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CALIFORNIA ENERGY COMMISSION

In the matter of:

SB 100 Implementation: Planning for SB 100 Resource Build	Docket No. 21-SIT-01
	RE: Land-Use Screens

COMMISSIONER WORKSHOP ON LAND-USE SCREENS

IN-PERSON AND VIA ZOOM

WARREN-ALQUIST STATE ENERGY BUILDING

ROSENFELD HEARING ROOM, FIRST FLOOR

1516 NINTH STREET

SACRAMENTO, CA 95814

MONDAY, MARCH 13, 2023

1:00 P.M.

Reported by:

Martha Nelson

APPEARANCES

COMMISSIONER

Siva Gunda, Vice Chair

CEC STAFF

Mona Badie, Public Advisor

Erica Brand, Project Manager

Saffia Hossainzadeh, Geospatial Scientist

Travis David, Research Data Specialist II

Gabriel Blossom, Research Data Specialist II

Hilarie Anderson, Workshop Admin Lead

Benjamin Finkelor, Advisor to Vice Chair Gunda

CPUC

Jared Ferguson, Regulatory Analyst

NREL

Anthony Lopez, Researcher, Geospatial Data Science Group

PUBLIC ADVISOR

Mona Badie

PUBLIC COMMENT

Daniel Kim, Golden State Clean Energy

Frank Harris, California Municipal Utilities Association

Shannon Eddy, Large-Scale Solar Association

APPEARANCES

PUBLIC COMMENT

Ellen Wolfe, Resero Consulting

Brian Biering, American Clean Power Association

Kyle Navis, Public Advocates Office, CPUC

Nancy Rader, California Wind Energy Association

Kate Kelly, Defenders of Wildlife

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P R O C E D I N G S

1:00 p.m.

MONDAY, MARCH 13, 2023

MS. BRAND: Good afternoon. I'm Erica Brand with the Energy Commission Siting, Transmission, and Environmental Protection Division. Welcome to today's workshop focused on land-use screens and environmental and land use evaluation in electric system planning.

Before we begin, I'm going to go over a few housekeeping items.

First, this meeting is being recorded and is being held both remotely and in-person in Sacramento to improve public access. The workshop recording will be made available on the Energy Commission's website.

For those of you joining us remotely, to make the workshop more accessible, Zoom's closed captioning has been enabled. Remote attendees can use the service by clicking on the live transcript icon and then choosing either show subtitle or view full transcript. The closed captioning service can be stopped by exiting out of the live transcript or selecting the hide subtitle icon. Closed captioning cannot be exited by phone.

Workshop materials can be located on the CEC website, or for those in person today, we have hard copies located in the back of the room near the entrance. For those of you online, we will drop the link to the workshop materials in the chat.

For those of you joining in-person today, restrooms are located outside the Rosenfeld room to the left near the P Street exit. In case of emergency, please follow building staff to Roosevelt Park located diagonally across from the Warren Alquist State Energy Building.

Next, when we get to the public comment portion of our agenda, we will start with those in the room followed by those online. For those in the room that would like to make a public comment, please fill out a blue card located in the table in the back of the room and walk it over to Mona, the CEC's Public Advisor.

Thanks, Mona.

For those of you on Zoom that would like to make a public comment, we will be using the raised hand feature today, which looks like a high five. And for those of you joining by phone, press star nine to raise your hand and then press star six to mute and unmute.

Please also note that the chat feature is not available to the audience today.

A few more notes on public comment. Public comment will be at the end of the meeting. Comments may be limited to three minutes or less per speaker. We'll show a timer on the screen and we'll alert you when your time is up and all comments will become part of the public record.

Next slide, please, Hilarie.

Now I'm going to quickly run through our agenda for this afternoon.

We'll start with opening remarks from Vice Chair Gunda. Following opening remarks, the content of today's workshop is divided into two sections.

The first section will focus on methods for assessing renewable resource technical potential. This section will include presentations from the National Renewable Energy Laboratory, the California Public Utilities Commission, and the California Energy Commission.

The second section will focus on busbar mapping and potential updates to the environmental and land use evaluation.

Following the presentations, each section will include time for questions and answers on the material presented today. Between the two sections, we'll take a brief five-minute break and at the end of the workshop, we'll have public comment.

With that, I'll turn it over to Vice Chair Gunda to lead our opening remarks.

VICE CHAIR GUNDA: Thank you so much, Erica.

Thank you, everyone, for joining today and for all the staff for helping pull this workshop together.

This workshop is to provide another opportunity for the public to comment on the updates towards the land-use screens for electric system planning before they're finalized later this spring.

CEC's land-use screens work, as most of you know, which we're going to hear about today, is foundational and has the potential for significantly impacting state processes, including the CPUC's IRP process, but also our long-term planning on SB 100. And it's really important that we at CEC consider all the various perspectives thoughtfully in developing the screens and making sure all the priorities are reflected as we move this work forward.

And really appreciate all of you who submitted the comments to the draft staff report, which was released in October as a part of the IEPR process, but also, you know, those of you that have reached out for briefings and meetings and making sure that we really heard your updates. And I'm incredibly grateful for Erica and the team for taking those input and feedback into consideration as they try to evolve and go into this next phase of work.

Just want to give a special thanks to the CEC team, Erica, obviously, who's going to be emceeing this workshop today, but also Saffia Hossainzadeh and Travis David, Gabriel Blossom and Elizabeth Huber, all the CEC team, and also our collaborating agency partners, including

Jared Ferguson from CPUC and staff from multiple state agencies and federal agencies, too many of them to name here.

I also want to just elevate one other point. We recently had a tribal consultation regarding SB 100 last week, and we're going to continue that work as well. And the tribal partners also noted the importance of this work and ensuring that, you know, their voices are heard as we develop this and really leveraging, you know, the work that they have done as tribal nations.

So this is one of those works that really brings all of California together and really look forward to both listening to the presentations and hearing the feedback.

With that, back to you, Erica. Thank you.

MS. BRAND: Thank you very much.

Okay, Hilarie, next slide. Great. So I'm going to go to -- we can go to the next slide after this one. Thank you. Alright.

So I'm going to spend a few minutes setting the stage for today's workshop and the role of geospatial or map-based environmental and land use information in California's electric system planning activities.

Next slide, please.

As I mentioned in the agenda, today's workshop has two key topics. The first section is going to focus on the use of land-use screens or map-based environmental and land use information to estimate renewable resource technical potential.

And to learn more about what technical potential is, we're going to be hearing a presentation from Anthony Lopez at the National Renewable Energy Laboratory about national technical potential estimates for long-term energy analysis and planning. Following Anthony's presentation, Jared Ferguson from the CPUC will be here to discuss technical potential estimates in the integrated resource planning process. And then after that, we'll hear a presentation from Saffia from the CEC project team about the proposed update to the environmental and land use data in the land-use screens used to estimate technical potential in California's long-term planning activities.

The second section of the workshop will focus on busbar mapping. Jared will return for an overview of the busbar mapping process at the CPUC. And then Saffia will present on the current environmental and land use evaluation methods for busbar mapping, as well as discussing possible updates.

Next slide.

So today's workshop has several goals. The first is to present proposed modifications to the draft land-use screens for resource potential in response to public and agency feedback to the draft that we released in October.

The second goal is to provide an additional opportunity for public engagement and comment before finalizing the staff report and concluding the cycle of updates to the land-use screens for electric system planning.

And then finally, the third goal is to create an opportunity for early feedback into the scope of potential changes to the environmental and land use evaluation methods for the CPUC's busbar mapping process.

Next slide.

So just to set the stage, for over ten years, the CEC, CPUC, and California ISO have used land-use screens in statewide electric system planning in both integrated resource planning and Joint Agency SB 100 analysis. Land-use screens help to estimate the technical potential for large-scale renewable resources like utility-scale solar, land based wind, and geothermal. The land-use screens are high level and rely on statewide information to help establish an upper boundary estimate of how much development is feasible or what the development potential is by different regions.

The technical potential estimated after applying the land-use screens then becomes an input into capacity expansion modeling, such as RESOLVE modeling for the IRP, which Jared will share more about in his slides.

One important point I want to make on this slide is why the energy agencies have used land-use screens for so long in electric system planning, and it's because it's one part of a multi-pronged approach to coordination across state and federal governments to really strategically plan to achieve the state's multiple goals, including clean energy deployment to address climate change, biodiversity conservation, and sustaining agricultural lands.

Land-use screens support increased transparency in decision making and early identification of issues or barriers to development, which really supports long term reliability in planning for long lead time investments, such as transmission.

Next slide.

This slide from the 2021 Joint Agency SB 100 Report takes a closer look at the role of land-use screens in the resource planning modeling framework for SB 100.

If we look at the first box on the left-hand side of this slide, you'll see that land-use screens are used to inform renewable resource potential, and that's an important input into the middle box, which is the capacity expansion modeling that's done to model different portfolios for what achieving SB 100 could look like. And then on the far right, this is an example of the SB 100 core scenario from the 2021 report.

So this slide is just meant to put into context how do land-use screens fit into the modeling framework that's done for a report like SB 100.

Next slide.

So the goal of this slide is to show that the land-use screens are just one deliverable in the overall analytical framework for evaluating land use in the next SB 100 report. So the land-use screens, we’re in the first box in the top left where the revised land-use screens will be used to help estimate the technical potential, which then becomes an input into capacity expansion modeling.

After finalizing this cycle of updates to the land-use screens, our team will move into developing methods for refining the maps with more local data to support the next SB 100 report. In the next report, we plan to assess the potential impacts and tradeoffs of the different scenarios or modeled pathways for achieving SB 100. And having more local and regional data is a helpful part of being able to conduct that tradeoff analysis.

Next slide.

Alright, lastly, this slide here, I won't go through all the dates, but what it does is it recounts the public process steps and the timeline for this cycle of updates to the land-use screens. Through the 2022

Integrated Energy Policy Report update, or the IEPR, the CEC led a public and interagency process to take a look at the land-use screens that were previously in use by the state energy agencies and consider data and method updates. This process included several workshops and the release of a draft staff report in October 2022 with detailed proposed changes. We'll discuss that draft staff report more when we get to the CEC staff presentation.

The timeline also captures upcoming activities related to busbar mapping, which we will describe later in the slides, as well as developing the additional methods for the land use analysis for the next SB 100 report.

So with that, I am going to help us transition into the next section of the workshop -- so, Hilarie, if you could move this slide forward? -- where we're going to be talking about technical resource potential and, again, really starting with this national perspective and then zooming down into California, and eventually ending up specifically on the staff proposal for the updates to the land-use screens that the state agency used for estimating technical resource potential.

So with that, I'm excited to be able to introduce Anthony Lopez, a Senior Energy Researcher from the National Renewable Energy Laboratory, or NREL.

Anthony, could you please turn on your camera?

And Hilarie, could you go to the next slide?

MR. LOPEZ: Alright. Thank you so much, Erica. I guess I'll go ahead and start my presentation. That was a great introduction to kind of the needs of technical potential assessments. So I had a little spiel about why we need those, but I think you did a fantastic job, so I'll go ahead and just continue with my presentation.

So I'm here to talk about technical potential assessments from a national perspective, and more specifically to talk about what kinds of data that we consider, what types of methods we use, and what types of outcomes we're seeing in our analyses.

So I will say, though, that, you know, with the increased demand for, you know, clean electricity and energy associated with zero-carbon futures and new research into the spaces and places that underpin technical potential estimates, you know, we're really starting to kind of get a lot better estimates and raise a little bit of questions about what's actually truly developable. So this research is quite critical.

Next. And you can go ahead and skip over.

So I'm going to first talk about data. So the first thing to say is that technical potential assessments, they stand at the intersection of multiple disciplines. So first, to accurately quantify potential, one must consider local siting constraints and the interaction with technology options, both present and future in those interactions with wind, solar, or other resources. And what I mean by that is that the wind technology, solar technology, and other VRE technology is rapidly evolving, and we need to be able to capture those.

In addition, as they're evolving, their land use requirements are changing as captured through capacity density or the energy density, and this is directly influencing the amount of land that you might need across the landscape to achieve different levels of generation potential.

Next slide.

So the other types of data that we integrate into national technical potential analyses are the wind and solar resources, and other resources as well, but I'll focus on these two because these are the pretty graphics that I have.

On the left-hand side, you have the Wind Integration National Dataset, or WIND, toolkit. And on the right-hand side, you have the National Solar Radiation Database, or NSRDB. Both of these datasets are spatial temporal datasets. They allow us to produce at very high spatial resolution the amount of hourly and sub-hourly generation profiles associated with technical potential, which is critical for downstream modeling in either production costs or capacity expansion.

I will say that we've always used historic resources to give us a sense of the technical potential that we usually model many, many years to capture uncertainties within your annual variability, and this gives us a really good historical perspective. However, we are starting to look into what we call super-resolved global climate change model data, and we're integrating these now into our modeling ecosystems to try to understand the impacts of climate change to resources and load. And this does represent a new kind of frontier of research in trying to understand how climate change might impact our renewable energy resources available.

Next slide.

As far as data is concerned in terms of land use constraints, environmental constraints, whether they're rangeland disturbance, species core habitat, public and private land conservation, and more are quite critical. For NREL, in our national assessments, we typically represent or capture legally or administratively protected lands, or lands with a regulatory hook that could prevent deployment or could enforce some level of curtailment on the generation.

I have below on the right some example datasets.

This isn't a full list, but this does represent the bulk of kind of the environmental constraints that we consider, namely in there in terms of the land area, the Protected Areas Database GAP Status 1 and 2, and the National Conservation Easement Database GAP Status 1 and 2 represent the bulk of the area that is precluded from development within our models.

We also have other possible exclusionary areas or siting constraints that we apply within the model, whether those are conservation reserve programs, locations, bat hibernacula, or sage-grouse core habitat located on federal lands. These are all things that we consider.

Next.

We also consider airspace issues. Now this is primarily a wind consideration here, but airspace considerations include radar interference, airport proximity constraints, military training routes, special use airspace, and more as all of these can dictate the final placement or height of a perspective turbine.

Next.

We also consider social and the regulatory landscape. So human infrastructure is a physical obstacle, but this is also confounded by the increasing number of siting ordinances which dictate setbacks, sound limits, density limits and more, and are intrinsically linked with the technology assumptions broadly. An example of this is that most ordinances are based off of, for wind, a tip height, and it's a tip height multiplier. When you directly link that with the turbine technology assumption, you can get more or less area associated with development.

You can see we're building on our -- our analysis is built upon two different databases that we've been collecting over the years. They are the Wind and Solar Ordinance Databases. You can see two maps of those in the bottom left-hand side and links to those databases. These are publicly available for anyone to download and to use. And the maps, the highlighted, those are highlighted counties of which have an existing wind or solar ordinance.

So when we take the existing infrastructure across the landscape, whether it's a road or a person's house, a transmission line, a railroad, or more, and then we apply these ordinances, we start to get a better understanding of land that is either excluded from energy development or, if you want to flip the coin, you can say land that is available for energy deployment or codified for energy deployment.

Next slide.

For anyone who's really kind of been deep into technical potential analysis or supply curve, what we call supply curve modeling, and I'll talk a little bit more about that soon, we all know that siting is actually very difficult and uncertain. In non-technical terms or non-scientific terms, it's squishy.

For the remaining lands, we always apply what we call a land characterization because we know that siting is not always Boolean. It's not always a yes or no question. So what we do is we quantify the characteristics of these remaining lands, especially those developed within our capacity expansion models, to help illuminate the potential scale of additive pressures. So for example, roughly how many turbines might DOD expect to intersect military training routes?

So you can see an example, example datasets, on the right over there, whether those are TNC-resilient lands, wildlife areas for solar or wind, American Farmland Trust, productivity, versatility, resiliency, information, and more. These are all additional datasets that we just try to have a better understanding of how our models are really either preferring to develop on those, nearby those, or not at all.

Next slide.

Ultimately, when we weave all of these conditions together, at least siting constraints together, we can impose locational dependent limits on deployment opportunities in many resource-rich regions. And consequently, we can illuminate the need for increased tailoring of power plants into the local, social, and ecological, and topographical context.

And what do I mean by this? Well, as I stated earlier, technology is evolving very rapidly. In the maps in the middle, on the top map, the green areas are showing locations that meet a levelized cost of energy threshold. We all know this is roughly the wind belt in the United States, but through R&D investments of near future innovations for wind turbine technology, we might be able to envision a future on the map below, where the green areas represent an expanded geographic area of low cost wind, in effect, lowering our siting constraints for wind technology, because we're making low-cost wind more broadly available to the system.

So next.

Okay, so now that we have all of this data that we're looking at, how do we actually integrate all of this? I will talk so through the methods that we use at NREL.

Next.

So we use what's called the Renewable Energy Potential Model, or reV. And this is a best-in-class model for estimating renewable energy supply, and you can see the technologies that we have available to model. The point of this graphic, I would say, though, is that we model on broad geographic scales. In this particular case, we model the contiguous United States, or CONUS, and its waters, its offshore waters.

In addition, across this broad geographic scope, we go all the way down with a lot of spatial fidelity to avoid even individual houses when we're conducting our technical potential analysis.

Next slide.

So how does it actually work? Well, it's a high-performance computer leveraging petabytes of data and conducting billions of spatial temporal calculations. It's big data.

