs, learning from each other, and sharing those ideas. One of the beauties of the utility industry that is that we don't compete with each other, and so there's a very strong reason for us to work together, and so we've committed to continue to do that.

So let me say a little about -- I'm sure, over the course of the workshop, you've heard a lot about the changes here in the state relative to weather and the conditions that we're dealing with. I'm just going to focus a little bit on the fact that there's many things that we've been doing already, and what we're describing here as our community wildfire safety program is building on that, and looking to do more, working with our communities.

We've been out already meeting with communities. In fact, we've done almost 300 of those meetings, in some cases now doing our second round with those folks, as we get closer to some of the details of the plan, seeking and incorporating their engagement in those conversations.

The next slide is what we're calling our "pillar"

slide, the really three pillars of our community wildfire safety program, and, again, I think you will see the same kinds of elements, as each of the three utilities, the investor-owned utilities, shares our plans here.

I do want to highlight a couple of things that we think are particularly helpful for us, and are already playing out for us in this wildfire season. We've implemented a seven-by-24 -- what we're calling a "wildfire safety operations center."

This is a group of people whose sole purpose is to focus on situational awareness across our service territory relative to fire activity, leveraging satellite imagery, the kinds of weather sensors and information Brian alluded to, fire detection systems, as well as we have seven aircraft, spotters that are flying every day, looking for conditions that are changing on the ground.

This organization, since late June, has been monitoring, on the average, about 35 to 50 fires that are happening every day in our service territory, so we're finding it to be a critical resource for us in managing our response.

The other thing is, I want to mention that we've implemented a weather station, similar to what Brian touched on. We have 65 in place now. They're streaming data to the public, so it's available for anyone who wants

to see it, and enhancing and increasing our weather modeling.

The next pillar is a focus on new and enhanced safety practices. Liza, in her presentation earlier, talked about a need to shift and focus vegetation management away from sort of meeting simply compliance obligations and moving more to fire risk mitigation. We're working with our communities to use our powerlines as fire defense zones, removing fuel under the powerlines, working with them to remove trees farther away from the powerlines to reduce those impacts.

We've implemented this year already a practice of disabling reclosing devices, and we are preparing for public safety shutoff events in the event that that happens, and, you know, I want to emphasize that this is really as a last resort. We appreciate in many ways the importance of having energy and power to our customers, and this is not something we take lightly, but we believe has to be in our toolkit in the event that the conditions warrant it.

Then the last provision is really in the -- last pillar is really the long-term focus, in terms of how we're thinking about our infrastructure. It is adding to the work that we've already been doing to strengthen our conductors, but actually adding coated conductors that are

much more resilient to material falling into or blowing into those lines, then, with the goal of preventing any kind of a spark or an arc moving to non-wood poles as part of that program.

Then the other is -- Brian touched on it, as did Jana -- a real focus on community resilience zones. These are really helping support communities when they're faced with an event. They can go to a place that has power, is able to provide those critical services, and designing that into our infrastructure.

With that, I had a couple of other slides and materials, but I'm going to -- just in the interests of time, they're there available for reading, and we can cover them if we need to. Thank you very much, and I'll turn it over to Bill.

CHAIRMAN WEISENMILLER: Okay. Kevin, so one question. So, again, having talked to Melissa Lavinson about PG&E's efforts, your ex-VP, to --

MR. DASSO: I don't know Melissa very well.

CHAIRMAN WEISENMILLER: -- yes -- to basically deal with some of the permitting or access issues on forest lands, how is that going now, in general? Can you get in to deal with these issues on a timely basis, either federal or state lands, I should say?

MR. DASSO: Let me say -- I'll focus on federal

first, since that was the first part of your question. I'm cautiously optimistic about that. The omnibus bill had some provisions in it that encouraged federal land managers to accept plans by utilities for vegetation management in particular, and to act on those plans quickly, with a focus on giving us access to do the type of work I'm talking about as it relates to vegetation management. So I'm optimistic there.

We are also engaged in a broader conversation with the Department of Interior on all the agencies that they are responsible for, and again speeding up the access to particularly deal with the vegetation management issues on federal lands.

The last thing I'll say is, as it relates to state lands and private property owners, this is one of the biggest challenges that we face, in terms of implementing the kinds of programs that we believe will have a very big impact on wildfire risk reduction. We need to obtain their permission, do the types of work kind of above and beyond the minimal compliance requirements, and it's an area, I believe, that we need to deal with, as a state, more holistically.

CHAIRMAN WEISENMILLER: Yes. I would suggest talking to Terry O'Brien, who is now in the governor's office, on these issues, and certainly has very deep skills

and experience on federal and state permitting.

MR. DASSO: We're leveraging that already as well. Thank you very much.

CHAIRMAN WEISENMILLER: That's good.

MR. CHIU: Okay. Good afternoon. My name is Bill Chiu, from Southern California Edison. I head up our resiliency and public safety program management office, and I wanted to echo what Kevin said about sort of the heart-wrenching impact this wildfire has around all of our community, and this is something that Edison takes very seriously in addressing the public safety issues.

I think you will find that our three utilities have very common, very similar approach, so I won't belabor a lot of these details. Essentially, it's the same concept, and we're working very closely to move forward in addressing these risks.

One thing I do want to mention is sort of this state of the new normal and the mind set change. This slide has a lot of stats, and I think everybody is familiar with that, but I think understanding that this new normal requires a new mind set shift. What has worked for us in the past is not sufficient for us going into the future.

So, you know, it would behoove us to think very critically about, how does a wildfire actually start? How does it actually propagate from the initial ignition source

to having an abundance of dry vegetation and dead, dying diseased trees nearby, to having wind gusts at the wrong place at the wrong time that help to develop these wildfires, and you should realize that we need to think about these very differently.

One of the things that I know Brian and Kevin's company will do the same thing as well is to really think about, what can we do to harden our systems? So maybe I'll just touch on that a bit. I think, for the longest time, the industry has been served very well. Our existing construction practice and design practice has been there for decades.

We have bare conductors out on our distribution lines. We accept the fact that occasionally we're going to have tree branches and metallic balloons and stuff that come into contact with our lines, and we have high-speed relays that will detect these and isolate these quickly, but, in the process, it generates some potential arcs and sparks.

So one of the things we're doing is to really think about, what can we do to eliminate that potential for having these arcs and sparks? And one of the things that Southern California Edison is aggressively looking forward to is to deploying a new covered conductor technology. This is really a change in the mind set. It requires some

investment to harden our grid, but I think it will help to significantly reduce, if not eliminate, the source of arcs and sparks that we have on our distribution lines.

Edison actually has been actively looking at these areas and addressing the risk. We haven't talked about blocking of the reclosers. We have that program in place. In fact, going forward, we're implementing newer technology to allow a relay to be able to be much more sensitive and speed up the detection of these faults to isolate these conditions. The whole idea here is trying to reduce the energy that is being injected into these fault locations, and by further reducing the type of potential arcs and sparks that we have.

Vegetation management, we talked a lot about that. Situational awareness is also one of the areas that we're very actively working towards. In a short amount of time, we have really bolstered these capabilities, very much like San Diego, SDG&E, and what PG&E is doing as well.

So I know we're short on time, so I just want to maybe quickly go through some of the key points around public safety power shutoff, because I think we were asked to talk about that a bit.

