Start now.

Yeah. If you guys want to move to-- this is a big room, so it would be great if folks could move toward the center. If you wouldn't mind clicking, just to go to the next slide.

[SIDE CONVERSATION]

How do we get it up here? Oh, it's over there.

Nope.

And in the back, if we could go back one, please-- slide.

[SIDE CONVERSATION]

You guys, could we go back one slide, please, in the back?

[SIDE CONVERSATION]

OK. Hi. My name is Ed Ross. We're going to be doing something a little bit different in this session. Behind me-- or on the side-- you will see a QR code. If you wouldn't mind taking your phone out and launching that link. Or, underneath the QR code, you can see the URL. If you are not already on the summit Wi-Fi, you might want to go ahead and join that.

So for today's session, what we want to do is, we want to get input from all of you on the various topics that are going to be happening over the course of the afternoon. The speakers are going to give a bit of a talk, and then they're going to pause, a question's going to come up, and you'll have about three minutes to provide whatever input that you would like to be able to provide.

In the back of the room, we've got some folks who are taking all the data that you guys have provided and throwing that into generative AI with some prompts that we've built. And we're going to, at the end of the presentation, show you what we've learned from everybody today. So with that, I'll hand it off to Alex and Jon to take things off. Thanks, guys.

Yeah. Thank you.

Thank you. I'm Alex Portilla.

I'm Jon Stallman.

And we're really excited to have you guys here today. So as he was explaining, this is an interactive session. And basically, you all are going to provide the content. So make sure to get your QR out there. And we'll be asking some questions. And kind of in a real-time experimentation, the AI engine-- the little bots in the back of the room-- are going to feed that back to us. And, hopefully, it'll tease out some insights. So today's session, you heard a lot this morning about how the grid is going to get more complicated, more dynamic--

[INAUDIBLE]

--moving from-- oh, is it up there-- thousands of devices that might be totally unconnected to our system to millions of devices that might be integrated, receiving signals from all kinds of external outputs or inputs. So we really need to improve the visibility of DERs to not just accommodate this energy transition and new DERs and our customers but to really leverage them-- as they were talking about in the morning-- for the benefit of our system, to the benefit of the larger grid, and cleaning the grid that is more affordable than the system today.

So we think that by leveraging AI-- this is an AI conference-- and other new tools and processes that we can transform the operations of our grid to a more optimal state.

Thanks. All right, appreciate it.

Today's session is organized in three different sections. We're going to pose three questions to you all and hopefully tease out some insights. We're looking for your expertise and your insights. So the first topic we're talking-- about how do we build confidence in DERs? How do we trust them as grid assets? Then we're going to talk about, how do we use data to improve our real-time situational awareness and near-term forecasting capabilities?

And, lastly, we're going to put it together and say, how do we orchestrate? How do we orchestrate DER actions against the grid needs and for the benefit of the customers, the grid, and the system? So, Jon, let's jump right in.

Yeah, let's jump in. This will be fun. Little reminder about what he says-- we're getting used to what the screens--

Oh, [INAUDIBLE].

--are telling us. So up on the screen are these three-- building trust and then situational awareness and orchestration. So we're going to jump into it. You heard all this morning a whole bunch of great setup with the load that's coming on, the challenges that we have coming in front of us. So I just wanted to flash up here for you our enterprise, true North, and our strategy. And this is kind of our guiding compass for all of us to be aiming for.

And some of the key things that I just really want to highlight when we're talking about how distributed energy resources can help us with this enormous load that's coming on, the infrastructure that we need-- we think about it in the red-outline box. We're going to architect a new electric system. And that new electric system, we really need to be focused on making sure it's resilient, it's decarbonized, and it's optimized. And DERs play a role in all of those and, in particular, in the optimized space. So we're going to take a little walkthrough, and we're going to drill down deeper into this.