First, we start with the resource data. This is fed into the system's generation model to estimate hourly or sub-hourly generation profiles. We enable site-specific economic assumptions to estimate levelized cost of energy. We apply siting constraints to whittle away the resources we deem not developable. And then we have transmission routing to then evacuate that site-dependent energy off onto the existing electric grid.

Then, finally, we have modules for interoperability to feed these into either our capacity expansion zonal models or our production cost models that typically model on a nodal basis.

Next.

But because we're mostly concerned with land siting, I want to talk a little bit more about that and how we're approaching this at NREL.

So the first thing to note here is that the capacity density assumption has been primarily used as a means to infer what the capacity potential could be after exclusions are applied. However, there are some limitations with this, primarily that capacity density is a historical looking -- is an empirical assessment and historical and basis, but oftentimes when we're looking towards the future, the technology, wind technology in particular and solar technology, are evolving so fast that we want to look at prospective development, not historical development.

So we are looking -- we've developed a spatial optimization of local wind plant designs, and this represents a novel advancement in the technical potential assessments. Our approach accounts for the interactions between wind technology design, wind plant layout and the vast array of regulatory land use and infrastructure conflicts with wind development.

Ultimately, we spatially optimize across 67,000 sites in the United States. This represents around 3 million turbines that are explicitly sited. It outputs a capacity density into our technical potential estimate as opposed to being an input into our technical potential assessment. Ultimately, we get a capacity estimate from this.

Next slide.

And as I stated before, siting is very dynamic, it's evolving, it's sometimes squishy, or often I should say. And so how do we capture that uncertainty within our models?

Well, we have this philosophy and this approach, what we call siting regimes or a scenario framework, to approaching this uncertainty. We've developed an open access siting regime. This basically represents the least restrictive combination of siting constraints, meaning that you can't develop in legally administrative-protected lands like Yellowstone, and you can't develop on existing infrastructure like someone's house or the highway. But other than that, wind development is open, is open. And this gives you a ceiling of development potential.

Then we have reference access, and this is a moderate siting regime that balances siting considerations by utilizing, where feasible, best management practices. And this helps to guide the deployment potential. And when I say best management practices, it means that we're starting to implement the existing ordinances, but in addition, the practices that developers tend to follow, even if there are not any codified lands via ordinances.

And then we have limited access, and this is a combination of the most stringent siting considerations of all scenarios. It represents a plausible floor for available land.

In this particular case, we get a little creative, and we try to stress test the system, what are important aspects, and what are release levers within our models when siting becomes incredibly difficult across the landscape?

Next slide.

And as I said earlier, after all of this, you have to evacuate the energy off into the electric grid. So we have transmission methodologies using least cost path analyses.

So in this, we use regional voltage-based costs, which are selected based on the perspective wind or solar site size, as guided by the exclusions, and these are routed to neighboring substations to estimate the cost of spur transmission and point of interconnection. This routing is guided by regional hard costs, so the cost of the steel and the wires, as well as soft costs, so the land composition. It's a lot more difficult to develop in suburban areas as opposed to fallow lands. And in addition, plots are guided by natural and cultural constraints as friction to avoid likely high mitigation cost areas, as seen in the maps on the bottom left.

We do this routing for about the 67,000 locations in reV, and you can see kind of an example map of what this looks like. You have the reV wind site in the middle. You have kind of that gray lake-looking area as the excluded area. You have kind of the land composition that looks like -- you know, it's a little more difficult to develop on mountainous forested areas. And then you have the routes that are being -- and you have the transmission lines that are being routed to each one of those substations.

In addition to this, in terms of methodologies, we've now started to model network upgrade requirements as a function of these locations as well. Based on kind of the recent LBNL research done, I believe, in PJM, we are now starting to see that this is a very important consideration and cost within both our supply curve as well as our capacity expansion model -- or technical potential and capacity expansion model.

Next slide. Next slide. Oh, there we go. Okay, so -- oh, can you go back one? There we go.

So when we bring it all together, we call this -- basically what we call a supply curve. This is a technical potential assessment that has additional information about the economics associated with each one of these individual sites, which are really useful in terms of understanding the quantity, quality, and cost of the VRE resources.

So when you put a supply curve together and you put it on this kind of graph, it looks like a line, but that line is actually 67,000 individual points, each with a specific geolocation, a specific cost, a specific capacity, and a very specific production -- I'm sorry, power profile that's used within our production cost and capacity expansion models. So it represents a lot of information that we are generating to create these insights needed.

Next slide.

So, outcomes. So when we actually conduct this analysis and we incorporate these land-use screens into our analysis, how much of an impact does it have on the future energy system?

Next slide.

The short answer is a lot, at least from a technical potential perspective on this slide. So what we found in recent research in 2021 was that the influences of local siting on national wind potential can be quite profound. On the left-hand side, we're using those siting regimes, and the left-hand side, we're showing open access, and we have about 15 terawatts worth of technical potential capacity. If we move over to the middle map, we see about

7.8 terawatts of capacity, and if we move over to the right, in the limited access, we have about 2.2 terawatts of capacity. So the darker the blue on those maps means the more capacity available.

Now, we all know that it's not just about capacity, but the quality of those resources that remains, which is really important, in addition to how remote those are. We can gain information about these through those supply curves and technical potential by looking at the distributions of the wind speed associated with that capacity, the levelized cost of energy, and the remoteness as viewed via the levelized cost of transmission of that capacity in our analyses.

Now, 2.2 terawatts is not -- is decremented a fair amount, but that is still seen as enough for kind of current decarbonization projections, most of them, depending on what you're looking at. But what kind of effects might that have on renewable energy deployment?

Next slide.

And we had a companion manuscript that we wrote with this previous dataset, looking at and using our capacity expansion model in those scenarios to look at what would be needed or what would happen if we were to enforce 40 percent wind generation on the system. And what we found was that local siting influences not only the pace, but the scale and the distribution of wind resources and resource and wind resource development.

So on the left-hand side here, these land-use screens resulted in the open access having highly concentrated wind development in the darker blue areas. That high concentrated wind development was also enabled to be deployed within very high-quality resources, meaning that we needed about 559 gigawatts to reach 40 percent generation.

But on the right-hand side, under a limited access scenario, we see that siting constraints are very difficult and it doesn't allow us to tap into those high quality resources. It requires us to distribute those resources across broader geographies and ultimately need higher capacity, about 666 gigawatts total, to reach 40 percent generation.

So siting definitely has a pretty big impact on kind of our understanding of what it means to achieve high wind contributions to kind of the electric grid.

Next slide.

And I will say here that technical potential estimates, I heard this in the introduction, this is great, they're foundational to studies. They provide the necessary resource and grid interconnection characterizations. And ultimately, these lay the foundation for all the studies that we're conducting in it, a lot of the studies we're conducting, I don't mean all of them. And ultimately, to understand decarbonization pathways, we must first define, you know, what's possible.

Next slide.

And with that, that's the end of my presentation.

MS. BRAND: Thank you so much, Anthony. We appreciate you joining us today.

I'm going to pause here and I'm going to see if, Vice Chair Gunda, if you have any questions for Anthony before he has to leave today?

VICE CHAIR GUNDA: Yeah. Thank you, Anthony, so much for that presentation. I really enjoyed how clear that was in its structure. I had a couple of high-level questions I might have not tracked carefully.

One is just the climate impacts and how you are including them in the broader wind potential, if you could comment on that?

And also the second one, you specifically talked about the open access reference and the limited access portfolios and looking at the compiling the cultural constraints. I wanted to understand how you're approaching that, and then, you know, if you -- how you compiled those.

And the third question, I'm just going to put it there, is in terms of next steps in improving your work, what do you see as the opportunities, if you could comment on them?

Thank you.

MR. LOPEZ: Great. Great questions.

Okay, so first, for the global climate change data, often with the GCMs, they are -- the outputs of those are usually 100 kilometers or so, the spatial resolution, and they're often daily in terms of their temporal resolution. And so those are not resolved enough, both spatially and temporally, for us to use in technical potential assessments, nor are they spatially or temporally resolved enough for us to use in our capacity expansion models.

And so we've been conducting some analyses and research at NREL to use machine learning and AI to spatially and temporally downscale those, so that way it fits within our model naturally and in the same way as we've been using historical estimates. And so the goal then would be to downscale an ensemble of climate scenarios and climate models to then start to ask the question of how much does global climate change our understanding of technical potential?

Okay, second question is the siting regimes. So, you know, those are kind of qualitative scenarios that we define. And, you know, again, on the open access, what we're really trying to do is make no judgments about things other than legally or administratively lands that would preclude energy development or an infrastructure. So you can't build on my house. But other than that, it's just open for development. And really what that gives us is a ceiling, and it gives us something to kind of benchmark against.

In terms of reference access, we apply these siting ordinances, and we're collecting these kind of on an ongoing basis as they are kind of continuing to expand across the country. For example, in 2018, we first started collecting wind ordinances. We had about 300 of them. We did a new collection four years later, just recently, and we have about 1,800 of them, so they're expanding quite a bit. And it's giving us an understanding of what communities are asking of developers. So that's one way we're approaching it.

Another way we're approaching it is we talk to developers to understand what their best management practices are in terms of development. So maybe a county doesn't have an ordinance, but they're still going to impose on themselves, you know, some sort of a setback away from houses or roads or transmission lines and things of that nature.

The real focus on that as well, from an

environmental perspective for us at NREL, is that we try to focus on things that have a regulatory hook. Could, you know, development be precluded via some sort of regulatory hook? But we try to -- we don't necessarily make a lot of judgment on kind of the private land ecosystem services focus that, you know, other organizations do, which I think is fantastic. It's just not our focus.

And in terms of limited access, what we're trying to see is a lot of these counties or communities -- some of these, not a lot, some of these communities are imposing pretty restrictive ordinances on wind and solar.

And then similarly, you know, we're starting to see very difficult siting in places like Europe, whether it's Germany or Denmark or what have you, and so we want to ask the question, you know, what if this starts to kind of happen in the United States? What if it becomes very difficult to site things locally? What if there's a lot of social opposition? What if there's a lot of environmental opposition to development? What does that mean in terms of still reaching our goals? Does that make transmission more important? Does that make distributed generation more important? And that's what we're trying to do from a limited access scenario.

And then I am so sorry. What was the third question? Oh, what's up and coming?

VICE CHAIR GUNDA: Yeah.

MR. LOPEZ: Okay. Okay, what's up and coming?

So what we're focusing on now is a tailoring. So I talked a little bit more about how turbine technology and solar technology is intrinsically linked with technical potential assessments. Historically, most of the literature is focused on using one, maybe a couple different turbines and they're making kind of broad assumptions about what the land use requirements would be for those turbines or those PV panels. So you might use one static capacity density assumption. But if you look empirically, they vary very drastically. You could have one megawatt per square kilometer, you could have 20 megawatts per square kilometer, depending on where you're siting.

And so what we're trying to do is say, okay, well, let's create some models that can optimize and give us realistic deployment estimates and capacity density estimates based on a range of perspective wind turbine technology, so it's an output of our model rather than input. And this can basically change your understanding of technical potential.

So for example, we have some research that's just coming out now that would actually change limited access and increase the capacity if you were to choose an optimal turbine for those siting conditions, similar with the reference axis. So it's all about kind of optimizing the technology design to try to squeeze out the most out of our technical potential estimates.

VICE CHAIR GUNDA: Thank you, Anthony. There's a few other questions I could raise, but I know, in interest of time, really appreciate your time. And I know how complicated this work is and those efforts as a whole. Thank you.

MR. LOPEZ: Thank you so much for having me.

VICE CHAIR GUNDA: Yeah, thank you.

MS. BRAND: Thank you, Anthony, again, for joining us today.

For attendees, Anthony's slides are available on the workshop web page, which has been linked in the chat.

So next, we're going to be joined by Jared Ferguson from the Public Utilities Commission to present on land-use screens in the CPUC's IRP.

So Jared, I'll hand it over to you.

MR. FERGUSON: Thanks, Erica. And thanks to the Energy Commission for the opportunity to present at the workshop today.

I'm Jared Ferguson, as Erica said, and I'm an Analyst with the Integrated Resource Planning Team in the Energy Division at the California Public Utilities

Commission. Today, I'll briefly highlight the roles of land use and environmental screens and integrated resource planning related activities at the PUC.

Next slide, please.

First, I'll give a brief refresher on what integrated resource planning is and how it interacts with the various processes of California's electric resource planning ecosystem. And then I'll discuss the points at which land use comes into play and where we plan to implement these new CEC screens into it.

Next slide, please.

Established by SB 350 in 2015, IRP is meant to guide electric sector resource planning to help the state achieve its greenhouse gas reduction goals at least cost while maintaining system reliability. We do that by looking across the boundaries of individual load serving entities towards the whole electricity system to identify resource and optimization opportunities, as well as issues that might not otherwise be apparent when looking at things on an LSE by LSE basis.

The goal of the current IRP cycle, the 2022-2023 IRP cycle, which is our third IRP cycle, is to ensure that the electric sector is on track between now and 2035 to achieving the deeper mid-century decarbonization goals of SB 100.

A typical IRP planning cycle is divided into two halves. The first part of the cycle, or rather in the first part of the cycle, the CPUC identifies an optimal portfolio for meeting state policy objectives and then sets requirements for the load serving entities to plan towards.

The second half of the cycle starts after LSEs have submitted their plans. The CPUC aggregates those LSE plans, compares that electric system to the identified optimal system that was identified in the first half, and eventually adopts a final preferred resource portfolio for use in planning and procurement. This second-half effort leads to the development of the preferred system plan and is where we are in this current 2022-2023 cycle.

Next slide.

This is a commonly used slide to show how IRP, that I just described, fits into the broader electric sector planning ecosystem. It's good for taking a step back to show the scale of interagency coordination and the dependencies of the various processes on each other and across the multiple state agencies and the ISO.

As you can see from this web, IRP relies on higher level policy guidance provided by the Air Resource Board's Scoping Plan, and the Joint Agency's SB 100 work. It also relies on the Energy Commission's IEPR, which provides demand forecast, as well as a few key cost inputs into the IRP. The IRP process in turn feeds into and receives updates from the Cal ISO's transmission planning process. And finally, IRP oversees compliance and planning by LSEs and orders procurement when necessary.

It's a complicated web, but it works to ensure that state agencies and market actors are moving together in the same direction so that our generation and transmission system is on track to meet our climate goals while maintaining reliability and affordability.

Next slide.

So within integrated resource planning at the CPUC, there are two key uses for land use. The first use is in the development of the portfolios themselves. IRP staff utilize the RESOLVE Capacity Expansion Model to support the development of the portfolios. It's used to create an optimal least-cost portfolio that informs what type of resources and how many are needed within specific time horizons. And in RESOLVE, land-use screens serve as inputs to the model to help determine the magnitude and location of resource potential that RESOLVE can choose to optimize amongst. I'll be talking more about this in the next few slides.

The second use of land-use screens is in the busbar mapping of the portfolios being transmitted to the ISO for the annual TPP. And we'll be going more into this later in the workshop.

Next slide, please.

IRP and the RESOLVE model itself use a broad array of inputs and assumptions. These assumptions include resource potentials for the various renewable resources across California and the wider West. And we rely on land-use screens to help establish these resource potentials.

The inputs and assumptions were last developed at the start of the previous IRP cycle back in 2019. And with the current new IRP cycle, staff are working on an update to the inputs and assumptions. This effort was kicked off last fall. And the updated draft inputs and assumptions document will be shared publicly in Q2 of this year.

As part of these updates, staff will be overhauling the resource potentials in the RESOLVE areas. And as part of that update, CPUC staff are planning to incorporate the new CEC land-use screens once they are complete. These resource potentials used in RESOLVE are developed by applying a series of screens to filter out areas not suitable or not preferred for development. That process of screening begins with an area-wide potential for onshore wind or, in the case on the right here, solar. You can see at the top figure, this shows the estimated solar capacity factors across the entire state of California.

The first screens we apply are a series of techno-economic constraints, which represent areas where resources physically cannot be built, like in bodies of water or steep terrain, or areas of limited economic viability, such as very low estimated capacity factors or very small candidate project areas. These screens are being updated as part of the new inputs and assumption, and I'll talk about them in more detail next.

After these techno-economic screens are applied, we then apply the broader land use environmental screens, which includes the legally and administratively protected areas. For recent portfolios, IRP has been using a screen that combines RETI category one and two exclusions as those screens, but specifically includes the least-conflict areas from the San Joaquin Valley study and the preferred development areas from the Desert Renewable Energy Conservation Plan.

It's this third step here, the land use and environmental screens, where the CPE staff plan to utilize the new CEC's land-use screens, which will be replacing these screens that I had just described.

Next slide, please.

So the table here on the right is a preview of the proposed techno-economic exclusions from the upcoming draft of the 2022-2023 IRP inputs and assumptions (I&A). An important note is that this I&A process is still ongoing with the, as I said before, the draft report and stakeholder review coming in the next few months, so these criteria are not finalized and may be further adjusted based on feedback.

These exclusions are centered on the physical and economic viability limitations based on the technological assumptions for the resource types. These exclusions, as I mentioned earlier, include the steep slope areas, exclusions around urban areas and areas of high population density, and exclusions around key infrastructure such as airports, railways, and highways.

And then on the more economic side of things, we have exclusions around minimum capacity factors and minimum potential project areas.

It's important to, again, note that these screens do not exclude based on legally and administratively prohibited areas. Those areas, as well as screens centered around prime farmland or flood zones, those are left for the assessment in the subsequent land use and environmental screens. So some of those areas, like the legally and administrative protected areas, are eventually excluded from the final resource potentials, they're just not excluded in this techno-economic screen.