I think there may be some sort of a confusion around, you know, how does a utility decide when to shut off the power? The reality is, there's not one single sort

of reference point, a particular wind speed, for example, that sets the criteria for us to be able to deenergize the circuit. There's lots of very detailed and robust consideration that goes in behind the scene. So maybe I'll just talk through a little bit about that.

You know, we want to understand the weather conditions. Are there red flag warnings or fire weather zones within the impacted circuits that we have? We want to have an assessment for our internal meteorologist on the conditions, including wind speed, having troops on the ground to actually see what's going on, having real-time situational awareness, reporting back from the field, input from our own fire management folks, and specific concern from the local and state fire authorities regarding the potential consequences of wildfire in selected locations.

Are there alternate ways to route power to the affected areas? Having awareness about, are there any sort of ongoing mandatory evacuation that's going on that could be potentially be impacted if we deenergize portions of the circuits, and then what are the other operational considerations to minimize potential wildfire ignitions, including blocking a recloser and in identified circuits?

Ongoing activity throughout the areas, progress of customer notification. We do definitely want to give customer advance notification, to the extent that we can,

so they can be better prepared to deal with the impact, and ongoing notification and coordination with local jurisdictions and local governments, so there is a very good understanding of the potential impacts for the community.

So the slide here has a lot of information about how we're planning to -- sort of leading up to the decision to exercise PSPS. In the interests of time, I'll leave that, maybe, for further discussion.

CHAIRMAN WEISENMILLER: So one question, which I think the answer might be that you'll file something later, but, you know, last fall, Pedro (phonetic) was really focused on the insurance issues, you know, basically, how to get reasonably cost insurance for the utilities, and, obviously, (indiscernible) following that, whatever, 200, 250,000,000 to get 350 of insurance. So what is -- you know, again, it may be just a subsequent filing, but what is the insurance situation now, progress or not, for the utilities?

MR. CHIU: Yes. So this is definitely an area of concern for us. There is some progress in this space, but I think it's beyond just utility insurance. You know, we talked a lot about vegetation management. The indemnification or insurance of the contractor that does the tree trimming is also a significant concern for us as

well, because then they recognize the risk that they're being exposed to, to doing work in this high-fire area. So I don't have the specific details, but I'm sure we could provide those information for the commission as well.

CHAIRMAN WEISENMILLER: Yes. No, that would be fine, and certainly, also, the sort of vegetation management part is interesting. You know, we had a study done on homeowners, but, obviously, that's only a small piece of the puzzle, and, you know, I've had talks before with folks on the utility part, not the vegetation management part. So more information from the three of you would help. Thanks.

COMMISSIONER MCALLISTER: So I want to ask about the customer outreach, you know, giving them the heads up, and I know that's an exact science (sic), but how special do you treat -- how specially, I guess, do you treat customers with special needs, like, you know, on oxygen, medical devices, things like that? And, you know, obviously, a shutoff can be critical for them, so I guess I'm wondering how you handle those issues, and how much information you actually have about those customers.

MR. DASSO: So I'll start. Brian alluded to it a little bit in his conversation, and this is an area, again, we've all been working together closely on, to really figure out what are those best practices, but first things

start with a real strong outreach to customers in every way that we can, to make sure that we have accurate information about their status and how to contact them, and in a world with, you know, people not having landlines, it's critical that we have a way of connecting with this, and we know this is not unique to the utilities. First responders have the same challenges in terms of reaching out.

So, generally, the first part of the campaign is reaching out to customers to say, "You may be in this area that could be affected. Please help us contact you. What is a way that we can contact you? What's the way that you prefer to be contacted?" and so on. That's kind of the general population.

With respect to medical baseline customers in particular, again, we're reaching out to the customers who are already registered that way, as well as affinity groups and other community groups that may have access to those customers that perhaps haven't registered in that capacity, again to try to make that awareness, really try to make them aware of the options available to them.

In terms of communication, medical baseline customers get special treatment. So it is our expectation that we will make positive contact with every one of those customers, again, unless there's just no possible way to do that, but we're starting in advance to make positive

contact somehow with medical baseline customers, to let them know that this could happen, and to begin to make those preparations for that type of event, so whether it's a phone call, some other kind of contact, and potentially, you know, sending people out to knock on the door is part of our (indiscernible).

CHAIRMAN WEISENMILLER: Are you coordinating with the locals, in case you have a combination of either a power shutoff or evacuation of those special needs?

MR. DASSO: I would say those conversations are starting and evolving, is probably the best way to describe it, at least certainly in our service territory, and, again, until it becomes a reality, it's very abstract, and so we're really trying to help work on that, and taking evac and incorporating it.

MR. D'AGOSTINO: And I think the only additional thought is, I think of a lot of the relationships with the fire agencies and the Red Cross that gets developed, because, when you get to the evacuation standpoint, really, it transitions to their operation, in a sense. So we become now, "How can we support them executing their mission?" as opposed to before the evacuation, where, with the power safety shutoff, it becomes more what we are trying to mitigate the risk. But they really take over at that point.

MR. CHIU: I would just add to what Kevin and Brian mentioned, that, in our world, we call those the "critical care customers," that have special medical needs, and we take extra precautions to notify those customers. We do everything we can to make sure that they get the notification, and I think one of the things that we are actively working on is to make sure that we have the most current contact information from those customers, and that's a critical piece of the overall link.

MR. HERRIOTT: Okay. Good afternoon, everyone. My name is Bill Herriott. I am the Assistant Director of the Power Transmission Distribution for Los Angeles Department of Water and Power. We're a small municipality in Southern California. It's a joke. We're actually the largest municipality in the United States, and probably one of the largest in the world, and, you know, we've been in existence since, you know, 1893. So we've been around a while.

This first slide here, unfortunately, this slide is only about a year old, so it doesn't really reveal our true skyline, which has grown quite a bit in the past 12 months, but, to start off, I just want to state that, in November 2007, our Board of Water and Power Commissioners petitioned Los Angeles Department of Water and Power to look into increasing our construction standards in fire

hazard areas. So this was quite a while ago.

In February of 2008, LADWP implemented a wildfire prevention plan that, to this date, meets or exceeds regulatory requirements. LADWP's wildfire prevention plan effectively, we believe, reduced our risk to causing fires within our metropolitan area.

We continue to review this prevention, all of our prevention measures, to ensure that we're in line with our reliability standards and any regulatory requirements, and as new technologies become available, Water and Power purchases those advance materials, and we place them into the field and do a test trial to see how they work with our system, and how we can implement them, you know, globally throughout our system.

Okay. This next slide here, okay, this is an illustration of Los Angeles Department of Water and Power's high wind and fire area zones. There's two maps that you'll see up here on the slide. The map to the left is the metropolitan area of Los Angeles.

As you can see, we don't have a great amount of fire risk around us, because we are, you know, a densely populated community of just 4,000,000 people, but one of the things that we do have is, if you look at this map, it also incorporates the L.A. city fire brush clearance zone, which is right in the center of that map.

That orange area right in the center is through the Santa Monica Mountain Range, along Mulholland Highway, divides the San Fernando Valley from metropolitan Los Angeles. So it's not part of the CAL FIRE map, but it is part of the L.A. city mapping for a high-brush area.

So, in this area that's up here, you know, we keep in mind that we have over -- we have 22 receiving stations within that small blueprint, and those receiving stations are taking 138,000-volt, 230,000-volt, 500,000-volt high-voltage transmission voltages into the city, and transforming them into 34,500-volt subtransmission voltages, which radially spreads out throughout the city to over 130 distribution stations, and those distribution stations then take that 34,500-volt subtransmission voltage, and it drops it down to our 4,800-volt distribution voltage that pretty much serves the majority of our citizens.