And on this slide-- we've heard all morning long the load growth and the types of drivers to that load growth. And you can see this hockey stick in the load growth from about 2025 to 2040. And you would think that if you saw it in one model and didn't see it in another model, or it got a different answer in a different model, you might think about something like, oh, maybe it's not really going to happen.

But actually, all the modeling is telling us similar things. It's all going to hockey stick like this. It might go up and down just a little bit, depending on a whole bunch of different variables. But for the most part, we're looking at 2x energy needs. We're looking at 10 times the EVs on the system. We're looking at new forms of battery storage, including thinking about EVs as rolling battery storage.

And then we know that there's also going to be incremental growth in distributed generation, PV, and other resources. So just thinking about those drivers and what's happening with the load and everything you heard about this morning, we're going to drill deeper into that role of what these devices-- Distributed Energy Resources are coming on with a lot more sophistication, communication, controllability, signaling, and response. And so we're going to be able to do new things, new different things than we used to do.

So in this slide, we're looking at the way we think about things today and what we have been doing for quite some time, in terms of traditional demand response. And traditional demand response, we're thinking about it maybe a couple of times a year-- when the system is really stressed, at the supply side of high peak, it's hot outside, there's loads all over the state. We call some of these demand response programs.

When the energy is expensive or it's dirty, we'll use these preferred resources out on the system-- energy efficiency, demand response programs-- of all different types in residential, industrial, commercial, and largely catering to that bulk system, but only a few times a year for a very limited amount of time, usually two to four hours.

And where we're going with this in the future-- and that might be as soon as now. It might be as soon as next year. It could be in five years from now in different levels of it-- but we see a lot of different types of resources, a lot more controllability. Just take EVs-- if they're charging at 7 to 9 kw at a single time, if we can reschedule that to another point in the load of the day, that's a huge opportunity. That's a really big difference in how we would think about working with the load shape on the distribution system.

So thinking about these dynamics, we're going to apply more of these resources at a higher frequency at more granular levels in the system. And so, typically, when we look at these things, we look at technology in the market and the consumers and what kind of processes and systems. Today, for Alex and I, what we're really focused on is DER situational awareness, that state awareness on what the system is doing.

And we're looking at trust. That's the building blocks of making DER successful-- is trust. Without trust, the house has no foundation. So that's what we need to do. And we're hoping to do that with data and using that more intelligently. So-- actually, I'm going to fire through this because I'm getting the yellow flag of timing.

So we know we have customers that need certain expectations. We need to orchestrate the DERs in the right way to get them to show up on the system. We need our planners to be able to trust what those DERs are doing when they're showing up, how they're showing up, how they're signaled so that we can actually do forecasting correctly and apply it to investments. So these are the actors involved.

So let's get right into the first problem statement. So the first problem statement is really about trust, and it's really about planning and planning our system. And when we're planning our system, we're thinking about making investments in the system. So if we're planning for the system, we need to have a very, very high degree of confidence that what we're planning for and how we're solving for that is going to show up and actually solve for that need on the system, whether that's capacity or it's voltage or it's some various form on the system.

So DERs need to be trusted, and we don't trust them right now. We don't know who controls them. We don't know how long they can show up for. We don't know when they'll show up or how best they can be used or stacked together. And we need to build that trust.

So get right to the problem statement here-- planning for grid investments to meet increased capacity demands requires high degrees of confidence in infrastructure solutions. Lack of DER data and statistical confidence renders the use of DERs as grid assets to be untrustworthy and excluded from operational level grid assets-- OK, thinking of them as grid assets. So let's go to the question. And here's your first interaction, which-- we're super excited to test this out. So go ahead and scan the QR code.

And at this point, from the lens of infrastructure and investment planning, what might help us significantly improve trust and confidence in DERs as viable grid assets? We are particularly interested in the AI and ML solutions or data intelligence that you might bring to the problem. I'm going to give you a couple of minutes, and I'll flag you when there's one minute left. Give you three minutes and a moment of silence. Please provide your solution. We'd love to hear it.