And as noted here at the bottom, although these screens have been in development, the CPUC staff have been sharing the screens with the CEC for their work on the land-use screens. And so we've been having back and forth and have been refining these screens throughout the past few months.

And for example, some of the few key changes that have been made since the last CEC workshop in the fall include a decrease in the excluded minimum candidate project areas down to 0.5 megawatts per kilometer squared, the re-inclusion of military lands as a prohibited area, and then the removal of exclusions centered on wetlands and prime farmlands because those are better accommodated within the CEC's land use sets that they are developing.

Next slide.

So these two maps depict the remaining potential for the utility-scale solar on the left in yellow, and onshore wind on the right in blue, after the draft techno-economic exclusions have been applied. The bold solid black lines indicate the resource areas into which the resource potential is binned for use in the capacity expansion model.

Next slide.

So our capacity expansion model RESOLVE does have some geographic granularity to selecting what renewable and storage resources. And this allows -- this granularity allows the application of different capacity factors, cost assumptions, and importantly available transmission capacity and potential transmission upgrade cost. So these resource zones or resource areas have been formed around the transmission system, the existing transmission system, as shown on the bottom left, and key constraints, so key transmission constraints that were identified in the ISO's recent transmission capability estimates white paper.

With some approximations and simplifications, each resource area is centered around a major transmission constraint or set of transmission constraints. So the shape of these zones or resource areas are guided by the transmission system. In total, we have ten areas for solar and storage and, at most, 15 areas of wind and geothermal within the main California modeling area; we have additional out-of-state resources, particularly for wind.

I'll note, though, it is important to consider that although we have 15 possible areas for wind and geothermal, that not all of those areas will have resource potential in them, particularly after the screens are applied. So RESOLVE is actually going to be modeling fewer than 15 for wind or for geothermal.

And so for each of these RESOLVE resource areas, once all the screens have been applied to the resource potential, the amount of megawatt potential is summed up and that serves as the amount of -- the total amount that

RESOLVE could choose from.

I'll finish with a quick note about the total number of 10, and then, like I said, the 15 for each resource type, is that that number is trying to strike a balance between capturing the geographic and transmission constraint granularity versus the RESOLVE computational load. As we increase the number of resource areas, the RESOLVE runtime can significantly increase, making running the model unwieldy. So we are trying to balance those two factors when we've developed the number of resource areas that we have.

Next slide, please.

So I will finish my summary of how the resource potentials are used in capacity expansion there and turn it over to the CEC to go into the details.

MS. BRAND: Thank you so much, Jared.

Okay, Hilarie, can we go to the next slide, please? And one more. Forward. Great.

Okay, so next, Saffia and I will present an update on the draft land-use screens for estimating technical resource potential informed by public comments received to the October draft. So in the following slides, we'll get into the details of how staff have responded to the public comments that were submitted and proposed modifications that we would like to make. We are seeking additional public input into these proposed modifications prior to finalizing the staff report later this spring.

Next slide, please. Okay.

This might be the most important slide in my part of the presentation, the intended use of this information. So it's important to clarify and spend some time describing what this analysis is and what this analysis isn't.

So the models and the draft land-use screens that you'll see in the following slides, they're for use in electric system planning, including SB 100 modeling and integrated resource planning. They are intended to inform these high-level estimates of technical resource potential rolled up, for example, at the level that Jared just shared of transmission zones. They're not intended to be used on their own to guide the siting of generation projects nor assess project-level impacts.

So these are for supporting system-wide modeling, for long-term energy planning. They are not seeking to identify specific development zones on the ground or locations for projects.

So next slide, please. Great.

I'm going to go very quickly through this because both Anthony and Jared laid a great foundation for how technical potential is estimated, but I'm going to go through this very quickly.

So just to recap what we heard from Jared, there's a couple of different key steps in estimating technical resource potential. There's the application of the techno-economic exclusion datasets or the techno-economic exclusion layer. That is the map with green, second box over to the right. Then to that, we apply a protected area layer that's meant to capture areas where development is legally or legislatively precluded. And then to that, the CEC applies additional environmental and land use spatial data to refine down the technical potential estimates.

What remains is then summed up to help inform the technical resource potential for electric system modeling. And the map on the far right has the RESOLVE zones as an example that Jared just shared with you to show how this information has been rolled up to that scale to then become an input into modeling.

Next slide, please. Okay.

So Jared also provided a great overview of the land-use screen that has previously been used by the state agencies. So this slide here is meant to serve as a reference to you all in public comments to refresh everyone on what the contents of that most recent land-use screen are.

So this land-use screen was used in integrated resource planning and the last SB 100 Joint Agency Report. It includes all the components that you see in the rows there, from techno-economic exclusion layer to exclusions from RETI, and then the priority development areas from the DRACP and the San Joaquin Valley A Path Forward least-conflict stakeholder planning process were included as inclusion areas.

The map here on the right shows the solar resource potential footprint from that land-use screen. And in blue, we have outlined the boundary of the San Joaquin Valley from the San Joaquin Valley stakeholder process, because this is an area that I want to highlight on the next slide to discuss some of the public feedback that we've received about this screen in the past.

So next slide.

So one of the pieces of feedback that we received about the land-use screen that has been used for several years now by the energy agencies is that it is not including information or not including resource potential from some areas of the state where there are either opportunities for low-impact renewable resource development or areas where we're seeing a lot of commercial interest and ongoing renewable resource development.

So this map here is meant to show, again, we have the solar resource potential in purple. And in green, we have solar footprints from a new dataset that my colleague Gabriel will be sharing a little bit later today, the CEC solar footprint dataset. And what we're trying to show here is a comparison between where solar energy development has taken place and where resource potential was identified in the last land-use screen.

So onto the next slide, please.

As I mentioned in the timeline slide at the beginning, the CEC staff started a process at the beginning of 2022 aligned with the 2022 Integrated Energy Policy Report Update to take a look at the information that has been used in the last land-use screen, as well as environmental information that was used in SB 100 resource mapping and busbar mapping and go through an interagency and public process to review those datasets, review the methods, and make updates.

Between January and October of last year, we hosted three workshops that discussed the process and potential updates to the land-use screens. And again, during that time, we worked with staff from multiple state and federal agencies to discuss the data that was being used and opportunities for updates.

In October, the CEC staff released a draft staff report and a draft results data viewer documenting that process and the proposed updates to the land-use screens.

The CEC received 27 docketed comments and nine public comments to our October workshop. And I'm going to summarize some of our high-level takeaways from the thoughtful feedback that we received.

One of the first points was that additional public process steps would be helpful before finalizing the cycle of updates. And today's workshop is directly in response to that. We wanted to create another opportunity to provide feedback into the process.

The second high-level takeaway is that there were gaps in the protected area layer that the agencies were using, and that there were some important datasets that needed to be added to that. And Saffia will describe that more in her slides next.

We also heard from multiple commenters that there should be more discussion around solar resource potential in critically over-drafted basins as defined by the Sustainable Groundwater Management Act.

And then finally, we received a number of comments that really recommended that the land use evaluation for the next SB 100 report include evaluation of the land use-related non-energy benefits of distributed energy resources.

We also received several comments relative to busbar mapping and the land use and environmental evaluation that's done for that process that we'll describe later on in the workshop.

Next slide.

This slide here is meant to capture and summarize the three land-use screens and their updated information that were proposed in the October draft staff report. These draft land-use screens were heavily informed and built on past screening approaches and past datasets used in land-use screening. They incorporated the same datasets but updated with newer information wherever possible.

A common question that we received was why we had three land-use screens, and it was because our team proposed to use each screen in a different way to support the evaluation of land use and environmental implications in long-term energy planning, so some similar parallels to what Anthony presented in terms of making different assumptions about land availability and really understanding what the implications might be in planning.

Having multiple screens which contains different assemblages of environmental data allows our team the analytical capability to compare the tradeoffs and implications across different scenarios.

I won't read through all three of the draft land-use screens from October in detail, but this slide is a reference for public comments and reviewing the updated proposal that we're going to share today. And at the bottom of this slide, there are links to the October draft staff report which provides much more information and the workshop slides from October as well.

Next slide, please.

So that brings us to today. In October, we put out three draft land-use screens with proposed updates to data. Today, based on public feedback and comments, we're proposing two land-use screens for estimating technical potential for land-based wind and utility-scale solar. These two proposed screens modify and replace the three that were proposed in October. The screens largely rely on the same datasets from the October proposal with some new data additions or modifications to the method, such as thresholds, as recommended in public comments or feedback from agency partners.

We will also today share an updated proposal for land use evaluation and resource potential estimation for geothermal energy resources. And later on in the presentation, we will detail updates and method changes specifically.

Next slide.

So this slide here presents a snapshot of the two proposed land-use screens that we're sharing today. The first row shows where staff proposed their use. So we're proposing a core land-use screen, which would be the default set of land use assumptions that we would recommend for integrated resource planning and across all the portfolios in SB 100 modeling.

We're also proposing what we're tentatively calling an SB 100 climate resilience study screen, which would be a sensitivity or study scenario in the next SB 100 report. This screen would bring in additional information around terrestrial climate resilience that you'll hear more about in just a little bit.

So this slide describes the modified screens. It's in a similar format, so in your comments, you can go back and compare it to the October proposal and to the previous land-use screen that's been used by the energy agencies.

I do want to highlight a couple of different points on here. So I've already highlighted where staff would propose to use these screens.

The second thing I want to highlight is if we look down to the results and the statewide potential, both shown in acreage and then also in capacity, the core land-use screen identifies 5.4 million acres for utility-scale solar, which roughly translates to around 780 gigawatts of capacity using a capacity density conversion of 7 acres per megawatt. For comparison, in the 2021 SB 100 report, the core scenario selected 70 gigawatts of utility-scale solar. So, therefore, the draft screen identifies over ten times the resource potential selected in the last SB 100 report. And this provides the capacity expansion model that is used, flexibility and optionality, when selecting a portfolio of resources and modeling.

The other point I want to make is on the land-based wind. So the revised screens identify more land with wind resource potential as compared to the October draft. This is driven by several factors, including proposed changes to the techno-economic exclusion layer, which Jared outlined, as well as proposed changes to the cropland model, which will be described by Saffia next.

We also propose to use a different capacity density metric for wind from the October staff report to what's reported today.

And then the final point I'll make is for comparison, the last SB 100 report selected 12 gigawatts of land-based wind from within California and across the western interconnection. And you can see on the slide here for land-based wind in the core scenario, we have around 3.4 million acres, or 84 gigawatts of technical potential.

Next slide, please.

So, with that, I'm going to hand the presentation off to my colleague Saffia Hossainzadeh to talk you through, specifically, the changes that are being proposed in the updated screens.

MS. HOSSAINZADEH: Thank you, Erica. Alright. Thanks.

Now I'll go into greater depth explaining our modifications since October.

Next slide, please.

So, here are the main topics of change that have been made.

The base exclusions, which are the areas where solar and wind renewable energy development is considered off-limits, have been adjusted. This includes the techno-economic layer, which you already heard about from Jared, and we also updated the protected area layer.

We filled data gaps based on feedback we received from the public and other agencies after the October draft.

Number three, we have updated how the general public lands, development focus areas, and variance process lands are considered. These are BLM lands in the DRECP. We are now including general public lands as having resource potential, which we did not include before, and are more accurately partitioning the DFAs by technology type.

Next point, number four, is we're using, has to do with the use of the CEC cropland model. The cropland model is a suitability model that the CEC developed and shared in October which emphasizes soil quality in the presence of existing crops.

Next, our use of the Conservation Biology Institute's terrestrial landscape intactness is being brought out more prominently. We are using it in the core land-use screen scenario and we use it standalone, not as part of a suitability model.

And finally, we have revised our approach to the biological component of the land-use screens. We are proposing to apply individual datasets instead of an integrated suitability model to refine the technical resource potential for use in energy system modeling.

Next slide, please.

So here you can see visuals of the two components of the base exclusions. The map on the left in teal shows the areas that are excluded by the techno-economic factors. The map on the right, shown in purple, are the protected areas that preclude energy development due to the area's specific designation of use. They include large swaths of public land, such as national parks, monuments, historic sites, state parks, wildlife reserves, and conservation areas.

BLM lands contain several categories of protected areas. The National Landscape Conservation System is one component, which includes wilderness areas, wilderness study areas, wild and scenic rivers, among other designations. There's also areas of critical environmental concern, or ACECs, recreation management areas, and greater sage-grouse habitat management areas that are brought into this layer.

Areas of U.S. Forest Service land that are protected came from inventoried roadless areas and special interest management areas on U.S. National Forest lands. This brings in experimental forests and research natural areas, among others.

We drew from California-specific datasets to include easements and Gap Status 1 and 2 conservation lands.

Those are the main categories of the protected areas that make up this layer. An appendix section at the end of the slides lists the data sources used in this area, in this layer.

Next slide, please.

So here's a map showing all the additions to the protected area layer that we've compiled since October, with the previous protected area layer overlaying them, shown in gray. Some of these added layers, like ACECs, the California Desert National Conservation Lands, wild and scenic rivers, had already been partially included from other data sources in the last report. So the majority of their footprints aren't visible here, but the improved data -- with the improved data sources, we've been able to fill the gaps in those designations.

We also have several new standalone datasets, like Mono Basin National Forest Scenic Area, Alabama Hills National Conservation Area, and Vinagre Wash Special Management Area.

We're also now including extensive and special recreation management areas and off-highway vehicle recreation areas on BLM land, which hadn't been included before.

And a new category of protected areas includes local land. We queried the two main protected area databases, CPAD and PAD-US, the CBI edition, for city- and county-level open spaces and parks. That brings in the big swaths of Orange in the Owens Valley.

We also included the proposed Molok Luyuk or Walker Ridge expansion to the Berryessa Snow Mountain National Monument.

Overall, our changes to the protected area layer increased the footprint by about four percent. And again, all of the sources for these datasets can be found in the appendix. And if you have any questions, contact me or the team.

Next slide, please.

Alright, the BLM created a land use plan amendment as part of the DRECP. BLM allocated the development focus areas and variance process lands as areas that could facilitate renewable energy generation while also preserving the important ecosystems of the California desert conservation lands.

The CEC received several public comments related to DRECP lands after the release of the draft staff report in October. Staff takeaways from these comments included the following: DFAs need to be correctly partitioned by technology type; the capacity of already developed renewable energy projects on BLM land needs to be subtracted out from the resource potential estimates; and the resource potential shouldn't consider the entire footprint of a DFA or variance process land because there are still limitations to the development.

So we propose to address all these points. Working with BLM, we have corrected the DFA partitioning by technology type. We will remove all existing project facilities on DRECP land from the resource potential estimate. And we will apply the statewide land-use screens over the DRECP, DFAs, VPLs, and GPLs so that the entire footprint of that layer won't contribute to our statewide technical potential estimate. And after meeting with BLM, we propose to include the general public lands with resource potential estimation.

So each of these components of the BLM lands are broken down and displayed in the map seen here on the slide. The black areas scattered throughout are the GPLs. The pink areas are the VPLs. And the remaining areas of teal, orange, blue, and purple are the DFAs broken up by technology type.

Next slide, please.

Alright, now we'll turn to updates on the CEC cropland model. The input datasets and configuration of the suitability model for areas of the state used for cropland have remained the same, so we didn't change anything to the model. But we proposed two modifications to the application of this model.

First, we proposed to change the method for partitioning the threshold from Jenks natural breaks to the mean value. And here you see a plot of how much of the cropland model gets partitioned into the high category and will be removed from the technical resource potential estimate as you vary the threshold. Overall, there is a linear rate of decrease in the percent of the cropland model that is removed as you increase the threshold, about ten percent per unit threshold. So partitioning the model by scores -- partitioning the model scores by a middle value like the mean is a mathematically fitting way to bin the data into high and low categories.

Moving the threshold to the mean results in a small increase of solar renewable resource technical potential, approximately 11 gigawatts or 78,000 acres. And we also limit the cropland model's use in our current screens to solar technology only. Because of the large spacing between turbines, it can be compatible amid agricultural fields.

Next slide, please.

So CEC staff received multiple comments that the land-use screens should consider implementation of the Sustainable Groundwater Management Act, or SGMA. These maps here depict solar technical potential in relation to the critically over-drafted basins as defined in SGMA. The basins are shown in purple and the technical potential is shown in black.

The purpose of this slide is to demonstrate the increase in solar resource technical potential within these basins from the previous land-use screens to the current proposal. The increase in solar technical potential is driven by multiple factors, including moving away from using only the least-conflict areas identified in the SJV, or the San Joaquin Valley, stakeholder planning process, as well as changes to the techno-economic exclusion layer.

For this cycle of updates to the land-use screens, staff consider the increase in technical resource potential within these basins reasonable for the purposes of statewide transmission planning while accounting for the range of potential land use change futures that could be driven by initiatives to bring the groundwater basins back into balance under SGMA.

Next slide, please.

So in the current proposed screens, we still use the Terrestrial Landscape Intactness data layer developed by Conservation Biology Institute, but we treat it differently. Terrestrial intactness brings in a critical element of the land use evaluation, estimating the amount of human impacts in the landscape.