So, I mean, as you can see, this area is quite densely populated, and the majority of our service territory is metropolitan. The map to the right illustrates Water and Power's facilities and service territory that runs up through the high desert area, the Owens Valley, and that extends all the way up to Long Valley, right at the base of the Sierras.

You know, one of the things that we benefit from

at Water and Power, being a municipality and being within the metropolitan area, our Los Angeles Fire Department is a class one fire agency, and the response time they have to any of our facilities or any of the communities is within five to seven minutes, to respond to any type of fires in the area.

In fact, just recently, LAFD had to respond to two brush fires in our city. One was the La Tuna Canyon fire last year, and the second was the Skirball fire, that subsequently started during the middle of the Craigg fire that was going on. Because they were in the city, and they stayed within the city, L.A. City Fire Department kept instant command of those fires, and did an exceptional job suppressing the fires, and preventing heavy structure loss.

Now, back in 2008, when we came up with our new construction standards, one of the things we looked at is our overhead conductor sizing. So we increased our overhead conductor sizes in not just high-wind areas, but near any tier two or tier three fire zones, and in heavy brush zones, to one/ought copper, minimum, in the coastal areas, and then a three/ought aluminum-constructed steel-reinforced wire in the outer areas that are away from the beach and aren't susceptible to the degradation of the salt water.

Now, along those, with minimum standards, we

increased our conductor spacing. A GO 95 minimum spacing is 11.5 inches. Our minimum spacing in these zones is 39 inches, as you can see from the slide. That 39-inch spacing helps us prevent wires from getting together in severe high-wind storms, which could create an arc flash.

We have replaced service voltage conductors, so that is the secondary volt conductors that serve, you know, homes, commercial businesses, so on. We replaced those conductors that were normally bare, or old triple-break wire that they called (sic) back in the '40s and '50s, with a suitably protected multiplex wire.

One of the other things that we've done is -- the wind-loading requirement for the state is 56.6 miles per hour in the wind zones. We've put a minimum load calculation, on load calculations for all of our distribution power poles, to 80 miles per hour in all wind, brush, and high-fire tier areas, and that is our standard since 2008.

Vegetation management. We maintain a database, a tree database, of over 400,000 trees, from the Owens Valley all the way down to the Wilmington District at L.A. Harbor. It's over 350 miles of a tree database that we maintain. It is a 12-month pruning cycle, and we employ contract workers as well as Water and Power workers to provide tree or vegetation clearance. We also assist other city

agencies and departments. We respond to external agencies, at customer request, on our vegetation management.

One of the things that has been critical for us in vegetation management recently, even though we always exceed the minimum requirements -- we trim to the maximum homeowners will allow us to -- one of the things that we've been a victim of quite recently is of the fact that was brought up earlier, I think, by the CPUC enforcement, agency, is that, you know, we have trees that look perfectly healthy, and they're 80 feet away from our pole lines. It's a 100-foot pine tree, and it topples over and destroys our conductors, brings everything down.

It's quite a serious thing. It's a phenomenon that's really been taking effect, I believe, talking to our arborist, basically due to the fact that we've gone so many years with droughts, and then, in 2016, we had quite an abundant rain and snow year. We had one of the largest snow packs in the Sierra Nevada in many years.

That rush of moisture that came into Southern California, into a lot of counties and communities there, created a lot of quick crown growth in the trees, yet the root systems were so impacted by many years of droughts that the root system could not sustain the weight of those crowns. So we still are suffering for those today, and something that was brought up earlier is the ability to

work with customers and agencies to either trim or remove those trees for protection of, you know, public safety.

Okay. Future resilience planning. I've been recently -- one of my tasks I've been given is the Chief Resilient Officer for the power systems for Water and Power. I just returned from Washington, D.C., last week, from my first meeting back there on this, but, you know, we're quite a bit behind the IOUs, you know, unfortunately. You know, sometimes that's good, sometimes that's bad. It's good in the fact that a lot of them are probably going into their second or third generation of meters, AMI meters, and we haven't even installed them yet. So we said, "Well, we have the money right there," but we are working towards a smart grid technology, distribution automation, advanced metering infrastructure, distributive energy resources, and, you know, continuing in advanced materials and products as they become available.

I think, basically, what California is facing right now is really going to, you know, steer manufacturers into creating the types of materials that are going to be required for us to build in future energy-resilient systems, and that's really the invention of technology, is the necessity. So we have worked closely with different manufacturers of overhead and underground types of materials and specification standards, and they've worked

quite well with us. We continue to work with them, and, hopefully, in the future, we can help build a more resilient power system with climate change.

I just want to mention, it's my first time meeting Kevin, Bill, and Brian, so I look forward to working with them in the future, but, you know, the power companies, whether they're publicly owned utilities or if they're investor-owned utilities, we do get together frequently throughout the year, and we share lessons learned.

We share our successes and failures, and we communicate what we see in the future for best practices, and we do help each other quite a bit, and I'm not sure if you guys are all aware of that, here in the commission, but it's something that we do and we're quite proud of, because we are not in competition with each other when it comes to public safety, when it comes to power reliability. We're all in this together, and I look forward to working with these gentlemen right here in the future.

CHAIRMAN WEISENMILLER: No, that's good. I think certainly all of us are getting questions from legislators just on, you know, "Are the POUs" -- or from the PUC -- "Are the POUs learning lessons learned that the IOUs are now struggling in?" Certainly they all pretty clearly had communicated, and had a, you know, common approach on

stuff, a lot of it driven, I have to say, by the PUC's questions, but, you know, certainly trying to make sure that indeed you and the other POUs connected into that.

You know, I helped Harry Call (phonetic) at one-point back in the '80s on a strategic planning exercise for your company, and at least at that point, it was explained to me the theory was to see what Edison did, and what worked and what didn't work, and then take the pieces that worked and, you know, then implement. So, certainly, at this point, with the fire stuff, we have to move pretty quickly. So that's important.

I think the other PUC question was trying to get a sense of -- you know, we do research. I mean, this is actually bringing in the science to try to connect them to the PUC's activities, but, you know, how much research are the POUs doing on these issues? You've got a list of the right topics here, but we're trying to see, you know, again, how to enhance the communication back and forth on these topics, but to try to make sure that everyone is picking up their fair share of the load.

MR. HERRIOTT: Well, I don't work in the group that is involved with any research on that. We have a very robust engineering department that's always looking at new products and developments, and we do have a group that is over environmental concerns, climate change, and that type

of stuff, that they're working into and looking through, you know, what we're going to do in the future, and communicating with both power and water. Because we're a municipality, we're water and power. So, you know, water reduction, you know, water conservation, power resilience is something that we work with our groups on.

CHAIRMAN WEISENMILLER: Well, certainly we've talked a lot about fires today, but the other issue of -- you know, there's a bunch of things that are changing with climate, you know. One of those is heat storms, and you've certainly had issues on that. How are you doing on trying to address that part of resilience, or what happened, and, you know, what are you doing going forward, so they can maybe learn some lessons?

MR. HERRIOTT: Well, honestly, we really haven't changed much going forward, because we are in the process of a power system reliability program at LADWP, where we are upgrading our facilities for resilience. Right? You know, one of the things, because of the fast rapid growth in Los Angeles, you know, there's quite a bit of load that's being added to our circuits.