In the October draft, the CEC created an additional suitability model that combined intactness and distance to a protected area with the intention to identify areas that are intact and close to protected areas as least suitable for new energy development. Based on feedback from the public and collaborating agencies, instead of using the suitability model approach, staff proposed to incorporate the raw CBI intactness dataset into the core and SB 100 study scenarios.

The dataset itself is a result of a suitability model, CBI's Environmental Evaluation Modeling System, or EEMS model, which brought in over 25 variables or datasets to create this layer. The intactness data layer is partitioned at the mean, so any cell greater than the mean is removed from consideration for a refined statewide technical resource potential estimate.

Next slide.

So for the representation of biodiversity-related factors of the land, the previous October draft screen used a suitability model based on ACE connectivity and ACE biodiversity datasets. ACE has been used in other major planning efforts by the state, 30x30, (indiscernible) and past CEC planning efforts, and it's intended to be used for statewide planning scale.

Based on feedback from the public and collaborating agencies, instead of using the CEC biodiversity model, staff proposed to instead use the data directly, as well as other important biological and habitat-related datasets, including the U.S. Fish and Wildlife Service Critical Habitat.

Next slide, please.

So here's a list of the datasets that will be brought together to form what we're calling the biological planning priorities component of the screen. Each of these layers is stacked in the GIS, and the union of their extents forms the footprint of the areas of the state that would be removed from consideration for statewide technical resource potential estimates.

So first, we include ACE terrestrial biodiversity. This is a summary dataset of the best available information of the biodiversity measure of amphibians, birds, mammals, plants, and reptiles in California. It takes into account three factors, native species richness, which is the diversity of all species in the state, irreplaceability, which highlights unique endemic species, and rarity, the diversity of rare species, into a single measure. So all three of those factors are brought together as the overall biodiversity score. And we remove the top 20 percent of values, or the rank 5.

Next is connectivity, which evaluates how an area contributes to wildlife being able to move from one habitat to another. Fours and fives represent essential mapped linkages and corridors, especially if they are the last remaining habitat connections for a species, or if a priority species move within them. And we obtained a recently updated version from CDFW that incorporates new ungulate data.

And next we have irreplaceability as part of our screen. Irreplaceability measures the uniqueness of habitat areas for rare endemic species. This means it emphasizes in the highest ranks rare species that can only live in a limited geographic extent. We take the top 40 percent of values of irreplaceability for our screen.

So next, we have the U.S. Fish and Wildlife Service critical habitat, including the bi-state sage-grouse proposed critical habitat. These are areas considered essential for the conservation of threatened and endangered species. Past state land-use screens have included critical habitat, including the DRECP SJV screen, and the CEC received comments from public participants and agency partners to continue use of these data and estimating technical resource potential.

For wetlands, we use a recently enhanced version from CA Nature, which includes a more comprehensive category of wetlands.

So using this new approach, especially for the high-ranking subsets of ACE data, we are more precisely carving out the most important aspects of the data so that those priority areas get screened from our statewide estimate of technical resource potential.

Using the suitability model approach in the last October draft, we would effectively be averaging the two input components, biodiversity and connectivity, so that if one component was high while the other was low, like if one had a score of four while the other one had a score of one, it would remain in the technical resource potential. While areas where both datasets had a rank, had a middling rank of 3, it would be swept up into the high category and would be screened out. So in this new approach, we are making sure we're getting -- we're including the topmost ranks of ACE data as being excluded in the high category, in the screened category.

Next slide, please.

Alright, so the SB 100 climate studies screen uses all of the components previously described plus ACE climate resilience ranks 4 and 5. These components are depicted in the figure shown here. The areas of the state in gray are the base exclusions for solar. Then in green are the areas of the resource potential that are removed by the core land-use screen for solar. The areas in pink, along the central coast ranges, scattered in the West Mojave and Northern California, these areas are removed by ACE climate resilience ranks 4 and 5. And so that leaves the area in blue as what remains as technical potential under the climate study screen. S

o these high-ranking climate resilience scores identify where climate refugia will exist under future climate conditions. These are areas of the state where climate conditions will still be suitable for the majority of species and vegetation that currently reside in it.

Since SB 100 is a long-term planning effort where electric system modeling will project out for 25 years in the future, we were motivated to design a study scenario that incorporates terrestrial climate resilience. Conservation of climate refugia is a part of adaptation planning and climate change -- or adaptation planning for climate change, so it's a way of building resilience to climate change if we plan for it now.

Further, the inclusion of this dataset addresses the recommendation from the last SB 100 Report, which is quoted here on the slide, to better align future system modeling with terrestrial climate resilience data.

Next slide, please.

Alright, so here are the results of applying the base exclusions and land-use screens for solar technology. On the left, the map that contains purple is the DRECP SJV solar technical potential most recently used by the CPUC in integrated resource planning and in the last Joint Agency SB 100 report. In the middle, we have our current results. This is the technical resource potential footprint that remains after applying the core land-use screens, which includes the base exclusions. On the right, we have the results from the SB 100 study screen, which is exactly the same as the core screen, except climate resilience is also incorporated into the refinement of the resource potential area.

Notice large contiguous blocks of land in the San Joaquin Valley, the West Mojave Desert. These are all areas where the resource quality, the solar irradiance, is high and developer interest has been established. Notice that the study screen removes a lot of the resource potential in the coast ranges and along the central coast. This is not the final result, though. This is an interim geoprocessing step that will be aggregated to a larger scale before being passed as input to the electric system model.

Next slide, please.

So in order to feed the available resource potential to the electric system model, like RESOLVE, the technical resource potential is broken up into these coarse areas, like these provided by the CPUC. And we sum all technical resource potential that falls within each area to get a total acreage or megawatt per RESOLVE area.

Next slide, please.

So, finally, this is the information that can be -- or this information can be summarized into a table showing how much resource potential is available from each RESOLVE region. This will be used in the capacity expansion modeling. Here you see the different RESOLVE areas in the leftmost column. Then I've listed the total area of each RESOLVE region. So for Northern California, it's huge, over 40 million acres, but most of them are only a few million acres.

Then I've listed the acres that remain as technical resource potential after applying the core screen. So you can see how much acreage exists within each RESOLVE resource area. Then I show the percent of that total RESOLVE area that has a resource potential. So mostly we have, you know, less than ten percent in most regions.

So you can see that in the largest -- yes. So with these upper limits on how much resource potential is available per region, RESOLVE or any other capacity expansion model can more accurately project how much new resource potential from each of these areas will be needed in an optimized future resource portfolio.

So under the SB 100 climate study screen, resource was reduced in all the regions. Now, when the electric system model receives this altered distribution of the resource potential, we will see how it responds. With a limited amount of resource coming from those areas, does it swap the resource from solar to wind or another technology from that area, or does it increase the amount of solar from another region of the state? So what pathway does it select to achieve the state's policy goals when given a slightly more restrictive statewide distribution of resource potential?

So this is what we're trying to test when giving the electric system model multiple scenarios. And that's more clearly seen in the last two columns of this table. So that's where we get the total resource potential coming from the core scenario from each of the RESOLVE regions and the resource potential coming from in the study scenario.

Next slide, please.

For wind, on the left, we -- so now here's the results for wind. So on the left, we have the DRECP SJV resource potential. In the middle, we have our newest proposed technical resource potential under the core land-use screen, and that's shown in blue. And on the right, we have the technical resource potential for the SB 100 study screen scenario. The spatial distribution of the technical resource potential shows that a significant amount of the resource potential exists in the San Joaquin Valley and the Sacramento Valley. Additionally, in southern Imperial County, we have a large footprint of resource potential as well.

You can see areas of critical habitat, like areas of the bi-state and greater sage grass area are much diminished, especially compared to the DRECP screen. But as mentioned before, this is an intermediate processing step. We don't use this detailed spatial footprint of technical resource potential by itself.

Next slide, please.

And instead, we sum the total resource potential by these regions, for example, in the case of the current RESOLVE configuration. And for wind, they're slightly more refined than solar. We have slightly smaller areas.

Next slide, please.

And so we can summarize the information, the spatial information, into a table like this. We have each resource area listed on the left, the total area of that zone listed next, and then the total acreage of resource potential that meets the screening criteria for the core scenario shown in that third column from the left, and the percent coverage of that RESOLVE area is next shown. You can see, generally, we have much smaller percent covers, even with the smaller footprint of technical resource potential for wind.

And then finally, we have the resource potentials shown in gigawatts converted from acres using a 40-acre-per-megawatt conversion factor. The climate study screen provides a reduction in the resource potential across all regions. And so this refined upper limit of resource potential from each region is ultimately how careful evaluation of the land use priorities using explicit geospatial datasets described previously is used in electric system planning.

Next slide, please.

Alright, so now we're going to get into the geothermal methods.

Next slide, please.

So for geothermal technologies, we apply a different methodology than for solar and wind, since the hydrothermal resources that traditional geothermal power plants utilize are only present in discrete areas of the state. The occurrence of geologic conditions required to develop geothermal energy are somewhat unique. There needs to be permeable rock that allows for sufficient flow of steam or heated fluids that have temperature greater than about 130 degrees C and that occur within a mile or two of the Earth's surface. So the hot fluids and steam produced from these depths is generally used to spin a turbine and generate electricity.

In California, these conditions occur in sufficient number and magnitude, but the state is the leading producer of geothermal energy in the United States. For our purposes, the goal for estimating statewide geothermal technical resource potential that can be used in planning efforts is to not only estimate the quantity of resource potential, but also the surface footprint that bounds where the heat from the geothermal reservoir could be developed. So this is where the land use evaluation will come into play.

Next slide, please.

Alright, so first we'll turn to estimating the magnitude of the geothermal resource potential. We use the USGS 2008 assessment of identified geothermal systems, which gives a point location for each geothermal system and estimates the underlying reservoir's volume, temperature, and electric power generation potential or the resource potential. We use their mean estimate in our work. We also include the Truck Haven resource identified in an environmental impact statement by BLM. And so the total estimate of resource potential for the state is about 5,444 megawatts.

This figure here shows the locations of the geothermal systems identified by the USGS with the addition of the Truck Haven site west of the Salton Sea. The USGS data is split by those that intersect within two kilometers of a geothermal field, and those are shown in the brown triangles, and those that don't intersect those geothermal fields that are shown in green.

Next slide, please.

So in our next step, we estimate a surface area that delineates the geothermal resource. This is where any land-use screen would be applied to refine the resource potential to a better representative value that takes into account statewide constraints. The majority of the geothermal resource potential identified lie within or within two kilometers of the established geothermal fields. These are the KGRAs and geothermal field boundaries shown in the Department of Conservation 2002 map and CalGEM's online data map data portal of field boundaries.

So we sum the geothermal systems identified by USGS that fall within two kilometers of each geothermal field to get the total resource potential from that spatial footprint, so this is what you see here in the figure. The orange are those known geothermal fields. And overlaying them are the point resources identified by USGS.

Next slide, please.

So for points that remain outside of a geothermal field, we approximate the land footprint that can be used to access and develop the geothermal field. We buffer the point resources by a certain radius using a power density of ten megawatts per square kilometer. We then calculate a radius and circular area to define the region needed to support the estimated resource potential.

So next slide, please.

So this chart shows the area of those constructed geothermal fields. The areas are at least in order of magnitude less than the other established known geothermal fields, like the KGRAs and the CalGEM field boundaries.

Next slide, please.

Ten megawatts per square kilometer was chosen for all resources outside of the geothermal fields on the basis of an international study by Wilmarth et al. in 2020. This chart from the study shows the power density from over 100 electricity producing geothermal fields worldwide and their estimated reservoir temperature. Staff reviewed the temperature data from the USGS data and for these resources, they are relatively low temperature, between 130 and 180 degrees. The temperatures would therefore be more typical of resources that would have a power density of about ten megawatts based on the Wilmarth et al. 2020 data.

Alright, next slide, please.

Alright, so now that we've created geothermal resource map with a 2D representation of the extent of the geothermal fields, we can apply a land-use screen to them. So here on the right are all the geothermal fields and the protected area layer is shown in blue. So like in the October draft, we exclude the resource potential from geothermal fields that lie entirely within the protected area.

Next slide, please.

Alright, so the final component of our analysis must include an estimate of the geothermal resource that's already in use by currently operating power plants. For that, we've turned to the QFER, the Quarterly Fuel and Energy Report, which provides main plate capacities of all generators of all the geothermal plants, one megawatt or greater. And again, we can partition those plants and sum them by geothermal field to get a representative value for each field.

And in the case of the geysers, this approach doesn't work. It produces inconsistent results because the actual production has changed over time. And the main plate capacities of those sites are overestimating the production. So instead, we use an estimate by Lovekin et al., which was based on energy generation data, so that's how we can subtract out the megawatts in use.

Next slide, please.

So again, for electric system modeling, we'll summarize the statewide estimate by broad transmission zones and pass the results along, summarized by coarse geographic zones, like shown here. The vast majority of resource potential is coming from Imperial, and the vast majority of technical resource potential comes from within previously established geothermal fields. So this gives us a total net undeveloped technical resource potential of about 3,354 megawatts.

Next slide, please.

So in summary, here are the results from all three renewable resources. We have the total acreage listed for each scenario, as well as their total estimated resource potential in gigawatts and megawatts and their proposed uses.

So this ends our presentation on the land-use screen. When this cycle of updates is complete, the full methods will be documented in a revised report. And if there's any additional analyses you'd like to see, we'd appreciate your ideas on that, as well as any questions or comments on our approach. Thanks.

MS. BRAND: Thank you so much, Saffia.

So Hilarie, you can advance to the next five or six slides.

But for the audience, just to let you know, attached to that set of slides are appendices with a table of all of the datasets in the screens and links to where to find the information.

So the next presentation we have is from Travis David with the STEP’s GIS Unit on updates to the draft results data viewer, so I'll hand it over.

MR. DAVID: Hello. Can you hear me? My name is Travis David. I'm a Research Data Specialist with the California Energy Commission, and I specialize in geographic information system projects. Using this technology, I created draft land-use screens Map Viewer, which I'll describe in this presentation.

Next slide, please. Or actually, one more slide. Yeah.

This Map Viewer is available to anyone who is interested and can be accessed through internet web browsers. The latest draft SB 100 land-use screen datasets are available as map layers, which can be viewed through the Map Viewer or downloaded. We are sharing this information to provide transparency to our proposed draft results, input datasets, and methodologies. We hope this information will assist stakeholders in preparing written comments responding to this workshop as we finalize this iteration of the SB 100 land-use screens.

This Map Viewer is not currently live. We intend to make the viewer live tomorrow, Tuesday, March 14th.

Next slide.

A web link to the Map Viewer will be posted to the land-use screens workshop website. Data will be available for download from the Energy Commission GIS open data website. Here are the web links to those sites, which will also be linked to from the Map Viewer itself.

Next slide.

The image to the right is what the Map Viewer looks like. It's a map of California with some of the SB 100 land-use screen layers on by default with groups of buttons on the top left, top right, and lower left corners. The top left buttons are for navigating around the map. You can use them to zoom in, zoom out, or return to the default mapped extent, which is the whole state of California. The top right buttons are for interacting with the map.

You can search for an address or location, open the layer list and legend. The majority of my presentation focuses on what data layers are available in this button. There's also a button to change the base map to things like aerial imagery or detailed street maps. And there is also a measuring button, which allows you to measure distances or areas.

The lower left buttons open up information about the Map Viewer and link you to a web page where you can learn about what each data layer represents and where you can download each dataset.

Next slide.

Let's focus on the layer list button found in the upper right. The button looks like three squares stacked on top of each other. When you open the button, there are two tabs, a tab called layers, which allows you to toggle different layers, many organized into groups, on or off.

The open eye symbol next to each layer means that the layer is toggled on. A crossed out eye means that it's toggled off. And the legend tab shows you what the symbols of all active layers represent.

In this example, we're looking at the solar resource potential by RESOLVE region core scenario. The darker the shade of each region means the higher calculated resource potential.

Next slide.

The first group of layers available in the layer tab is existing electric infrastructure. It contains solar footprints in California, a new dataset that Gabriel Blossom will discuss in the next presentation. Other data layers in this group are California power plants, electric substations, and electric transmission lines. These datasets are not -- were not used in developing the land-use screen results but are helpful in comparing the screens which are used for planning with existing related infrastructure.

Next slide.

The next group of layers are counties and RESOLVE regions. Counties are there for context and RESOLVE regions are the CPUC-made unit of measure that the land-use screens projected resource potential results are rolled up into.

Next slide.

After that is the results group which contains solar, wind, and geothermal resource potential for core land use and climate study screens with resource potential broken down by RESOLVE region. These results are what goes into other planning models and workflows.

Next slide.

There is a group of solar and wind base exclusions which combine techno-economic and protected areas exclusions with some known resource areas from the Desert Renewable Energy Conservation Plan as an inclusion.

Next slide.

Solar and wind protected areas or exclusions are composed of datasets that represent areas that have legal restrictions regarding renewable energy development.

Next slide.

Solar and wind techno-economic exclusions are a set of exclusions created by the CPUC with datasets that take into account things like railroads, airports, slope, flood zones, military installations, and others.

Next slide.

There is a group showing cropland suitability model where a cropland is given a suitability score on a scale of one being the least suitable lands for crops and ten being the most suitable. The top layer shows the threshold we have assigned as an exclusion for land-use screening. The bottom layer is the full cropland model.

Next slide.

Landscape intactness is a measure of landscape condition based on the extent to which human impacts such as agriculture, urban development, natural resource extraction, and invasive species have disrupted the landscape across California. Terrestrial intactness values are higher in areas where these impacts are less prevalent.

Next slide.

Climate resilience is a measure of sensitivity, adaptive capacity, magnitude of exposure, and potential spatial disruption of course vegetation communities under various climate change scenarios. Climate resilience ranks 4 and 5, the two highest ranks from the California Department of Fish and Wildlife's Areas of Conservation Emphasis Project, are exclusions in the SB 100 land-use screens.

Next slide.

And finally, we have a group of biological planning priorities which include data layers of high biodiversity, connectivity, irreplaceability, critical habitat, and wetlands which are exclusions in land-use screening.

Remember all of these layers can be toggled on or off. You can search. You can use the search button to zoom to your area of interest. The base maps can be changed depending on your preference. And the measuring tool is available if you're curious about distances or calculating areas.

Next slide.

The folder looking button in the lower left corner of the Map Viewer navigates to a web page that lists all of the mapped datasets along with information describing what each dataset is and a link to download the data in different formats.

If you click on one of the datasets -- next slide, this is the final slide of my presentation -- it's what the page looks like for each dataset. You're given a variety of information about the data, including when it was published and updated, a summary of what the dataset is, and a link to download the data in various formats.

Thank you for watching my presentation. I hope the Map Viewer is useful in showing our land-use screen results and methods. We look forward to hearing back from you in the comments.

The Map Viewer will be live tomorrow, Tuesday, March 14th. Thank you.

MS. BRAND: Thank you so much, Travis.

Okay, next slide, please, Hilarie.

Next, we have our last presentation for this section from Gabriel Blossom from the STEP’s GIS unit.

MR. BLOSSOM: Thank you, Erica, for that introduction. My name is Gabriel Blossom. I've been working with the CEC for the better part of four years now. Some of that work has been with SB 100, where I did work on solar footprints. And earlier you saw the crop model and I also worked on that.

Okay, let's get started talking about solar footprints.

So what we did is we created a layer. It is a GIS dataset that represents nonresidential solar footprints in the state of California. By nonresidential, I mean, we didn't map anything that was on someone's roof, basically. And we tried to capture areas that were about a half acre and larger.

And by footprint, we don't mean that we're mapping actual solar panels. What we're mapping is the facility that the solar panels are placed on, so a lot of times that's represented by a fence line, a rooftop, parking lots, that kind of thing.

And they included both rural and urban areas. This mapping project started, roughly, in November of 2022 and finished up in February 2023, so that was about a four-month process to put it together.

Okay, next slide, please.

Okay, so the last IEPR meeting that we had in October, it was identified that we needed to have some solar footprints to kind of do a gut check against some of the other work that we were doing to sort of truth it. So we looked around and we weren't able to find anything that was up to date, so we went on ahead and decided to make our own on the basis of aerial imagery interpretation and previous existing solar footprints.

Next slide, please.

Okay, so the layers that we found that were pretty useful was one from the Quarterly Fuels and Energy Report, that's called QFER. Another one was from the Conservation Biology Institute that was put together in 2017. There is a Utility-scale Solar Points from UC Berkeley. And there was also a layer from the journal, *Nature*, that we were able to find from 2022.

In terms of imagery, we used ESRI-based data imagery, which is updated at varying dates. We used the National Agricultural Imagery Program, NAIP, data from 2020. And we used Sentinel-2 satellite imagery at 10-meter resolution for January 2023.

So what we did is we had two analysts do a sort of old-fashioned imagery interpretation where we started one analyst at the northern part of California, one analyst at the southern part of California, and we just basically worked our way towards the center scanning imagery as we went to try to find all of the solar facilities and hand digitize them. Some of the solar facilities were identified earlier by the four layers I mentioned, and others were offset. And then by the end of it, what we did is we just merged everything together.

Okay, so the next slide, please.

Okay, let's talk a little bit about results.

We ended up with 5,435 footprints with a mean size of 23 acres, and that was, again, as of February 2023. There was a total of 128,790 acres in the state of California.

We made a couple of observations because we spent a lot of time scanning imagery, so you kind of, you know, you notice things. And one of the things that we noticed was a very, very fast rate of solar development in the state of California. I can't say exactly how fast, I just know that there were times where I would go into an area and digitize all of the rooftop solar, and then you'd go back two weeks later, and as we updated the imagery, and there's five new sites. And that was happening all the time, so it was very much a moving target.

Other observations included that large warehouse districts in Southern California, particularly in the L.A.

Basin, are missing rooftop solar. The reason for that is currently unknown. You can speculate as to why, but I'm not going to. It's just not there.

Rooftop and parking lot solar are more common in newly developed areas. So as you see the new developments outside of urban cores, where they're putting up, you know, a new Kohl’s, new Walmart, that kind of thing, you're seeing a lot more solar in those areas than you are in previously developed areas.

Solar gradually becomes less dense moving north to south, which makes perfect sense because you end up with – or, sorry, south to north, which makes perfect sense because you end up with less solar quality as you move north, more clouds.

School grounds have a surprising amount of solar. There are -- I would argue that maybe most large school parking lots in the state of California have some solar parking on them. It's also common to see solar, especially in Southern California, to see solar in playgrounds, which is nice because the kids get shade from that.

There are a lot of farms, relatively small farms, that have small to medium solar on the facilities. That was quite common.

Another observation is that solar on asphalt is very difficult to identify at times. Even a human eye can almost barely see it.

Next slide, please. Actually, can we go back to that previous one? I just want to talk about the image there.

That's the solar parking lot that's under construction. So this is a good example of a digitized solar parking lot where -- and that's Six Flags, if I'm not mistaken -- where you can see they're still putting in construction on the left-hand side of the parking lot.

And the other picture over on the right-hand side is the L.A. Warehouse District. You can see only one of those warehouses has solar on it, whereas you might expect to see much more solar in that area.

Next slide, please.

Just some patterns that we recognized during this digitization effort. Large-scale, moving from left to right, large-scale farming solar tends to look like the pattern that we captured there. It's not necessarily continuous. It tends to be broken up by parcels, the small to medium-sized solar facilities that are common throughout the San Joaquin Valley shown in the next image over.

We've also got, here in Sacramento, we've got rooftop and parking lot solar for IKEA and the adjacent Walmart in West Sac. There's an example of school parking there adjacent to the IKEA image. And of course we've got, where we're at now, we've got the DOCO, so that's the King’s Stadium, Golden One Center, followed by -- with Macy's next to it.

Above that, there's an area in L.A., east of L.A., where we've got some large rooftop solar followed by -- and also some, what appears to be a landfill that's been filled in and has some medium-scale solar placed upon it.

And then on the far right, we have the Ivanpah Solar Facility, a rather famous facility most of us have seen on the way to Las Vegas.

If we could go to the next slide, please?

So this is sort of an overview of the total of the state. As you can see, most of the solar footprints are in areas where you've got a reasonable degree of human footprint already.

And in terms of next steps, one of the things that we're doing is we're classifying the solar data into ground, rooftop, and parking lot solar. We're also going to classify it by urban and residential. And we're going to add a unique date field. Everything that I've identified so far is going to be round one. But if we set up an update schedule per year, then we'll be able to apply that date field and hopefully actually watch it grow over time.

And that concludes my presentation. I think we've gone pretty fast, didn't we?

MS. BRAND: Thank you so much, Gabriel. I appreciate it.

Okay, thank you so much to all of our presenters -- excuse me -- Anthony, Jared, Saffia, Travis, and Gabriel.

We're now going to spend some time here on questions on the presentation before we move into a break and then the second section on today's agenda, so if our presenters could turn on their cameras in case questions are directed towards you?

I first want to check and see if the Vice Chair has any questions for our presenters from the CPUC or the CEC on the contents of their staff presentation on technical resource potential.

VICE CHAIR GUNDA: Thanks, Erica. That was pretty dense material I'm trying to digest, but really appreciate, you know, the GIS work and the mapping work that both Travis and Gabriel presented. I think it's really good kind of work in the spirit of the vision of the CEC on making more and more data available. So just wanted to thank you both. And we could, you know, potentially have briefings separately on those things and understanding the features of that.

So I want to, you know, save most of the time for the questions from potentially the stakeholders and public who are calling in, but maybe start off with a couple of questions.

Saffia, if we could pull up your -- bring up your slides? I just wanted to get a little bit of one of the summary slides you presented in terms of acreage and the total potential. You kind of went, you know, pretty thoroughly, but I'm trying to digest the information that you were providing, specifically the San Joaquin Valley and the fallowed lands and how we could use some of those additional lands for development. I think it's something we've heard before.

Would you expand on that a little bit, kind of what did we do since October in terms of specific coordination with the stakeholders and what kind of input you tried to include in expanding that overall area? It would be helpful if you could just expand on that. I'm specifically thinking about the process.

MS. HOSSAINZADEH: Yeah, sure. I don't know if, Hilarie, if you could go to the slide called solar resource technical potential and critically over-drafted basins? It probably will give people a good visual.

But basically, so for that assessment, all I'm doing is showing -- so in purple you have the critically over-drafted groundwater basins. And then I'm showing in black where each of the technical resource potential exists under these various screens. So DRECP SJV screen, that's what's currently being used in IRP. So the resource potential is just kind of in those more defined areas like the San Joaquin Valley least-conflict areas as identified in that report. And then actually a lot of that, kind of that groundwater basin, that's not really part of the San Joaquin Valley, there's an abundance of technical resource potential there to the west of the San Joaquin Valley.

And then in the middle plot, that's showing just the resource potential under our October draft land-use screen one. So this would be including, you know, the base exclusions, so that would reduce the technical potential, and also just ACE biodiversity, the CEC biodiversity model, which was ACE biodiversity and connectivity, and then also the cropland model. So that also came into play here.

So that created a total footprint much higher than what we saw in DRECP, but still 1.3 million acres amongst -- throughout the whole -- throughout all of the critically over-drafted groundwater basins.

And then if we move to our current proposed core land-use screen --

VICE CHAIR GUNDA: I'm sorry, one clarification there.

MS. HOSSAINZADEH: Yes?

VICE CHAIR GUNDA: So between DRECP, and then as you go down there, you know, to the west, that little -- I'm sorry, the almost kind of a trapezoid shape or a rhombus shape to the side, you know, some of the solar potential actually reduces in some of the areas and some areas it grows. Could you kind of share a little bit on, you know, where it decreases and where it grows, like between the DRECP to the work that is currently here?

MS. HOSSAINZADEH: Yeah.

VICE CHAIR GUNDA: So specifically I'm thinking like, why did some of the areas reduce from DRECP? If you could just kind of point to that a little bit, that'd be helpful.

MS. HOSSAINZADEH: Yeah, so the, I mean, the main -- the bulk of the San Joaquin Valley that's shown here in the DRECP SJV screen, the only places where technical potential is allowed was what was already determined by the San Joaquin Valley A Path Forward study, that planning process. So it only included areas -- it was about 500,000 acres of areas considered that was agreed upon in that planning study as priority least-conflict areas, potentially least-conflict areas, and least-conflict areas, I believe. Those were the terms. So like in the San Joaquin Valley, that's basically the only, everywhere else was excluded from technical potential except for those areas designated by that path planning process.

So that's why like when we don't have that constraint and we're not including that specific planning process in the October draft, that's why we see so much more resource potential. But we still have a significant overlap with the priority least-conflict areas of the San Joaquin Valley A Path Forward study, because actually we ran numbers and I think we have about 50 to 60 percent coverage of those priority least-conflict areas. So that's why like in the main central valley, San Joaquin Valley, you're seeing growth in resource potential.

And then as far as why it reduces, I mean, overall, like we're just kind of uniformly applying those ACE datasets in our biodiversity model and then the cropland model as well. We're uniformly applying all those datasets throughout the whole state. So it's just you're coming up with, you know, the proportion of those areas that would be removed by the thresholds chosen, whereas, you know, in the DRCPSJV, there wasn't any suitability modeling being done, I don't believe, so it would just be the result of these kind of discrete datasets that were chosen in the RETI planning process.

VICE CHAIR GUNDA: Got it. And so the other piece, I know we've heard in October and after the draft results, is kind of thinking about the commercial interest and how do we overlay that. You know, could you walk through an example on how that was overlaid and how it's considered?

MS. BRAND: You want me to take that one?

MS. HOSSAINZADEH: You can go.

MS. BRAND: Okay. Yeah. So I think one of the ways that we double checked the proposal for the land use greens was against the solar footprint dataset that Gabriel just presented. We wanted to understand if areas with technical resource potential, how they did or did not relate to where we have been seeing utility-scale solar development within the state.

So the San Joaquin Valley is a good example of that. I showed a slide earlier where we had the resource potential from the DRCPSJV screen compared to where solar installations have gone, and there's been quite a bit of solar installations within the San Joaquin Valley outside of the lands from that stakeholder process that were identified as priority least conflict.

So taking this region as an example from a process perspective, we took the feedback that more resource potential should be identified in the San Joaquin Valley because the San Joaquin Valley least-conflict stakeholder planning process is about seven years old, six, seven years old by now. We have commercial development happening there and multiple stakeholders commented on the potential for lower impact solar energy development.

So we took a look at the October proposal. We met with our state agency partners that focus on agriculture, that focus on groundwater to kind of double check our assumptions and our use of data or understanding both cropland, the geographic extent of the over-drafted basins to get their perspective into how the information is used, as well. And that, the results of those conversations, have led us to the results here on the right where we feel like we are identifying more technical resource potential in the San Joaquin Valley than has been identified in past screens.

Again we're not, you know, trying to map these parcels here in black as places to develop projects. What we're trying to say is overall from the San Joaquin Valley, are we assuming enough like gigawatts of utility-scale solar for the purposes of input to either long-term energy study like an SB 100 or the transmission planning process? If we look back to the 20-year transmission outlook, you know, most of the utility-scale solar development studied in that scenario was located in the San Joaquin Valley.

So I would say those are all ways that we tried to check our decisions against what we were seeing in other studies, what we were seeing in the solar footprint dataset and what we were hearing from public commenters.

VICE CHAIR GUNDA: Alright. Thank you.

One quick question to Travis.

You know, Travis you talked about kind of some of the data that you're making available, you know, starting tomorrow, you know, what are the steps, you know, being taken to -- I mean, especially in this land use work, maybe the first question is do we have confidential information designation to any of the information that we currently have in terms of the locations of the power plants? I just am not sure. I have no idea. So if you want to educate, what level of confidentiality do we maintain on some of that information?

MR. DAVID: Yeah. Our power plant dataset has come into question in the past, whether or not that information is confidential. There were alternative datasets online, including a power plant dataset, public, made by the Department of Homeland Security. And there's also a substation transmission line dataset, as well. And we took that information and went to our legal department to see if location alone deems power plants confidential and it was found that it's not. So that's the reason why we made our power plant and substation and transmission line data public.

Any of the other SB 100 land-use screen datasets are not confidential.

VICE CHAIR GUNDA: So I'll give you a quick question for you. I don't know if it's really formulated yet, but as you were presenting quickly there and I was trying to digest, is some of the work that you're doing automated in terms of, you know, pixel reading and such or are you manually really looking at those areas?

MR. DAVID: Oh, for creating the solar footprints?

VICE CHAIR GUNDA: Yeah.

MR. DAVID: Do you want to do that Gabriel?

MR. BLOSSOM: Yeah. No, it was a manual digitization effort. And the reason we decided to go that route was because we noticed from the previous work that had been done that solar tended to exist in clusters, so we didn't actually have to scan the entire state. We scanned the vast majority -- well not the vast majority. We scanned the majority of the areas where we were likely to find solar, so it's not like anybody was looking up at like, you know, the mountain ranges or anything like that because there's nothing up there.

So yeah, it was a hand digitization effort just using a little fashion human pattern recognition.

VICE CHAIR GUNDA: Thank you. One last question and I'll stop there.

and maybe Erica, maybe 30,000-foot level, you or Jared can speak to this, how much information do we have on the geolocation of the clusters, like CAISO clusters? So in the CAISO cluster process, is there a geocoding of the project? One. If it is, you know, how do we crosswalk or not with the datasets that we're using for commercial interest?

MS. BRAND: Jared, do you want to take that one since --

MR. FERGUSON: Yeah, I can.

MS. BRAND: -- it comes up a lot in the busbar context?

MR. FERGUSON: Yeah, and this definitely comes up a lot in the busbar context because we do pay a lot of attention to the commercial development interest per the queues that the ISO and the other interconnection agencies have. And with that information for like the ISO interconnection queue, we have the point of interconnection. So we typically have the substation or in some cases just the transmission line where the proposed, where the project wants to interconnect at, so we know like the county and then the substation location.

For most resources, we can assume that it's not going to be significantly far from that substation because the cost of interconnection is a big cost factor to consider, but we don't have an exact location of -- we don't have like a longitude latitude of the proposed projects. We just have that interconnection information and the county level information.

VICE CHAIR GUNDA: Alright, Jared, so just to follow up on that, in terms of the CAISO's, you know, queue reform and things that they're trying to do right now, how much of our kind of land-use screens to your spatial work is used to inform, you know, the opportunity and the commercial interest and such in the queue reform?

MR. FERGUSON: I'm not sure how much it gets applied directly into the queue reform. It does go in through our busbar mapping work into the portfolios that get sent for the transmission analysis. But on the queue development side, the ISO is not incorporating any sort of land use analysis when they're conducting the interconnection studies for the most part, and they rely on information from the developers on such things as site exclusivity or information like that.