So we're working with our engineering group on methods to help develop a more robust power system that can withstand more of these heat events going forward, but one of the basic things is, Water and Power, we do an

exceptional job of keeping the lights on while we're replacing our infrastructure. We have quite a bit of redundancies built into our electrical grid that allow us to switch around certain circuits to deenergize them, portions of those circuits, while never losing power to our customers, and giving us the ability to replace those overhead and underground infrastructures without customers ever knowing about it.

There's quite a bit of difficulties we face. One is, you know, we do have street restrictions, being in a metropolitan area, because of traffic. We can't be on the street before 9:00, and we have to be off by 3:30. So between, you know, a lunch break and setup of delineation cones and traffic, it really has a huge impact on our ability to upgrade our infrastructure quickly.

You know, quite honestly, one of the things that occurred during the most recent heat storm is due to the fact that we had a reduction in some of our redundancies out there, specifically to the south of Mulholland Drive, on the coastal side of Los Angeles, you know, when we had to switch around some of those circuits to replace underground cables and infrastructure. When the heat came on us, we had no ability to switch circuits back to normal configuration, because the cables just weren't there, right, because they were in the process of being replaced.

So that had a bit of an impact on Los Angeles a few weeks back, and then the other thing that, you know, is becoming the new norm, again, is the climate is really unpredictable. You know, we are accustomed to triple-digit temperatures in the summer in our San Fernando Valley region, north of Mulholland Drive -- you know, it's kind of a low desert region, when you consider it -- but not so much along the coast, and in this last heat storm event, there was triple-digit temperatures for a couple days on the south side of Mulholland, going all the way down to the ocean, where they had 110-, 112-degree temperature reads, which is really unheard of.

So a lot of those communities, years ago, never had air conditioning. Homes south of Mulholland, for many years, had no air conditioning. Now most of those homes do have air conditioning, but they still don't use it that often. They don't need to. But that's something that we're seeing that's becoming more prevalent, is the high demand of, you know, air conditioning units within the homes during these heat storms, and the ability to provide the necessary power while upgrading our infrastructure.

COMMISSIONER HOCHSCHILD: I've got two quick questions, really for any of you, but, obviously, utility undergrounding is quite expensive, but forest fires are also quite expensive. I'm just curious if this has changed

your thinking about undergrounding as a strategy for the wires, and are you prioritizing areas of your transmission and distribution that it would make sense to underground?

MR. HERRIOTT: Most of our transmission is coming, you know, from out of the county and community. A lot of it comes from, you know, Utah, Nevada, areas like that. It will run through national forest land, Bureau of Land Management areas, but it's basically desert areas. We don't suffer the same critical needs that, you know, some of the northern utilities have to go through, you know, heavy, dense pine forests and things of that nature.

So we're fortunate there that we don't have that risk, but, as far as within the city boundaries, you know, on the outskirts, you know, again on that map, going back, if you look, the areas on the outskirts, it's not very densely populated. It's basically where the forest comes down to the city, and we really don't have that much infrastructure there, and it's serving, you know, just small areas there.

The only area on that map that would be an area that would have quite a bit of overhead infrastructure in a brush area would be the center of the map, through the Mulholland Highway there, along the Santa Monica mountain range, but it's fairly densely populated with homes, and it's very tight, windy, steep, narrow roads that, during

the red flag days, when we had red flag days, homeowners in the area are not allowed to park on the street at all. There's a city ordinance that, when there's red flag warnings that go out, they just are not allowed to park in front of their homes. All vehicles have to be in driveways, garages, or somewhere else.

COMMISSIONER HOCHSCHILD: Okay.

MR. HERRIOTT: So to build infrastructure in there would be quite daunting.

COMMISSIONER HOCHSCHILD: Okay. Then I was also just curious, just for all of you, just in terms of fuel load reduction, how much of your concern is just the treetops, versus the understory. I live in the East Bay, and, you know, one tactic that they're employing a lot now in the East Bay is actually goats. They have these herds of goats that they fence off, and they will eat everything, and, you know, they're more effective than anything else. I'm just curious if that's something that's useful or is a main concern, the treetops hitting the wires.

MR. HERRIOTT: For us, it's mostly trees, you know. I used to raise goats when I was a child, so you don't want goats around anything. They will eat trees.

COMMISSIONER HOCHSCHILD: They will eat powerlines. Yes.

MR. HERRIOTT: They actually prefer the bark on

the tree before they eat the grass and the brush below. So, if you have any trees you want to save in your property, you'd better fence them off, because they're going to kill it. Once they chew around the cambium layer of that bark, that tree is dead.

COMMISSIONER HOCHSCHILD: Is that a solution to the eucalyptus trees in the East Bay?

MR. DASSO: Let me just add, though, in terms of trees falling into powerlines, that's a challenging issue, but we do believe, and part of the basis behind the program that we're working with our customers to implement, is that powerlines can be a good place for fire defense types of practices, and we have found this to be an effective practice in transmission rights-of-way, and we believe it's a good way of implementing fuel reduction, as well as reducing some of the impacts of --

COMMISSIONER HOCHSCHILD: So just make the transmission corridor the firebreak, basically.

MR. DASSO: That's right. And we've done that for many years, but now expanding that into distribution lines, where appropriate. I think it aligns very much with what the governor has talked about with respect to his executive order on fuel reduction, and doing this in a collaborative way, we believe, fits together well, and we're looking forward to seeing how successfully we can do that, but it

all requires property owner's permission. We can't do it without that.

MR. CHIU: If I can add to this a bit, in terms of sort of the vegetation risk, we sort of bucket these in three categories. We call these the "grow-ins," the "fly-ins," and the "drop-ins." And so bottom line is, how can we look to prevent these type of -- sort of the consequences of having grow-ins and fly-ins and fall-ins? One of those will touch a bit on the underground discussion that you had earlier, is that we're not opposed to the idea of undergrounding, but the reality is that the cost benefit, or the benefit of the cost, is such a drastic sort of disparity.

If you look at can you effectively mitigate the risk that we talked about, we believe covered conductor is a very effective means, essentially reaches the same level as undergrounding, and if you look at the cost ratio, you know, depending on the type of circuits, it could be five times, seven times, or 10 times cost, in relative comparison to the next most effective mitigation, and that really becomes a pretty daunting math in terms of the rate impact to our customers, and that's something we need to be very thoughtful of.

MR. HERRIOTT: Yes. I'm going to put the cheap plug in here on mylar balloons. We took a two-week period

in the month of July and looked at our outages, and 45 percent of all customer outages that our customers in Los Angeles have reflected -- and I don't have the exact number of how many customers were affected, whether it was 30, 40, 50, or 100,000, but, in that two-week period, 45 percent of them were caused by mylar balloons, and mylar balloons are really something that everyone should be concerned about, because that is something that the utilities have zero control over.

We can do all the vegetation management, we can do all the clearance, we can do as much as we want to our infrastructure. We can put covered wire conductor up there, but -- I don't know if anybody watches baseball in this room, but I do. I'm a Dodger fan, and I was watching the Dodger game, and in horror when the lights went out, when they were playing the Milwaukee Brewers a few nights ago, because I'm responsible for that.

COMMISSIONER HOCHSCHILD: You might want to turn your TV off. I don't know.

MR. HERRIOTT: Yes. I wish I could have turned my phone off. The lights went out for about a second and a half. Basically, they lost power for a second and a half, because they had an automated transfer switch in another circuit. They have a preferred 35,000-volt circuit that feeds and an emergency circuit.

So the switch, you know, it acted properly. It switched to the second feed immediately. But it takes about 20, 25 minutes for the stadium lights to come. They have to reset them manually, and they have to come back up to brilliance. So it was around 8:00 p.m. or so that it happened, but, you know, we immediately, you know, sent crews out to determine what the cause was.

Now, even if we had covered wire out there, those mylar balloons came into an overhead switch, and when that occurs, it doesn't matter if you have covered conductor out there, because you don't have covered conductor on your switches. They're open. There's no such animal or beast, and I'm not even sure how they would develop one.

So that's something of great concern to us, and where that switch was, was over two miles from Dodger Stadium, and there's no telling whether somebody from the apartment lofts had let balloons go, or whether they were let go or released in Malibu or Santa Monica or Pacific Palisades, and this just happened to be the location they came down, because it's not just the balloons going up. It's where they come down. So it's something that's -- regardless of what we do and what we plan, if we don't do something more, it's seriously out of our control.

COMMISSIONER MCALLISTER: Can I ask about poles, and pole replacement? At least one of you mentioned that

as a strategy. I'm wondering sort of where that fits in the priority list of hardening your system, and which poles are the priority, and how you enter that -- how you plan for that, you know. Yes. Just, what does your program look like? Is it preventative or is it -- are you replacing the poles when they need replacement anyway, or how are you working that into your system?

MR. D'AGOSTINO: In San Diego, we're well into a very extensive pole replacement project. The one for the distribution system is called "FIRM." It's a fire risk mitigation program, and it's right now lasting through 2030, where, at that point, all 84,000 poles that are in our highest-risk fire areas are set to be transitioned over to steel, and hardened, proned (sic) for stronger winds for things like that. So there is an extensive program in place. There's also similar programs for our transmission system.

MR. DASSO: We're all really in the same boat. I mentioned the non-wood poles. That's part of our resilience strategy, in the event that a fire occurs, as well as strength and other resilience elements. It needs to be part of the fix. Thanks.

MR. CHIU: Yes, very similarly for us. We look at this from the resiliency angle, that if we have the ability to deploy these fire-resistant poles, then the

system will be much more resilient in case of a fire does happen.

I do want to comment on the covered conductor piece, because I think you do have a really good point, but it's really important that you study how the covered conductor technology has developed and evolved over time. The newer technology that we're looking at is not sort of your grandfather's tree-wire covered conductor. This is a very robust, three-layer design with a conductor shield, insulation, and a very toughened outer jacket.

If you study some of the history of this, then you realize that when you deploy this in the application of the covered conductor, you also need to cover these areas that was mentioned earlier, basically the pole heads, the jumper leads, the splices. That will be part of the program that we have. So we could essentially eliminate these sources of potential metallic balloon flying into the poles, what I call the "grow-in," "fly-ins," and "drop-ins."

COMMISSIONER MCALLISTER: Yes. I'm going to ask a related question to the sort of pole question. When you go through that replacement -- and it would apply to conductors, too, I guess -- are there any co-benefits? I'm not sure, you know, you are the right group for this, but are there co-benefits that you're able to realize when you

go through and, you know, anticipating all the distributed energy technologies and kind of, you know, your loads coming up for EVs, and all these other kinds of grid reliability topics that we're talking about, not today, but often, is, how integrated is the planning around that distribution investment?

MR. CHIU: So maybe I'll just touch on that a bit. Yes. We are actively looking at technologies where we could deploy into the poles. They're looking at embedding sensor into smart pole, if you will, that could help us detect what's actually going on, on the circuits, but that is a technology that's in development. We're making good progress, and, hopefully, at some point in the future, we could work with vendors to commercialize this technology, and could deploy these at mass scale. So that's something we definitely are looking at.

MR. DASSO: I would just say the types of things that you're talking about are the types of things that, to the extent that we have access to that or visibility into that, we want to incorporate it. As we proposed -- and, again, I think we're all similarly situated here -- it really is a rebuild of the system in these areas, and so you don't have to build it back the same way you built it the first time.

So, if there's a better route, take a better

route. If you can dip a piece of it underground, you dip a piece of it underground. If you can put a microgrid or distributed resources up on the top of that mountaintop, just to cover that repeater station, that might be a lot better than building eight miles of overhead conductors. So being smart about it, and integrating these new approaches, is absolutely how we're all (indiscernible).

MR. D'AGOSTINO: I just want to share one example. Part of the weather technology that was developed for the situational awareness on fire identified an area with winds over 100 miles an hour, and regularly over 80. So, during some of the redesign, the transmission is being rerouted around that area completely.

UNIDENTIFIED SPEAKER: Okay. Thanks.

CHAIRMAN WEISENMILLER: Go ahead.

MR. CROWLEY: So good afternoon. I'm Terry Crowley with the City of Healdsburg, and City of Healdsburg is a member of the Northern California Power Agency, and I'm going to echo some of the things that have already been said, but I also wanted to talk about more of a broader perspective from the city's aspect.

I'm a utility director, but I also manage the publicly owned utility's electric system, but also the water and the wastewater systems as well, and so, when you lose power for any type of sustained period of time, the

wastewater guys are scrambling. There's lift stations that need to pump raw sewage out. If they don't have power, that spills into the streets and creates environmental hazards. So our guys, when they lose power, they're running around town with a volt generator. So there's a lot of different spinoff issues with these other related infrastructures that need to be kind of considered and planned for in relationship to wildfires.

Just to give a little bit of background into the Northern California Power Agency, there's 16 members. Most of them are publicly owned utilities in Northern California. All of them, without exception, are affected by wildfire, whether it's an immediate affect to the City of Redding and City of Shasta Lake, or it's an indirect effect to the City of Palo Alto with the loss of their generation of the western area hydro plants that are up in Shasta County. So everybody has a kind of perspective there, and everybody has a clean desire to improve what we've done and look at things in a different way.

As far as Healdsburg, we have 60 miles of line in four square miles, so pretty dense distribution system. It's roughly 50/50 mix of underground and overhead. Overhead lines run through high fire risk areas, and we're surrounded by high fire risk areas. You know, we have areas inside and outside. Our fire department is the

emergency response agency for those areas outside, so we work with them closely in those risk assessments as well.

One of our big mitigation is not only for, you know, wildfire, but for power and reliability, is to annually go through and inspect for tree clearance and maintain at least four feet of clearance. To get that four feet, we require our trimmer to go to seven feet. So, at any time, the minimum clearance that we're asking for our lines is four feet. We've been doing that for several years now, and we also ask for additional clearance underneath the line, for sag, to accommodate for that.

As I mentioned, the city's fire department provides the services inside and outside. We are able to, as a city function and a group, work closely with the fire department, which helps us kind of have those dialogues about discussions of where their concerns are, and where we could potentially mitigate some of those concerns or work closely with them through these events.

Some of the more prevention efforts that we do is, we do visual inspections each year. You could look at the GO 95 standards and follow them to the letter, but we look at those as a minimum standard, and so we look at those as a minimum, and try and improve upon them, and allow additional safety factors in there.

So, as an example, when we design our poles, we

add an additional 10 percent to the safety factors, and maintain that, to provide a little bit more strength. One, that's for reliability, but, two, if there was a wind storm, being limited in resources, we don't have the staff to go out there and replace five or 10 poles that fell down.

Work to complete all maintenance items within 12 months, again, that's a reliability/customer service issue, but, also, we're trying to manage our workload. We can't afford to build up work over time.