And so I don't think on the ISO side they do much land use analysis with respect to the interconnection process. They're mostly focusing on the transmission implications of the interconnection.

VICE CHAIR GUNDA: Thank you.

Okay, I'll pass it back to you, Erica. Thank you so much.

MS. BRAND: Okay. Thank you.

So we will now move to questions from attendees, but we please ask that this time be used for questions specific to the content that was just presented, so clarifying questions of the like. If you have comments, please hold them for the public comment period, which will happen at the end of the workshop.

So we are first going to start with questions in the room, and then we'll move to virtual participants. We'll be using the raised hand for virtual, so if you have questions, you can raise your hand now to get in line, but I will first turn and see if there's any questions from the audience.

Okay, so we have a question. Please state your name and your affiliation for the record, please.

MR. KIM: Daniel Kim with Golden State Clean Energy. I just wanted to ask a question regarding the busbar mapping discussion that just occurred.

In regards to the kind of the way in which the constraints are analyzed in the busbar mapping, the land use component of the RESOLVE modeling is a critical piece of identifying how those constraints are determined, and then whether those constraints, once they're, you know, met, then the resource allocation will then go to another zone that doesn't have a constraint.

I think the, at least from what I understand, the goal of kind of some of the reforms in busbar mapping is to look at potentially identifying maybe new kind of transmission upgrades that are necessary in areas that do have constraints, for example, in the San Joaquin Valley with solar, because not all constraints are equal, I guess is what I'm trying to ask, you know, the staff.

Because when you look at the amount of acreage that is now being studied in or being pushed into the RESOLVE model for studying in the San Joaquin, I would argue that the transmission capacity study should also be aligned to the acreage study, so that given that there's constraints already there, the ability to put in a new, you know, transmission line or a new transmission infrastructure to increase capacity actually results in, you know, actually creating more generation from the land that is being actually identified through the process.

So I'm just wondering how that's kind of working in parallel, you know, as you're developing this land use, the new updated land-use screen?

MS. BRAND: Thank you for that question, Dan. So we'll actually be covering more about busbar mapping in the next couple of presentations.

Jared, is there anything that you want to speak to Dan's question now, or are you planning to address some of those pieces in your presentation next?

MR. FERGUSON: I can briefly address some of it now.

MS. BRAND: Okay.

MR. FERGUSON: And I think sort of towards the point that what we've been seeing with these land-use screens is that in the San Joaquin Valley area, we have likely over a million acres remaining, and if you do the rough conversion to potential megawatts, it's over, I don't want to do math live, it's at least over 100 gigawatts, so it's definitely in these cases --

VICE CHAIR GUNDA: Erica, just FYI, I think the conference room, you might want to turn off the mic.

MS. BRAND: Thank you.

MR. FERGUSON: Okay. I think one of the other mics is still on, I was hearing. Alright. I don't hear myself anymore, I think.

So what I was saying is that, yeah, I agree that I think in a lot of cases, the transmission capacity is the limiting factor. And we rely on the Cal ISO's transmission, various studies, mostly recently. And then as part of updates this year, we're going to be getting new information from the ISO on transmission capacity and, more importantly, potential transmission upgrades. And they're developing and amalgamating that information from the recent Cluster 14 Phase 1 Study results, and that Phase 1 Study had, you know, over 100 gigawatts of potential resources, so we're hoping to get a lot of transmission upgrade information from that to expand on the past upgrade information we've been using, because as our portfolio sizes have been getting larger, we've been running into an issue of having limited transmission information.

I'll just note, we can't hear anything on the remote side of things.

VICE CHAIR GUNDA: Yeah, we can hear now.

MS. BRAND: Okay, great. Thanks.

VICE CHAIR GUNDA: Sorry, Erica, we were able to hear you, but not the person who might be speaking you're looking at.

MR. HARRIS: Okay. So now I presume you can hear me?

VICE CHAIR GUNDA: Yes.

MR. HARRIS: So at a high level, you start with your technical potential, and then you adopt certain additional screens, and ultimately, you are left with a list. Is there an effort at that point to rank order the value of the locations that are on that remaining list? So not sort of this sequential Boolean approach that gets you there, but once you get there, then how do you rank order? Is that a policy question, or is there a technical effort to rank order those?

Thank you.

MS. BRAND: That's a good question.

So hopefully, yeah, that's off. Let us know if you hear echoing, audience or other panelists, please.

So, correct, we start with statewide hypothetical resource potential, and then we apply the different datasets and layers to refine it down to technical potential estimates across the state. That then becomes an input to capacity expansion modeling. And so how the capacity expansion model decides to select and build the portfolio is going to depend on a number of optimization factors within the model itself. So it might select some solar from Southern California, some solar from the San Joaquin Valley for different reasons that can range from reliability and cost to others.

We have received comments that it could be helpful for the energy agencies to go from, you know, broad suitability maps to refine it down to developable areas, but that would be a different initiative itself to do something like that. That would require a lot more on the ground information and local input to kind of take information from a statewide scale using broad factors down to more refined, like, developable areas.

MS. ANDERSON: Erica, this is --

MS. BRAND: Alright. Thank you.

MS. ANDERSON: -- this is Hilarie. Could you have the last commenter state and spell his name for the court reporter and the transcript? Because we missed that with the mic being off.

MS. BRAND: Okay. Thank you. Do you mind doing that again, Frank? Do you want to come over here?

MR. HARRIS: Hi. My name is Frank Harris. I'm with the California Municipal Utilities Association.

MS. ANDERSON: Thank you so much.

MS. BRAND: Thanks for your flexibility, Frank.

Okay, Hilarie, I think we can move to questions from our virtual attendees if you'd like to help facilitate that for us, please?

MS. ANDERSON: Of course.

So anyone that -- again, this is for questions on the content specific to what was just presented, if you have any comments that are public comments, those will wait for the public comment period at the end. So, go ahead and hit that raised hand if you do have a question. If you are on the phone, that will be star nine to raise your hand and then a star six to unmute. And so I have a couple.

We have Shannon Eddy, so Shannon, you should be able to unmute your line and ask your question.

MS. EDDY: Excellent. Hi, everybody. Thanks for today and really for all the work that you all have done over the last few months. I know this has not been an easy lift. So I have five questions. I'm going to try to shear it down to four. Is it better for me to just do them one by one or do you want them all at once? I'm thinking one by one.

MS. BRAND: I'm thinking that, too, so we can remember them all better.

MS. EDDY: Okay. Alright. And I didn't -- anyway, Shannon Eddy with the Large-Scale Solar Association.

So the first one, and Erica and Saffia have heard this, although I'm hoping you may have dug in on some of this, the use of the climate resilience layer does exclude quite a bit of acreage on the model assumption that species are going to migrate to those areas due to climate stress. And so it's logical to assume that other areas and habitat will be degraded under those same climate stress conditions, but that's not reflected in the model. Is the state planning to model climate stress related habitat degradation for this planning purpose?

MS. BRAND: So just to take a quick step back, one of the reasons that our team has proposed to use the terrestrial climate resilience data is thinking to the recommendation from the last SB 100 Joint Agency report that says that future system modeling would be aligned with the executive order for natural and working lands climate strategy, and so this is one of the datasets that came to us when we asked for feedback on what kind of spatial information might be available to help align our modeling estimates.

You know, I am not familiar with any analyses underway that looks at the other side of the question you're asking in terms of land that may be degrading. But that is something that we could certainly ask some of the collaborating agencies that we've worked with that have authority and jurisdiction, you know, over specific species and habitats that might be able to give us that advice. It's not something that we ourselves here at the Energy Commission are planning to model.

MS. EDDY: Okay. No, that would be great. I appreciate that. It's when we consider -- well, that'll be a comment thing. I'll just keep going through the questions. Thanks for that, Erica.

Can you talk a little bit about how local ordinances are currently included? I'm still threading through the techno-economic exclusion layer and the NREL layer and trying to figure this out, but are local ordinances that prohibit, for example, solar, are those included in the exclusion layers?

MS. BRAND: We do not have local ordinances included at this time in the datasets that comprise the land-use screens.

MS. EDDY: Okay. Thanks for that. I wasn't sure just based on the NREL presentation earlier, so that's good to know.

Can you just talk, just to lift up a little bit, can you talk a little bit about the use of the core land-use screen versus the SB 100 climate study screen and where those will be applied?

MS. BRAND: So our staff recommendation is that the core land-use screen would be the core set of land use assumptions for integrated resource planning, so it would be the land-use screen for integrated resource planning, that would be our staff recommendation. And then also it would be the land-use screen for all of the cases in the next Joint Agency SB 100 report. And then what we'd like, what we're proposing, is to have a sensitivity scenario in the next SB 100 report that uses that climate resilience study screen. So the SB 100 climate resilience study screen would be a sensitivity in the next report, it would be its own portfolio, so that we could compare the differences between that portfolio against the core cases.

Does that help clarify?

MS. EDDY: It does. That's very helpful.

One other addendum there, and that is the 20-year transmission study that the CAISO does, the core will be informing that, or would the SB 100 be informing the study case?

MS. BRAND: I feel like it might be too early to say with certainty, but I believe -- and if others, if this is incorrect, please correct me -- I believe it was primarily the SB 100 core scenario from the last SB 100 study that informed the starting point scenario that then went to the CAISO for the 20-year transmission outlook. And so if that were to happen again, then the core land-use screen would be the land-use screen that staff are proposing for the next, you know, whatever iteration of an SB 100 core scenario appears in the next report.

But I think, bottom line, it's a little too early to say with certainty because that framework is still being developed for the next report.

MS. EDDY: That's helpful. Thanks for that.

And then one other question, and that is it looks like the protected area, the protected areas grew to a certain extent. Can you clarify what the exclusion buffer distance is from those protected areas? It was one kilometer in the last rev.

MS. BRAND: So in the October draft, we had proposed use of a combined model that looked at distance to protected areas and intactness.

Correct, Saffia? Okay.

And in this proposal, we are just using the CBI intactness model directly, so we are not proposing to use the distance to a protected area component of a suitability model.

Anything you would add to that, Saffia?

MS. HOSSAINZADEH: Just the protected areas layer itself doesn't have any buffer attached to it.

MS. EDDY: Gotcha. Okay. Okay. Oh, and I said I wouldn't -- I'll just make this one really quick.

The technology partitioning in the DRECP area, does that mean that technologies will be excluded in certain DFAs where specific technologies are designated, I mean, one technology will be excluded over the other kind of thing? I'm thinking of Imperial.

MS. BRAND: What we're trying to do is accurately reflect what is in the DRECP Land Use Plan Amendment and some DFAs only allow one type of energy development, for example, or two types of technologies. And so we don't want to accidentally like say that all technologies could be developed there when that DFA itself might have a specification within the land use plan amendment.

MS. EDDY: Got it. Okay. Thank you. Looking forward to the next session. Appreciate your time, everybody.

MS. BRAND: Thank you.

MS. ANDERSON: Great. Okay. Thanks, Shannon.

We're going to move on to our next team that's raised and that's Ellen Wolfe.

Ellen, you should be able to unmute yourself and ask your question.

MS. WOLFE: Hi. Yes. Thank you. My name is Ellen Wolfe with Resero Consulting, and I appreciate the opportunity to ask a question.

I have a few clients that participate in the SB 100 process and in IRP, and my question pertains to the geographic boundary of the land-use screens at both the CPUC and the CEC, and maybe in SB 100 as compared with IRP if they're different.

For example, some of Jared's slides show that the boundaries in the CPUC process don't naturally always follow the state boundaries, that there are areas quite adjacent to California that are on the CAISO grid from which some of the California entities procure the renewable resources needed to meet their goals, yet, a lot of the land-use screens that I saw in the CEC presentation in particular seemed very exclusively limited to California.

Could you address that, please?

MS. BRAND: Yeah, so essentially the approach for in versus out of state from a land use perspective is the same from the October draft where we have focused a cycle of updates on updating California-specific information. The information that is used for outside of California, the joint agencies have in the past relied upon information from the Western Electricity Coordinating Council Environmental Data Task Force information.

We definitely heard the public comments about improving out-of-state data would be important to do. But from a resource and a time perspective in this cycle of updates we focused on California updates, but in parallel we'd like to explore opportunities and additional data sources to update what might be available in the West through future efforts on SB 100.

MS. WOLFE: Thank you. That's helpful. If I could maybe just ask a follow-up?

I would presume from your answer that it doesn't necessarily mean that you think the availability is zero outside of California, but just that the results you show in these slides pertain to California and you look to other sources when it comes to potentially identifying resources adjacent to California that can meet California goals?

MS. BRAND: Yeah, that's correct, and we've tried to footnote wherever possible on our slides that for the purposes of this deck our calculations were illustrative for California, so you're correct.

MS. WOLFE: Thank you. Appreciate the day.

MS. ANDERSON: Thanks, Ellen.

We're going to move on to our next person who has a question. It’s Brian Biering.

If you could state your name for the record? You should be able to unmute your line and ask a question.

MR. BIERING: Hi, it's Brian Biering with the American Clean Power Association of California.

First off, just want to thank you all for the public process, disclosing the map. All of this has been really helpful to really better understand the process, so really appreciate all staff suffered on that.

My question is directed at Jared. It was in relation to how you were talking about the IRP modeling, so in particular the preparation of the preferred system plan. And it sounded like you were essentially going to be applying the land-use screens in this cycle to inform, you know, how much capacity from various zones can be selected by the model.

An my question is if you're doing that in the preparation of the preferred system plan and then you prepare the capacity expansion results to then be modified again by the busbar mapping, would you essentially be applying the land-use screens and the limitations in certain areas twice by virtue of applying it on the front end and on the back end?

MR. FERGUSON: So we're applying it on the front end and the back end, but it's in two different ways. On the RESOLVE side, it's to just determine -- in the San Joaquin Valley, there's 80 gigawatts of solar potential. That's what the land-use screens are being applied to the resource potential. So I just made up that number.

On the busbar mapping side, we look at a more granular. We're looking at within a certain radius of a substation how many acres are within the land-use screen or so forth. And so that then tells us at a different geographic granularity sort of like how much land around a substation or in a certain area could solar be built on. So we're not sort of re-slicing or we're not chipping away at the amount, we're just applying it at different geographic granularities between the two processes.

MR. BIERING: Okay. I think I get it, so thanks for that.

And then I also wanted to follow up real quickly on Ellen's question. So we've also been, you know, hoping to see some, you know, better regional information coming out of the busbar mapping process. And I was curious, you know, even if you still focus on in-state busbar mapping, you know, relative to the CAISO system, will you still be identifying maximum import capability that's in upgrades in particular that are needed inside CAISO system to facilitate larger amounts of MEC?

MR. FERGUSON: Yes. And we did implement this for this most recent TPP portfolios where we identified areas or sort of the likely locations of out-of-state resources and also the likely intertied points into the ISO and noted whether or not the ISO should treat it as MEC expanding or utilizing existing MEC. And most of all the sort of the new generic resources selected by RESOLVE were identified as MEC expanding in that process.

MR. BIERING: Got it. So this would essentially be tracking the same way that you did the inputs and assumptions for the current TPP cycle that we're about to go into?

MR. FERGUSON: Correct.

MR. BIERING: Okay. Thank you.

MS. ANDERSON: Great. Thank you, Brian.

Okay, And then we have our next commenter, Kyle Navis. Sorry if I missed your last name. Please state your name and record. And you should be able to unmute now.

MR. NAVIS: Hey, everyone. Thanks. This is Kyle

Navis with the Public Advocates Office at the CPUC.

First off, thanks for all the hard work that goes into these. I do find myself revisiting these decks regularly, so I do appreciate the resources.

This question is probably for Saffia, and it's about geothermal. Did your geothermal screening include any assumptions about enhanced geothermal systems tech? And if not, do you have any plans to do so in future iterations?

MR. FERGUSON: We can't hear you. You have to have to unmute the conference room probably again.

MS. BRAND: On my mic? No. Okay.

MS. ANDERSON: There we go.

MS. BRAND: Okay. Go ahead, Saffia.

MS. HOSSAINZADEH: Okay. Yeah, no, we did not include any estimate from EGS, or enhanced geothermal systems. We only used traditional sources. And we came to that conclusion based on feedback we received from other agencies. I don't think we plan on using them going forward because we feel like it's too much of a -- we don't know, you know, how soon those technologies could really be implemented.

MR. NAVIS: Alright. Thanks very much.

Good afternoon Thank you, Kyle.

Okay, that was the last hand I see raised, so this is the last call for any questions online on the Zoom. Use the raise-hand function. If you're calling on the phone, star nine to raise your hand.

Okay, I'm seeing none.

MS. BRAND: Thank you for double-checking, Hilarie. Okay, so next slide, please, Hilarie.

Two things. We are still going to take a five-minute break, because I assume many of you, like me, need it the day after daylight savings time change. And you'll note that our -- it's now 3:50, so let's be back at 3:55. You'll probably also notice that on the workshop schedule, we had an estimated end time of four o'clock. We are going over that, so thank you so much for sticking with us today. Looking forward to coming back from the break to talk about busbar mapping, questions, and then public comments, so thank you. See you in five minutes.

(Off the record at 3:49 p.m.)

(On the record at 3:55 p.m.)

MS. BRAND: Alright. Well, welcome back, everyone. It's 3:55 by my clock. This is Erica Brand in the hearing room in Sacramento, and we are now going to move on to the next part of our agenda, which is focused on busbar mapping.

So welcome back, Jared, from the CPUC.

I'm going to hand it off to him to provide an overview of the CPUC's busbar mapping process.

So thank you, Jared. Take it away.

MR. FERGUSON: Thanks again, Erica. I am, again, Jared Ferguson, and I'm going to give a brief, high-level overview of the annual busbar mapping effort.

Next slide. And next slide, please.

The busbar mapping incorporates land-use screens as a process to help prepare the resource portfolios being transmitted to the ISO for the annual transmission planning process. As I noted before, the IRP resource portfolios consists of geographically coarse amounts of resources. To be studied in the TPP, however, the ISO needs the resources at a substation or busbar level of granularity. Thus, resource to busbar mapping is the process by which a Working Group comprised of CPUC, CEC, and Cal ISO staff map the high-level resources selected in the portfolios to specific busbar locations.

Next slide.

The CPUC just transmitted two portfolios for the 2023-2024 TPP. The Cal ISO will conduct its transmission analysis on those portfolios as part of the TPP and report on the transmission improvements or upgrades identified as needed in its final report next year.

This year, the CPUC transmitted, as the base case portfolio, a portfolio using the 30 million metric tons by

2030 greenhouse gas target. And as the load scenario, the CEC's 2021 IEPR's additional transportation electrification scenario. Traditionally, portfolios model out ten years for the TPP, but this year, the CPUC transmitted a 12-year portfolio, so we modeled and mapped resources out to 2035 results, not just the traditional 2033 results.

The CPUC also transmitted an offshore wind sensitivity portfolio with 13.4 gigawatts of offshore wind, with over 8 gigawatts of that being on North Coast to allow the ISO to continue to study the transmission needs of offshore wind, complementing the ongoing CEC's-led AB 525 work.

Just note that the figure on the left here shows this 2023-2024 TPP base case in comparison to past base cases, and we can see that this base case has significantly more than past portfolios transmitted to the ISO.

And the map on the bottom right shows areas of possible transmission exceedances for the base case, as identified in the busbar mapping analysis, and the possible magnitudes of upgrades needed to address those exceedances. These are just areas of potential transmission needs. The ISO's TPP will study and identify what exceedances are actually likely to occur and what transmission solutions are necessary.

Next slide.

In the current busbar mapping methodology used for this most recent ‘23-24 TPP, the Working Group seeks to optimize map resources alignment with the five criteria listed here. One, that resource is economic, has an economically appropriate distance to a substation, that it has availability of existing transmission capability, or the availability of a cost-effective transmission upgrade. We try to limit potential land use and environmental impacts. Four, we try to align with commercial development interest. And five, we try to map consistently to prior years TPP portfolio mapping. The role of land-use screens impacts primarily criteria three, but also criteria one.

And I will also note that we have additional criteria for mapping of battery storage, including prioritized mapping to air quality non-attainment areas, DACs, and co-locating storage with solar.

CEC staff compile and conduct the land use analysis of the mapping and to assess the potential impacts of mapped resources using an array of datasets. This table on the bottom right shows those datasets that have been utilized in the most recent environmental and land-use screens.

Next slide.

This slide is just a sample of the results of the busbar mapping analysis from the ‘23-24 TPP base case, specifically for resources mapped to the Tehachapi area and the Big Creek hydro transmission corridor. The table here shows each resource type by substation and the alignment of that mapped resource amount with the busbar mapping criteria. And in the final rightmost columns, we have the information utilized in the additional battery mapping criteria.

Again, the goal here is to maximize compliance across all criteria for the entire mapping. Thus, we often still map to areas where there is a noncompliance flag, as you can see with the few level two yellow non compliances and even a few level three red non compliance. Those flags aren't designed to prohibit mapping to that substation, but to flag the resource for further analysis by the Working Group to assess the potential impacts of the non compliance and whether or not that non compliance can be alleviated by remapping those resources. In these final results here, it was determined to keep the mapping as is, even with those non-compliances.

Next slide, please.

So that was a quick overview of the busbar mapping as it's been implemented and was implemented for the recent '23-24 TPP. IRP staff are now just starting to plan for the next cycle of busbar mapping, the '24-25 TPP. As I noted earlier, the '23-24 TPP, we mapped an unprecedented number of resources over 85 gigawatts nameplate by 2035.

Just as a quick aside, the first proof of concept busbar mapping, which was done for the 2018-2019 TPP, had about ten gigawatts of resources mapped. So you can see the significant multi-fold increase there. And for the next TPP, per the recent SB 887, which requires the CPUC to transmit a portfolio to the ISO modeling out at least 15 years into the future, the portfolio will likely have even more resources to map.

So in preparation for the '24-25 TPP mapping efforts, staff are considering significant updates to the busbar mapping methodology. We're just starting that process, and we've identified some high-level goals of any potential changes, which include improving the land use and environmental screens by implementing the array of new CEC datasets.

We also want to better enable the mapping to account for that, the increased resources, and longer planning horizon associated with the 15-year timeframe. And particularly, we want to see what criteria to consider in potentially mapping resources away from existing and already proposed substations, sort of trying to identify what are ideal areas based on the various screens that could be ideal for resource development.

We also hope to account for the rapid growth of recent solar development. We want to better incorporate existing footprints of resources, as CEC staff had showed with their new existing solar footprint dataset.

We also want to assess their existing interconnection impact at substations.

And finally, there are, in addition to those, there are several other stakeholder recommendations that both the CPUC has received through our annual TPP process and the CEC has received in this land-use screen development process that we hope to be able to implement as part of these updates.

Quickly, I just want to note that with the potential for significant changes, staff want to ensure time and opportunities for stakeholders to input and review on these proposed methodology changes. So we plan to publicly share the draft methodology and work to incorporate stakeholder feedback before we even begin busbar mapping for the ‘24-25 TPP, so we're trying to increase the level of stakeholder engagement than we have done for previous TPPs.

I will end my quick summary there in the interest of time and I'll turn it over to CEC staff to talk about some of their efforts in developing the datasets and screens to possibly include in the new busbar mapping methodology.

MS. BRAND: Great. Thank you so much, Jared.

We're going to hand it over to Saffia for a quick overview of current methods and then a discussion about potential new additions that are under consideration based on public feedback we've received to date.

MS. HOSSAINZADEH: Alright. Thank you.

Next slide, please.

Alright, so in this presentation, I'll go through two topics, the current busbar mapping evaluation, land use evaluation method, and also the new -- some ideas we have for what could be incorporated into the new busbar mapping method, evaluation method.

Next slide, please.

Alright, so just as an overview, the CPUC disaggregates geographically course zonal results from RESOLVE to specific substations for the transmission analysis. And so we received that list of substations and performed a land use evaluation on a very local 10- to 20-mile area around each substation. And then we report back to the CPUC metrics on that land use evaluation.

Next slide, please.

And so here I'll go through the methods that we currently use, but these have been explained in more detail in a previous CPUC workshop from last October on IRP and busbar mapping, so I encourage you to listen to that and dig into some of that, those details.

So first, in the first step of busbar mapping, we receive a list of substations with an allocated amount, a suggested amount of megawatts at each substation. We geolocate them and buffer those. We create a buffered area around the substation of about 10 to 20 miles, as you see here on the left.

And also what you see here is the solar resource area. So that would be the technical potential remaining after applying the base exclusions. And it is split into a low and high environmental implication category, and that's the result of an environmental suitability model that CEC staff created in the last busbar mapping effort and it was used in the last couple years of busbar mapping. So this is a suitability model that uses ACE biodiversity, connectivity, and terrestrial landscape intactness.

Next slide please.

So here you can see an in-depth, more focused view of what this looks like in an area around Fairfield, California. You can see the substations that have a proposed resource allocation allotted to them by the CPUC. You see the ten-mile buffer around them. And so within those buffered areas of focus, you see how much resource potential is available. You can see the total amounts vary per substation. And, also, the high and low categorization of that resource area, it varies between them.

So the first set of metrics that we report on back to the CPUC would be how much land is available, so how much has technical potential. And then, also, more importantly, so if the CPUC has allocated a certain amount of resource to the substation, how much land, if you were to convert that megawatt to an acreage, how much percent of the low implication area would that allocated and proposed resource potential cover? So like would there even be enough low implication land to support that proposed megawatt, a new resource build? So that's the first set of metrics that we report on.

Next slide, please.

The second set of metrics concerns all of the environmental components and implications. So as you can see here on the chart, the top of the hierarchy, we have the environmental model, and that's partitioned into low and high implication based on, you know, the total scores of the suitability model that went into that.

But we also want to report on more details of what went into that environmental implications model. So we want to report on the percentage of the high ranks, the amounts of fours and above of each of those input datasets that go into the environmental model. So we have the biodiversity, the landscape and intactness, and connectivity. And you can see those in the middle row. The raw distribution of the data is shown there. All the dark blues are areas that have a score of four or greater. So we would report out on the percentage of the total resource footprint that contains those 4s or 5s.

And then we go one level deeper, and we also -- because biodiversity and connectivity are made up of additional datasets of components, and so we go into that level of detail, too, and we report on how much irreplaceability, native species, and rare species have a rank of four or higher within the resource potential footprint. So that kind of gives the CPUC more of an understanding of what's driving that overall low implication area, and then also it highlights if there's any areas of concern for compatibility of this resource allocation.

Next slide, please.

So then the next, the final set of environmental metrics that we report back to the CPUC have to do with the important bird areas and the high fire threat districts, as you can see here. So these are just standalone datasets. They weren't part of the suitability model.

And next slide, please.

And for these, we just report on the total percentage coverage of the buffered area. So as you can see in some of these intersections of the buffered area with the raw data, some of these areas don't have any overlap with important bird areas or the high fire threat districts, and then some of them might be completely covered by either of those datasets, but these were considered. These were the two that were reported on in the previous methods.

Next slide, please.

So overall, this is the kind of result that we report back to the CPUC with. For every substation, in this case you're seeing the Bellota Substation example, we report on the land use implications of that proposed resource allocation to the substation. So we report on the total area of resource potential, and then also the percent of the low implication build. So assuming that that build could go into the low implication land, how much of it would be used by that proposed resource allocation.

And then we report on the two sets of environmental factors. First we go into all of the datasets that make up the environmental model. So those are listed here. And then we report on the percent cover, the total percent cover within the 10- or 20-mile buffer of those two standalone datasets, the IBAs and high fire threat areas.

Next slide, please.

So for wind, we do a very similar approach. We have the same metrics that we report back to, except we have to slightly adjust the areas of inclusion that we associate with the substation. So we start out by buffering by ten miles, similar to solar, but we -- but, often, that's not enough, that doesn't provide us enough resource potential for the allocated resource.

So we also allow for nearby wind resource areas to be included in the proposed resource area for each substation. And this could be done because the dataset we were given by CPUC had already partitioned the wind resource, the wind technical resource potential, into project areas that were discrete and so could be included that way. So here you see for Delta Switching Yard Substation, what the resource potential map looks like partitioned by the environmental model.

Next slide, please.

And then here you can see how those discrete wind resource polygons would have to be like manually assigned and included to be in this busbar mapping exercise. So first, you know, the two pink polygons are wind resource areas that do intersect the ten-mile buffer around the substation. But we also had to manually pull in those green polygon areas in order to sufficiently to have enough area to support the allocated resource potential.

And then we'd also note that in the table that we returned to the CPUC that, you know, we had to draw on a wind resource area X miles away.

So next slide, please.

And geothermal is very similar to wind in that we allow for the resource areas to come from further away than the ten-mile radius around the substation, so we allow for that. And we perform the land use evaluation on the whole geothermal resource that's closest to or that perhaps intersects the substation with the proposed resource potential.

Next slide, please.

And so, again, all of those metrics that we report back to the CPUC with go back to inform these noncompliance flags, and they're flushed out here for more detail. So basically, if any of the metrics fall above 50 percent, we flag it for them.

Next slide, please. Okay.

So, yeah, so this just summarizes the current busbar methods.

And now we will get into some proposed ideas that we have.

Next slide, please.

Okay, so here, so these are just some new assessments and ideas of considerations that we think could come into play in our updates to busbar mapping.

Next slide, please.

So first, we have parcelization. Every county assessor office keeps track of the land through parcels, which have a unique tax APN number. Here you see on the right all of the parcels in approximately a 20-mile buffer around Antelope substation in northern L.A. County. So each parcel is shown in pink with a gray outline, so you can infer by the gray density of the -- you can infer by the gray the density of the parcels. Areas that seem completely gray are just small parcels that are close together.

And, you know, a significant factor in developing large solar projects is the parcelization of land. So as the density of parcels goes up, the number of interested parties in any negotiation to add additional power to a substation goes up. So it can be costly and timely for a developer if an area has a large number of small sized parcels. So we could create maps of parcel density to help us indicate where conditions would be more or less favorable for developers.

Next slide, please.

So this can be shown in this image here. This is how we've -- we created a parcelization density surface and applied it on the resource potential map that we've created using our current land-use screen methods. As you can see, within that 20-mile buffer of Antelope Substation, some areas have a very high parcelization measure of more than 100 parcels. So this would be an important piece of information, we would think, that would relate to how developable this area is. And so perhaps, you know, this is a measure that could be reported back to the CPUC.

Next slide, please.

The other factor that we have thought of is including subtracting out existing solar footprints from the resource potential area around a substation. So, you know, some substations are already getting crowded. In the case of Antelope Substation here, existing solar projects from our new CEC solar footprints dataset is now covering about 15 percent of the low-implication land within 20 miles of the substation. So, you know, and especially with the high growth that we're seeing, maybe this will become a more critical factor going forward.

Next slide, please.

So finally, we have thought that for this local 10- to 20-mile area around a substation, it might be important to consider distance to a protected area as a factor. So here in this figure, you'll see the protected areas in yellow, and technical resource potential under the core scenario in gray. And so we're also showing some electrical infrastructure substations in the orange squares and transmission lines in orange.

So there might be a situation where buffering the protected area might reduce the available land area around a substation significantly, or if there's many separate protected area layers in a region, we might want to reduce -- I mean, that could be a factor from a conservation perspective of wanting to reduce the resource area of that region. So this could be another type of metric that we report back to the CPUC with, you know, how much of the resource, technical resource potential exists in a certain -- or within a certain distance to a protected area, basically.

So next slide, please.

So finally, we've developed the following questions that we hope the public can consider in addressing comments to help us and to provide early input into the environmental and land use evaluation for busbar mapping.

So first, we have what geospatial data could be used in the determination of available land area for substation level capacity additions for transmission planning?

Secondly, should the geospatial areas identified in the core land-use screen be used in busbar mapping to quantify available land area around a substation?

Should additional datasets be given that busbar mapping -- yeah, given that busbar mapping occurs at a finer scale resolution than the statewide land-use screens for resource potential? So if so, what datasets?

And then how might the CEC update the environmental and land use evaluation to be able to evaluate decisions across multiple land use objectives?

And finally, what environmental and land use metrics could the CEC report back to the CPUC?

So, yeah, with that, thank you for your attention and we'll open it up for questions and comments.

MS. BRAND: Thank you so much, Jared and Saffia.

We are going to pause here again for kind of quick clarifying questions on busbar mapping for either Jared or Saffia.

I'll first start and see if the Vice Chair has any questions. I think he might have had to run.

VICE CHAIR GUNDA: No. May I continue?

MS. BRAND: Oh, you're here. Good. Thank you.

VICE CHAIR GUNDA: Sorry. I do have to jump off at 4:30.

First of all, thank you so much for hosting. I will have Ben from our office provide closing comments.

He'll stay and listen in.

I just had one comment that we might want to consider as we think through this. As I'm listening to this, you know, Jared kind of talked about the 887 bill, and then kind of the need for the 15-year -- we're talking about 20-year transmission planning from CAISO. We're talking about demand forecast, demand scenarios, all sorts of stuff. I think we have an influx of analytical work that we're trying to do.

Having some sort of a public-facing website or information that's updated on a regular basis to just kind of show what our workplan is over the next two to three years, how we expect to integrate different pieces, would be probably really helpful. And so I'm just thinking more of either a subset of SB 100 or resource planning or just land use planning web page that just ties everything together. And how are we going to do the tribal consultation? And then what points are we going to include some of that work into the SB 100?

So I just defer to you all, but really, really enjoyed the presentations. Thank you so much. I know how much work this is.

I'll have Ben close it. I'll listen as long as I can, but I'll drop off a little bit after 4:30. Thank you.

MS. BRAND: Thank you so much.

So like last time with questions, we'll start and see if there's any questions here in the room. Okay.

So when you turn on the microphone to state your name, affiliation, and then when you're done, turn the microphone off. Thank you.

MR. KIM: Dan Kim. Dan Kim. Is that working? Dan Kim.

MR. FERGUSON: Yeah, we can hear you.

MS. BRAND: Jared, can you hear him?

VICE CHAIR GUNDA: Yes. Yes. Go ahead.

MR. KIM: Okay.

MS. BRAND: Great. Go ahead, Dan.

MR. KIM: Okay.

MR. FERGUSON: Well, it stopped working now. We heard Dan Kim, but now can't hear anything.

MR. KIM: This is Dan Kim. Can you hear me?

MR. FERGUSON: Yes, I heard that.

MR. KIM: Okay. I have a quick question regarding the substation mapping distance to protected areas. Actually, it's probably more just a clarification question.

Are you mapping substations at just one kind of like 500 kV, you know, level? I mean, like how many bays are you, you know, kind of looking at?