Proactively rebuild and harden facilities, again, customer service and reliability. So we look at our weak conductors, small copper conductors, and we're looking at replacing all those, and we're almost done with getting all of the copper conductors out of our system, and again looking at the poles, adding additional strength to the pole, and not looking at the minimum strength requirements for those.

As I mentioned with the fire department, we also work closely with the police department, as the utility director, I work closely with water and waste water. I work with our public works transportation group on streets because, if we lose power, we lose traffic signals, and that's a huge challenge. People are so ingrained to having the traffic signals tell them what to do that, if they're

absent, they just drive straight through those intersections, and it becomes a big hazard.

Things that we're looking at in addition to what we've already done is looking at increased inspections during red flag warnings, being out there ahead of time, just making sure that everything looks good, a best practice that was shared to us from Riverside, looking at, also, increasing the tripping times, or (indiscernible) tripping times on our reclosers, not only just blocking reclosers, but actually doing alternate settings that would trip faster, so that the amount of energy that goes into that fault is lessened for these elevated-risk days.

I also want to discuss the Northern California Power Agency. They have hydro facilities, general facilities, much like everybody, out in these rural areas that are affected by wildfire, and so they also have this need to assess their risks and mitigate those risks, and so the NCPA aggressively manages their vegetation management around their facilities. They work with CAL FIRE's Conservation Camp Program to help do some of the clearing. It's a great asset to NCPA. They also work with local contractors.

NCPA is also working with lidar in ground-based vegetation to identify clearance issues with transportation lines that are leaving the hydro facilities. So they take

that lidar information and put it into a computerized model, and they can also look at the snapshot of the lidar at that point in time, but also look at what that wire has sagged at under heavy loading, so that they maintain that clearance requirement as well.

They also work in coordination with the forest partners, U.S. Forest Service, State Parks, CAL FIRE as well, to make sure that they can get to the trees that they need to clear, even if they're outside the right-of-way, trying to work with those. And that's just keeping it brief.

CHAIRMAN WEISENMILLER: Again, I think the question -- we want to encourage communication on best practices among IOUs and POUs, and the obvious question here is, to the extent that IOUs are thinking of going to steel poles, then, you know, again, that may or may not make sense for you, but you're in such a high fire risk area, you know, you need to at least consider it.

MR. CROWLEY: So we've looked at steel poles. We've looked at fiberglass poles as an option. There was a time a few years ago that, actually, steel pole was just on the basis it was more economical, when wood prices were so high, but those are different things that we're looking at.

We're probably looking at more of the clearance requirements, making sure there's space and keeping things

away from the wood poles, versus going to the steel poles. I think steel poles are good for transmission corridors and lines that are locked into a clear right-of-way. Where we have poles along roadways that potentially could be widened, the steel poles may not be the right choice for us.

But certainly, looking at other utilities, working with other utilities, other public owned utilities, we take their best practices, spacing the wire further apart, looking at red flag warning days differently, looking at protection requirements, improving automation, all those other best practices, we are certainly looking at those and seeing what we can apply, what fits our specific service territory.

CHAIRMAN WEISENMILLER: I think the other thing is, you heard SDG&E, after the 2007 fire, really got very serious. Obviously, after last year's fires, Edison and PG&E got more serious. You know, we have just gone through the Bureau fires, you know, the loss of the generation from that, and some of the transmission, and some of your more remote members seemed to be isolated for a while. I mean, certainly, stuff I've seen generally indicates the wastewater treatment plants really got hit hard.

I guess what I'm saying is I think NCPA is going to have to do a pretty serious effort, anyone who's

thinking of preference power, to try to figure out how to better position things. You know, I was just sort of surprised that the bureau didn't have -- you know, they seemed to be having to do the manual controls to get the floodgates open, at the same time trying to evacuate the op centers, and the communication problems there. It just seems like that has to get better fast.

MR. CROWLEY: Yes. It's pretty impressive what the bureau staff went through, through those several days, with evacuating and trying to manage those damns, just the flows, maintain flows, not necessarily worry about generation. That's impressive. And for Healdsburg being, you know, 14 miles north of Santa Rosa, our community is on alert. Every time the wind blows, people are really, really nervous about it.

CHAIRMAN WEISENMILLER: Right.

MR. CROWLEY: And so we have to do a lot of community outreach, but we need to be, probably, as a small POU, a truly small POU, every proactive, and almost, in my opinion, a leader in demonstrating, "Hey. What can we do as best practices in maintenance? What can we do to demonstrate that we are at the leading edge of those?"

I'm not sure that a small PO such as Healdsburg, or some of the other NCPA members, it's appropriate for us to do research and development. I don't know that we could

really effectively develop those types of tools and study those things to say, "Yes, this is a reasonable technology," but I think certainly we want to look at what's existing in place, and what's been proven to work.

CHAIRMAN WEISENMILLER: Yes, and, hopefully, NCPA could become a channel into LADWP and SMUD, and certainly the IOUs, on what's been the effective research.

MR. CROWLEY: Yes. NCPA and other industrial groups, industry groups that -- you know, Northwest Public Power Association, CMUA -- there's a Western Underground Conference that also shares a lot of good information. SCAPA (phonetic) has an engineering and operations group that shares a lot of really good information. So, echoing the same sentiment, we all work together on safety. We all work together on reliability. We share our successes, as well as our failures.

CHAIRMAN WEISENMILLER: Exactly. But, I mean, certainly (indiscernible) op-ed this morning pointing out that, you know, if there were a fire, and you were liable, I mean, that goes directly to your city, not to your shareholders, in terms of the costs for those damages.

MR. CROWLEY: Would go straight to the city, and that's one of our big concerns, is how do we best serve our customers and our community and mitigate those risks? It's one tree into one line. It's not necessarily size that

matters.

CHAIRMAN WEISENMILLER: Yes. So the bottom line is I think, you know, it's very challenging for everyone, but it's going to be, very challenging, I think, for the smaller utilities in the remote high fire hazard areas. We have to figure out a way to -- maybe we have to figure out a way to -- you know, figure out how to best mitigate it, but it's not going to be easy.

MR. CROWLEY: Yes. It's not, but I'm saying it's not easy, but there's a lot of due diligence in it.

CHAIRMAN WEISENMILLER: Yes.

MR. CROWLEY: You know, are you trimming your trees? Are you proactively doing your inspections? Are you engaged in GO 165, and really believing in those inspection reports, and mitigating and fixing what you find? I think the end result is, do your reliability numbers show something that's better, something that's improved to your customers? Do you have a lot of outages? I think those are the measures that tend to show whether you're effective in the preventative maintenance.

CHAIRMAN WEISENMILLER: Yes. I'd certainly encourage folks to participate in some fashion in the PUC's proceeding, at least monitor it enough to learn what lessons are coming out of it.

MR. CROWLEY: It certainly is being monitored.

CHAIRMAN WEISENMILLER: Good.

MR. CROWLEY: I guarantee that.

CHAIRMAN WEISENMILLER: Good. Thank you.

MR. CHEN: Good afternoon, everyone. My name is Vincent Chen. I'm here with Jupiter Intelligence. I want to start with thank you for the commission to invite us today especially to Pam.

Jupiter Intelligence, we're a climate modeling company that provides data and data analytics for physical climate risks associated with climate change, and we have a specific focus on hazards, and just a quick background on our work and the areas that we operate in.

We currently have products pertaining to flood and extreme heat risks in geographies in the New York/New Jersey area, in South Carolina, and Florida, and we are just about to kick off our development process for a wildfire platform focusing on California for fire risks, and I'm happy to be here today. I'm excited to share the framework that we're following, and certainly highlight the potential role that a private entity could play in addressing this very critical challenge.

Before I jump into further addressing fire risks, there are a couple parallels that we can draw from Jupiter's experience working in other areas and other types of hazards, and, as many of many panelists and other

speakers alluded to today, the real challenge is to build resiliency, and there are lessons that could be learned from other areas.

Taking New York City after Sandy, for example, the significant loss catalyzes a whole host of investment and resolutions after those damages, including a 1,000,000,000 investment by Con Ed and other utilities to harden their substations, for example, and also harden parts of their T and D system, and for critical facilities, such as hospitals, nursing homes, or other data centers, possible options, and others certainly alluded to this today, including, you know, more backup redundancy or more flexible and robust fuel delivery arrangements, certainly more coordinated dispatch and capacity building for generators, and also, in the longer term, certainly, microgrids that could serve as effective backup system.

Obviously, wildfires in California present a very unique set of risks that are different from Florida risks, for example, but I think some of the resiliency lessons could be learned and are applicable across different geographies and hazards.

Today I want to really focus on a key piece of resiliency, which is on data and data analytics. This where Jupiter's work comes in to be relevant. Jupiter's role in this process is to provide scientifically accurate

and also statistically robust modeled forecasts, probabilistic forecasts, that is, of the hazards, to support both short-term decision making and longer-term planning.

This diagram, then, is our way of thinking, where we fit in into a larger ecosystem of really building resiliency in our communities. As a data analytics company, our role is to enable different partners, and these include communities, utilities, public agencies, and a whole host of other stakeholders, to better respond and plan as we see increasing wildfire risks.

I'll walk you through this quickly. As a data provider, we obviously work directly with asset owners and operators, and in the case of wildfire, for example, these would be agency that owns and manages public lands, vulnerable communities that are wildland-urban interface, utilities and other infrastructure operators, and also, in certain cases, agriculture businesses, and certainly also policy makers and regulators that have concerns in these issues.

In addition to directly working with these asset owners and operators, we also work with a whole host of other partners across both public and private sectors. On the longer-term time horizon, these could be engineering partners, financial institutions, insurance, re-insurance

companies, and certain specialty insurance companies, for example, parametric insurance companies that are interested in using more advanced data to both address the risks, but also help with some of the project financing for entities that are looking ahead of time and implementing some of the mitigation measures.

On the operations side, certainly, emergency responders, and also certain fire protection services could also benefit from more rigorous data analytics.

Moving on, I want to give a snapshot of the framework that we're approaching, developing our fire platform, and really our approach combines the latest scientific modeling knowledge from the scientific community, but it will also leverage the latest technology, which is scale computing and machine learning, in the process, and we approach both short-term and long-term forecasting very differently, because the underlying modeling efforts are quite different.

I'll start from going over some of the characteristics of our short-term modeling efforts. First of all, I want to speak to the benefits of having a cloud native infrastructure, particularly to the use case of wildfire risks. The data analytics are usually quite intensive, and during an onset of an event less so, maybe, during other times of the year.

So there's a quite drastic change of the necessary computing power needed. This is what we call, like, the "burst processing," because demands come quick and fast at a certain time. So a cloud infrastructure, as opposed to a traditional supercomputing infrastructure, is more suited and also more economic, in this particular case.

We're also leveraging -- one of the speakers earlier today talked about downscaling of the next generation of climate models. That's something that we'll actively take advantage of, to really generate hyperlocal numerical weather predictions, and these models are able to provide probabilistic forecasts at a high resolution for temperature, humidity, wind, and precipitation.

Obviously, these are only a subset of the factors going into wildfire modeling, but certainly more precision would allow better decision making, and one of the speakers earlier today alluded to providing data that is at a level that would empower circuit-level decision making. So this is certainly something, as we further downscale the climate models, we would be able to reach that level of precision.

Of course, beyond the weather factors, there's work needed to be done in the vegetation model, both in terms of fuel and also growth. So we are actively working on integrating public domain field surveys, but also

leveraging some of the new technologies based on commercial satellite and remote sensing technologies to incorporate those into our fire modeling process.

On the long-term planning side, the focus is a little bit different, and I want to talk about the first two factors, both commercial satellites and also machine learning together. So, obviously, commercial satellites provide a new set of data, with optical and radar-based observations, but, also, with those increased amount of data, we are able to leverage machine learning and AI technologies to better correlate what shows up in those imageries, and what it is in relation to the fuel that is available, actually, on the ground, and also downscale meteorological conditions.

So, although, you know, the physical intricacies of how these factors are connected are complex, but, through training runs, there could be empirical connections being made there, and that's something that we're actively leveraging.

In the longer term, also, we're taking into consideration the non-stationary climate, which, taking into consideration to the different climate change scenarios and emissions scenarios, we're obviously seeing different patterns of heat and precipitation patterns across the geography, so actively modeling those in as

well, in order to assess the full picture of the fire risk in the future.

I think the last piece of the puzzle really is a further integration of other system models beyond the physical climate models, the fuel status, and this extends into hydrology models, or even terrestrial ecosystem models that would really help us understand how vegetation growth changes as we see the climate shift in the long term.

So this what we have for today. I'm happy to answer any questions.

CHAIRMAN WEISENMILLER: That's good. I'm just going to start with two observations. One is, this past spring, I spoke at McKenzie (phonetic) Annual Sustainability Event in Shanghai, and one of your colleagues was there, actually, the day before I arrived, and spoke.

Anyway, we just connected, and so I thought that was a good opportunity to bring Jupiter into this forum. I appreciate, you know, how far you could go in the conversation, but, again, I think the McKenzie message seemed to be "These guys are state of the art in these issues."

The other observation was, in terms of Fourth Climate Assessment, as we look at the climate impacts, we've talked today a lot about fire. Obviously, that's not

the only area we see major impacts coming, you know, for example, sea level rise. So that fits very closely to some of your modeling on that side.

We also see a lot more volatility in climate in terms of temperatures, you know, these bursts of 111 at UCLA, much more common going forward, also, for the West, a lot of very long-term droughts, you know, going forward, and basically snowpack, a lot of melting of snowpack between now and 2050, 2100. I was going see if Guido knows anyone here to flag what I've missed, but those are least some of the key things that we're seeing coming out of the changes.

So, bottom line, a lot of focus on fire, but really that's just a start, you know, and that's certainly something which we're seeing very clearly now, but basic word of warning is that there's a lot of other impacts, and I'm sure folks afterwards may want to follow up with you in conversation.

MR. CHEN: If I might add, I think a lot -- from our experience developing our platforms for other kind of hazards, including flood and extreme heat, one of the most effective ways is to find partners that are, you know, actively working on issues in the industry, so just to put a plug really quickly, kind of, for Jupiter. We are looking for partners to codevelop our fire process, and

will be very welcome to any kind of discussions.

COMMISSIONER MCALLISTER: I did have a question or two, I guess. So I'm very excited, you know, about this, you know, heavy data analytical approach that we're doing, actually, increasingly, that kind of work, probably not to the granularity in sort of real time that you're working on, but it occurs to me that some of this could be linked to some of the policy work that's being done, you know, maybe not, you know, beyond emergency preparedness, certainly looking at energy consumption trends, and, as you do, modeling.