I mean, you know, this is important, I think, for purposes of master planning, something that we're thinking about in the San Joaquin in Westlands, for example, because when we're talking about, you know, multiple 500 kV lines, new lines, you know, there is a larger footprint that you should, you know, be thinking about, which also probably would mean, you know, kind of a larger kind of radius, so to speak, to be considering. So I just wanted to ask that clarification.

MS. BRAND: Maybe I'll start by saying we analyze a list of substations that's provided by the CPUC.

Jared, do you have any thoughts on how the substations range in terms of size?

MR. FERGUSON: Yeah, I don't know sort of if we have, you know, square footage information about the substations themselves. We have the location. And then I'll note that we focus and we try to stay focused on system-level transmission substations, so basically greater than 100 kilovolts or higher. We tend to not analyze, except in certain circumstances, lower voltage substations or distribution level substations. We focus on the system level, higher voltage substations.

But to the sort of the size of it, we currently don't -- we have not in the past utilized any information related to that or sort of as you're saying, sort of like how many interties does the substation have? That is something we are looking at in the future to see if we can obtain that information to see, you know, how many bays, how many remaining bays an existing substation has? What would an upgrade look like both cost-wise and size-wise to expand the number of bays at substations? And so that kind of information is something that we are looking to see if we can include in the analysis for future busbar mapping work.

MS. BRAND: Thank you so much, Jared.

I think that's it for questions in the room.

So, Hilarie, I think we can turn to questions from our virtual participants.

And again, folks, for the sake of time, if you could limit your questions to questions specific to the content just presented, clarifying questions, we do have public comment following this. Thank you.

MS. ANDERSON: Thank you so much. We have two hands raised right now.

Nancy Rader, you should be able to unmute your line and make your comment. Don't forget to state your name for the record.

MS. RADER: Hi there. Good afternoon. It's Nancy Rader with the California Wind Energy Association.

And first of all, I just want to say how much we've appreciated our dialogue with Erica and Jared and their teams. It's been very productive and really appreciate that.

I wanted to ask on the wind busbar mapping, you didn't indicate sort of how far beyond the ten-mile radius you would go. Is there some rule of thumb or how do you decide that?

And then in our comments on the PUC's inputs and assumptions process late last year, we commented that a large wind project -- or a large resource area could support a gen tie that is 30 to 40 miles long, and we recommended that the resource not be constrained by substations but by transmission lines since large projects can tap lines with new switching stations. So I wondered if you had thought about that?

And sort of in the big picture, I'm wondering how much of that wind resource potential that you identified earlier in the chart, around 50 gigawatts, how much of that remains after the busbar mapping exercise? So I know that's a lot.

MR. FERGUSON: So I can take a stab at it, Saffia. I think I can cover all of the questions. I will try at least.

So the first part, we don't have a fixed maximum distance we could consider. We did often consider, sort of based on the amount of resource potential, we were mapping to the area. I think, particularly like in the past, I'm thinking of the Round Mountain area in northern California, I think most of that resource potential was definitely over 20 miles from the substation, but given the size, we deemed that it was in an effective location.

And I'll say -- so I would say sort of, I don’t -- off the top of my head, I don't think there was a case where we went further than 30 miles.

I don't know, Saffia, if you can recall a case where we were identifying resources more than 30 miles out for wind?

MS. HOSSAINZADEH: Yeah, that's my recollection too, it was like no more than 30.

MR. FERGUSON: So I would say we didn't have a firm, you know, fixed max, but we were taking in consideration the amount of resource potential and the amount that we were mapping.

As to your point, sort of as you had -- Nancy, that you then brought up about sort of like being able to build a new intertie on an existing transmission, not focused, that is something we are actively looking at for future, for this upcoming busbar mapping, not just for wind but for other resources, as well, sort of how do we incorporate the cost of a new transmission and intertie sort of what size of potential would we consider it for?

So that kind of information from stakeholders would be helpful in that process because as we're looking, as I was saying, as we're looking out further into the future with larger portfolios, we are going to want to look beyond existing substations for those resource siting locations.

MS. RADER: Okay, great. And my last one, in case you forgot, was how much of the wind resource potential remains after the busbar mapping exercise?

MS. SWITZER: Oh, you're asking sort of with the three, I think it was like 3.8 gigawatts of onshore wind we have in the portfolio, how much, if we subtract that from the total amount of resource potential?

MS. RADER: Maybe you answered my question. Maybe the answer is 3.8 gigawatts. That is what remains after the busbar mapping exercise, I think. And that's why that's what is in the IRP portfolio?

MR. FERGUSON: Yeah, so about. So the IRP portfolio or the -- and the TPP portfolio that we transmitted to the ISO, the CPUC transmitted, in February had about 3.8 gigawatts of onshore wind. That wasn't the big out-of-state on new transmission, so it was mostly in state. Some of it is Baja California. Some of it, I think a little bit of it, is Southern Nevada Wind. But of that, sort of within the ISO system, we had about 3.8 gigawatts of onshore wind.

MS. RADER: Okay, terrific. Thank you.

MS. ANDERSON: Thank you, Nancy.

And we're going to move on to our next. She has a question, which was Shannon Eddy.

Shannon, you should be able to unmute your line. Remember to state your name for the record.

MS. EDDY: Great. Shannon Eddy with the Large-Scale Solar Association. I have three questions. Probably better just to one, one at a time.

And again, thanks you guys. This is starting to get really complicated, so I just appreciate the transparency and the open dialogue here. So I'll start with the easier questions first.

The first one is just the Audubon Important Bird information. Can you talk a little bit about how that's factored into the busbar mapping once the CEC has identified a percentage of impact around a substation?

And actually, let me ask them both at the same time, because they're kind of the same question now that I think about it, even though they come from different data sources, because the other question is: Can you talk a little bit about how environmental considerations are weighted against environmental interest -- or excuse me, against commercial interests, substation capacity, et cetera, as you're doing this mapping?

MR. FERGUSON: Yeah, I can answer that. And actually, if we could go back to the busbar mapping slide? It was Mapping Results Alignment with Criteria is the title on the CPUC presentation.

MS. ANDERSON: Give me just a second, sorry.

MR. FERGUSON: Yeah. No worries.

MS. ANDERSON: I'm trying to find it. I've got 150 slides to go through. What was the name of it again?

MS. BRAND: I think it's slide 13 on the IRP deck.

MR. FERGUSON: Yeah, but in the full deck, I'm not sure what slide number, but it's called that Mapping Results Alignment with Criteria.

So we split up the land use and environmental criteria analysis into two parts. And so you can see here, we have 3A and 3B titled Available Land Area. And then 3B are the individual datasets focused on the environmental impacts. And that available land area was that higher and lower potential environmental impact analysis that Saffia was walking us through.

And then the environmental impacts is flags for the individual datasets. So the CEC provides us with, for each individual dataset, what percentage of the resource potential in that substation had a level three or four, so that higher implication for that resource area, or for important bird areas, it was just what percentage was in an important bird area.

And so in the busbar mapping methodology, and Saffia pointed to these threshold, we had percentage cutoffs of sort of if the criteria had, for example, if sort of the criteria had a 95 percent of the resource potential was in that high implication area for important bird areas, then that got flagged.

And so basically, those were the points. So basically, we had 95 percent, and then I think 75 percent. I forget off the top of my head, but it's in the methodology documents. So those sort of high-level amounts is what triggered those criteria flags for that dataset.

And as I've said before, it’s when we’re trying to -- we’re trying to minimize criteria noncompliance across the whole mapping, so in this case, we're trying to minimize it across, I think we mapped to about 120 different substations, the 85 gigawatts of resources. And so we're ideally -- in an ideal location, we would have no flags, but that's not always possible. And so it's weighing, essentially, on a case-by-case basis the analysis at the individual substation.

And so in some cases, actually, we have to do significant additional analysis around a certain substation to sort of ascertain where are those environmental impacts coming from to see that impact. And so there's not a systematic threshold that we weigh each criteria at. Those percentage thresholds provide the flags that mean further analysis on the Working Groups part.

And then we try to do more detailed analysis to assess, can we decrease these impacts? Are there better alternatives at other cases? So for example, in areas that might have the high environmental impact, we would look at, so are there other substations that have a comparable amount of commercial interests or comparable high-level commercial interests that don't have as much impact that we can map to?

And so for like the example on this one, you can see there that that's 3 megawatts of Antelope Wind. That has high level of environmental impacts. I forget which datasets trigger that, but we basically had the analysis that was sort of -- based on the commercial interests in other areas, we didn't have a good alternative to put it. And it was such a small amount that even though a lot of the area had high potential environmental implications, that 3 megawatt amount could likely fit in that area in the proportions that had the low environmental implications. So the decision was made to not move that despite that flag.

I went on a little bit of a long tangent there to try to explain that, but I hope that helped clarify things. It does.

MS. EDDY: And I know this is not -- this doesn't sort of fit neatly into an encapsulated response because it's pretty tricky. And that's helpful, Jared.

I guess my next question might be even more tricky, and I really appreciate the questions that you are asking the public, and number three kind of tags to my next question, and that is: Do you have any thoughts about how you're going to be considering tradeoffs between mapping resources and even expanding substations to accommodate resources in conflicted areas, say those with high environmental implications, versus identifying to build an entirely new substation?

Because when we're doing 86 gigawatts, we can imagine that we're probably going to max everything out. But is that really the assumption, or are we really looking at preserving some megawatts around certain substations in order to build entirely new ones? Do you have any thoughts on that?

MR. FERGUSON: I will say I don't have any thoughts yet. I think sort of this is -- this sort of, as you're saying, is a crux of one of the issues that internally we've only started discussing amongst staff ourselves, and that's sort of part of the reason why we've asked stakeholders to go ahead and start providing their input, because at this point we are still trying to wrap our own thoughts around how to address this very complex issue.

MS. EDDY: Gotcha. Thanks for that. Appreciate it. That was all the questions I had. Thanks, you guys.

MS. ANDERSON: Great. Thank you, Shannon.

This will be the last call for our question and answer area for anybody on the Zoom. If you're calling in, you can do a star nine to raise your hand, and a star six to unmute.

And seeing none, I'm going to pass that back off to Erica.

MS. BRAND: Thank you, Hilarie, for facilitating the question and answer online.

Now we will transition to the public comment portion of our agenda, so I'm going to hand it over to Mona Badie, the CEC's Public Advisor.

MS. BADIE: Good afternoon. We will now begin public comment period for today's workshop. Each person will have up to three minutes for their comment. And to make sure we can hear from everyone, we may reduce that time, depending on the number of commenters. And we'll show a timer on the screen, and we'll alert you when time is up. I want to remind you that all comments will become part of the public record.

We'll start in the room and then move to virtual attendees. And I'm not seeing anyone in the room.

We had Daniel Kim in the room, and he did want to make a public comment, but he had to leave, so he said he will file something in the docket. And he is from Golden State Clean Energy, so I just wanted to note that for the record.

And I'm not seeing anyone else in the room.

If you are on Zoom and you'd like to make a public comment, we ask you to raise your hand. You click on the open palm raise-hand icon on your screen. If you're on the phone, you're going to press star nine to raise your hand, and then star six to unmute when called upon. When you are called on, we will open your line. You will unmute on your end, spell your name, state any affiliation, and then you can begin your comment.

And I will hand this off to Hilarie to facilitate our Zoom commenters.

MS. ANDERSON: Great. We have two hands raised so far, so we're going to start with our first one. We're going to go to order of the how I see them.

So you have Shannon Eddy. I'm going to unmute your line. We'll start the timer. Go ahead and state your name and your affiliation for the record.

MS. EDDY: Great. Shannon Eddy, Large-Scale Solar Association. Hi, guys. I feel like I was just talking to you.

So first, again, I can't say enough just how much we appreciate the time and the effort and the care that you have taken in speaking with us, with other parties, and really thinking about all of these things in a new way.

The land-use screens are so important to get right, especially even more. It feels like the ante has increased given the signaling of various proposals under consideration right now that elevate the IRP as a possibly enforceable procurement mechanism now via the governor's office budget trailer bill, and also as a potential priority driver for project interconnections in the latest IPE enhancement proposal. So all of these are going to point to the land-use screens as being even more important.

And zonal planning with accurate inputs may be workable as a first layer. But if we don't incorporate some of the risk assessment criteria, we could really run into problems of directing projects to certain areas and planning for infrastructure to those areas and then not being able to build the projects there. So we're really grateful that you're considering some of the development feasibility criteria that we've been talking about and look forward to seeing how those get integrated if there's a way, and we'll be thinking about this on our side, too, if there's a way to integrate those into the land-use screens themselves, not just the busbar mapping, we'll make some recommendations there.

Tradeoffs are also really important to consider, kind of just to our last conversation. If current experience is any indication, building new assets is going to be even more difficult than it is now, and so building new substations is going to be harder. I feel like we really do need to look at how we max out existing infrastructure to the extent we can so we don't trigger new conflicts with new infrastructure.

The climate refugia index or data layer does give us some pause, especially when we're using those to eliminate areas for consideration. Solar has been shown to be compatible with some species' climate adaptability needs, at least depending on the species' requirements and how a site is managed operationally, so that's one thing. But blanket land exclusions based on modeled assumptions of where species might go in a potential future really unnecessarily narrows our field of vision for state planning. And so we really caution against using this in the way that it's being planned, even in the SB 100 study index or study plan.

The other piece that I'll say is just, you know, development is getting harder and harder in California. It's a lot easier in other states. And what we're beginning to hear from developers who have access to limited supply chain products is that they're going to look at where it's easiest to build projects and go there. And so we want to make sure that California doesn't get more difficult than it already is in terms of how we build projects.

So we'll build on this in our written comments. Again, a lot to say here, not a lot of time. I know it's late. Again, appreciate your time. Thanks, everybody.

MS. ANDERSON: Thank you so much.

Okay, we're going to move on to our next comment, and that is from Kate Kelly.

Kate, your line should be open. You should be able to unmute yourself. Please state and spell your name for the record and begin your comment.

MS. KELLY: Good afternoon. Kate Kelly on behalf of Defenders of Wildlife. Thank you for your time today and thank you for all the work that the team has been doing on this project over the last year, and certainly the last few months.

Erica, Saffia, Tyler -- excuse me, Travis and Gabriel, amazing work, and we really appreciate it, the thought and the effort that's gone into it.

You know, has been pointed out by many people today, this type of planning is essential for California's energy future, as well as balancing our other state goals. And part of -- you know, as Mr. Lopez said earlier this morning, the path to decarbonization starts with deciding what is possible, and land use planning and environmental screens are key to figuring out what is possible.

And to that end, you know, thinking about where existing infrastructure exists versus where the right places to build things are not always the same thing. And so using these tools will help us see what really is possible moving to the future rather than trying to shove additional development into areas that are not appropriate for renewable energy development. So these tools are really essential to that, and we appreciate the opportunity to have these tools at hand.

And to echo Vice Chair Gunda's comment, the ability to have web-based tools, web-based maps and the website is essential for that kind of stakeholder participation. That really allows the ability to have all the people that really understand the issues come in and provide the input so that this is a joint project rather than a top-down agency-driven project. So we appreciate the opportunity for the stakeholder process here, and we look forward to having additional meetings and conversations as moving forward.

I have one question. It's a process question for Erica. In thinking about the final staff report on land-use screens, because there's been so many upgrades to what the work has been done since we saw it in October, will there be a draft staff report come out with a comment period? I'm not asking to get us into an endless loop of review and comments on draft staff reports, but it seems like we've had a lot of new information come forward. And with the inclusion now of the geothermal piece, it might be an opportunity to have that one kind of last stakeholder check-in.

With that, I thank you for your time today, and thank you for all that you're doing.

MS. ANDERSON: Great. Thank you so much, Kate.

I'm going to do one more call for anybody on Zoom. This is our public comment period. Please raise your hand, use the raise-hand function, it looks like an open palm, or if you're on the phone, press star nine to raise your hand or star six to unmute.

Okay, I am seeing no more raised hands, so I think we can conclude our public comment period. I'm going to hand that back to Erica.

MS. BRAND: Thank you so much.

Okay, well, just to wrap up, I want to say a very quick round of thank you to the project team here at the CEC for all of their excellent geospatial work.

To all of the public participants that wrote comments, made comments at the last workshop, reached out to help us understand your comments, thank you so much. We're looking forward to your comments to this new information and this workshop.

And I'd like to also thank Jared Ferguson from the CPUC and his team, Emily, Femi, and Sam just for the collaboration and thinking through how our processes fit together and how we can continue to work together to improve methods.

So with that, I am going to hand it over to Ben or Liz to close us out and adjourn the meeting.

MR. FINKELOR: Well, thanks so much. This is Ben Finkelor. I'm an advisor to the Vice Chair. And I know he did have to step out to another meeting, but he really both enjoyed the conversation and the engagement today.

And like you, Erica, wants to -- well, first he wants to thank you for all of your hard work, but then also thank everyone that participated today, both our presenters here at the Energy Commission and NREL and CPUC, but also the folks calling in and in person.

It's really, you know, I think this is something that he mentioned in his opening comments, which is that the product itself is really improved when we have this type of feedback and engagement. So a big thank you for that and thanks for staying late too. I know a lot of information to cover, great, great information to cover.

So with that, I think we can close the workshop. Thank you very much.

(The workshop concluded at 4:53 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 20th day of April, 2023.

Martha L. Nelson

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

MARTHA L. NELSON, CERT**367

April 20, 2023