It could inform our forecasting. It could inform, you know, our disaggregation of some of that work to get to the really local level. So I guess, you know, I'm sort of thinking longer term (indiscernible) about possibilities. I think there's a lot of substance there.

Are any of the utilities that spoke utilizing this or some other resources, or planning to?

MR. D'AGOSTINO: From the standpoint of SDG&E, yes. We own and operate four supercomputers, and a weather network of 170 stations to train them, a lot of partnerships with UCLA. So it's something we're extensive in, and another example where we've been working with the other utilities.

MR. DASSO: Data analytics is the future, and

it's absolutely something that's critical to us. We've got a team that's called our "digital catalyst group." We've been doing a lot of mobility work, but moving into analytics and trying to cap into these types of models, and I'll be exchanging contact information with Michael here at the end. I'd love to talk a little bit more. We're open to anything that folks with that perspective can offer to this problem.

MR. CHIU: I would just echo the same thing. We're actually very actively looking at building our analytical capabilities so that we can ingest a variety of data sources to perform these analyses, and it definitely will help us to be better at understanding weather patterns, predicting what's going to happen. This is definitely one of the key pillars of our strategy going forward.

COMMISSIONER MCALLISTER: I want to also just plug -- maybe you do this, for example, down in San Diego. You could coordinate with SANDAG on the transportation side. You know, they have a lot of resources to -- you know, they're the MPO, and they're the regional transportation organization.

So, you know, across the state, you have different versions of that, and it seems like these kind of -- again, it's sort of leveraging analytics that's

happening in one sphere to help another sphere, and I think, again, optimizing investments and all that kind of stuff, while you're at it in a given area, you know, SANDAG might be able to program some similar, complementary upgrades at the same time.

You know, obviously, there's a lot of bureaucracy involved in interactions with other governmental entities, but we're talking about a really generational shift here, and I just think it really warrants a lot of long-term thinking that is up to that task. And so, you know, those relationships might be important.

CHAIRMAN WEISENMILLER: So I thank everyone for their participation today.

Heather, in terms of when comments are due --

MS. RAITT: August 16th.

CHAIRMAN WEISENMILLER: Okay. And so we're now going to go to the public comment part, and I've got -- so public comment from anyone in the room. I have one blue card from So Cal Gas. Please come on up. Identify yourself for the court reporter.

MS. MORENO: Can you hear me?

CHAIRMAN WEISENMILLER: Yes.

MS. MORENO: (Indiscernible.) Thank you. (Indiscernible.) So Cal Gas is here to let you know that So Cal Gas is committed to maintaining diverse and balanced

forms of energy that can help communities be more resilient in the face of climate change.

We recently hired an external consultant to conduct case studies highlighting the resilience of the natural gas sector following four natural disasters that took place in 2017. They include the October wildfires in Northern California, the December wildfires and subsequent mudslides in Southern California, as well as Hurricane Harvey in Texas and Hurricane Irma in Florida.

The case study summaries of damages and destructions experienced, resilience successes, and lessons learned about opportunities to increase resilience across the energy sector.

Key lessons learned are clear. First, natural gas is a resilient energy resource that provides heat and hot water for homes when the electric grid is down. Second, natural gas provides backup generation for hospitals and relief centers through the use of fuel cells or combined heat and power systems.

Lastly, transit buses, garbage trucks, and other vehicles that serve our critical infrastructure needs, that run on CNG or LNG, keep cities running during emergency response situations. (Indiscernible) concerned with over-reliance on a single energy source. I can't stress enough that resiliency means not putting all of your eggs

in one basket. We need diverse and balanced forms of energy.

During the Thomas fire, the city of Ventura lost electricity due to wildfires. Because the power was down, emergency responders could not operate electric water-pumping stations, and fire hydrants did not have water for firefighters to (indiscernible) that were burning down homes. Functional backup generators were not available, and the city of Ventura is now looking at natural gas-powered water pumps to ensure greater resilience during wildfires and other natural disasters.

In light of this, it is critical for cities, counties, and states to understand that a diverse energy delivery system contributes to greater reliability, community resiliency, and, first and foremost, helps ensure public safety.

So Cal Gas is dedicated to improving the quality of life in the communities we serve. In fact, we are working closely with local governments to assist them in their efforts to plan for climate adaptation and hazard mitigation. We just launched our new climate adaptation and resiliency planning grid program, which will award $100,000 to local governments to help them plan and prepare for climate change impacts through the general plan process, as required by Senate Bill 379.

With that said, we appreciate the research that CEC and CPUC is doing around climate change adaptation and resiliency, and we hope that both agencies recognize that the natural gas grid should not be overlooked when addressing climate change mitigation and adaptation strategies. The natural gas grid is a valuable asset that provides reliable, affordable energy, and is less vulnerable to service disruptions caused from wildfires and other natural disasters.

We'll be providing additional comments that will elaborate on how natural gas and renewable natural gas can help improve resiliency in communities vulnerable to climate-related natural disasters, and plan to share the case cite, as I referenced earlier, as soon as I have them finalized. Thank you for your time.

CHAIRMAN WEISENMILLER: Thank you. I certainly encourage you to file the studies in the docket for this, along with what you're doing generally on adaptation.

MS. MORENO: Will do.

CHAIRMAN WEISENMILLER: Is there any other public comments from anyone in the room or on the phone? Okay.

I was going to again remind our utility colleagues that in October we're going to be doing these 13 local events on sort of adaptation and resilience issues coming out of the Fourth Assessment. It's a good

opportunity to partner with your sustainability groups or your, you know, adaptation folks, as we try to connect with local governments in those discrete areas, or 10 local, one tribe, environmental justice.

So we'll be reaching out to a number of stakeholders, and certainly, to the extent you can help us with that connection into the communities, that will be great. Certainly, you know, if you contact Pam -- raise your hand -- she can connect you with Susan and the other folks who are organizing this, and their agencies, so we can all move forward on basically dealing with the challenges that we have -- you know, we have had real challenges.

I mean, one thing I thought I saw in the Fourth Assessment is, to some extent, what's happening on the ground is happening faster than the science would expect. So, you know, we have a real crisis, and the governor would tend to say that two existential challenges are climate change and nuclear proliferation.

Of course, I don't have to worry about the nuclear proliferation issue, but certainly the climate change is one that I think we all need to rise to the occasion, particularly in the adaptation side. So thanks for your participation today.

Andrew?

COMMISSIONER MCALLISTER: Yes. What I was able to see -- I was in and out a little bit, obviously, but really quality panels, and looking forward to everybody's comments. There isn't really an issue about time, and I really can't put it better than the Chair did.

Unfortunately, I would say, you know, California is even more in a leadership position, just sort of because everybody else -- or others have stepped back. So we're kind of left further in front than maybe would have otherwise been, but we owe it to ourselves here in California to deal with the issue. So you're all helping us do that, and it's really a team effort. So I'm really happy to be at this forum, and certainly it's not enough, but it's a good step forward. Thanks.

CHAIRMAN WEISENMILLER: Okay. So we're adjourned.

(The workshop was adjourned at 4:16 p.m.)

CERTIFICATE OF REPORTER

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

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

IN WITNESS WHEREOF, I have hereunto set my hand this 6th day of September, 2018.

MARTHA L. NELSON, CERT**367

CERTIFICATE OF TRANSCRIBER

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

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

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

MARTHA L. NELSON, CERT**367

September 6, 2018