[UPBEAT MUSIC] [WHISTLING]

I thought that was you whistling. I thought it was you.

[SIDE CONVERSATION]

[INAUDIBLE] about three minutes [INAUDIBLE]. [INAUDIBLE] about three minutes [INAUDIBLE]. Three minutes max [INAUDIBLE]. Yes. [INAUDIBLE]

A minute left, so type fast. Can't wait to see what you all bring to the table. It's exciting.

[UPBEAT MUSIC]

All right. So as we finish up your answers on the last question, I'm going to start to introduce the second topic here that we're going to jump into together. So the second topic we're talking about is situational awareness. And that includes the near-term forecasting. So we talked about how the grid is going to become much more dynamic. Many of the DERs and the usage patterns are going to change. They're weather dependent or dependent on new types of loads and behaviors that we haven't seen before. And they might be responding to different types of signals from different actors or pricing or many different things.

So that creates a more dynamic situation on the grid, and that manifests itself in a couple of different challenges. At the bulk system level, there's the challenge-- as a utility and as load-serving entities, we need to procure electricity to match the demand. If we're wrong-- if we can't predict that in the near term, we're going to have to procure that electricity in the real-time markets at great cost. And so that increases the cost, our lack of ability to be able to more accurately forecast this more dynamic system minute to minute, hour to hour.

On the distribution grid, it creates different types of challenges around voltage, power quality, and-- perhaps more impactfully-- in the restoration process when we have lots of masked loads. So our challenges are around, how do we get more situational awareness and near-term forecasting to understand what's happening on the system? We're making investments in platforms ADMS and DERMS, but some of the more traditional methods of modeling the system kind of break down in this much more dynamic environment.

So second problem statement that we're putting out there is the accuracy of situational awareness, how it's measured, calculated, forecasted-- alongside our ability to understand behavior, the timing of that behavior, the masked loads. That directly impacts our ability to respond to the granular grid conditions, procure real-time energy reserves that are essential for grid reliability and stable cost.

So, again, break out your phones-- how can we leverage AI technology for increased accuracy of DER performance applied to real-time operations, increased situational awareness, response, and energy market get forecasting? So we got three minutes. Type fast.

We'll give you a one-minute warning.

[UPBEAT MUSIC]

[INAUDIBLE] for answering this question.

Super great. I see all these fingers flying on the phones. It's awesome.

I know. The content. The insights are only as good as all of you here in the room and all of you out there in cyberspace make it.

If I can only type like my daughters type-- somehow, they do it so fast.

Get the thumb work out.

[UPBEAT MUSIC]

So far-- we got our third topic. The third topic is bringing it together. So we've already created-- in the first-- we built confidence and trust of DERs as grid assets. We understand what's happening on the system. We've leveraged the existing data to apply an intelligent interpretation of that data for our situational awareness.

Now how do we use that? What do we do with that? How do we orchestrate DERs and pick the right DERs for the right job? So this topic is really about, how do we come up with those processes and come up with the optimal solution? What's the right answer of the DERs to use?

So it's important to think about how DERs can serve multiple purposes to multiple people-- customers. Why does a customer put a DERs in their home, a smart device? They want to get some function out of that device. Maybe it's bill savings. Maybe they just want to electrify and have heat or transportation. There's values for the grid. We're the utility. We think about these values a lot. We think about capacity. We think about the grid. How do we increase the throughput of our system?

And then there's the energy system. Jon talked a little bit about how demand response programs today are mostly targeted at this energy system value. So we're looking at, how do we serve multiple different needs with DERs? How do we choose which need to solve with which DERs?

And then DERs have different characteristics, right? A pricing program might be less firm-- we might not be able to predict the response in the same way of controls. Technology has different characteristics. The program design has different characteristics. How often can we call upon these resources to solve a need? How fast are they in responding to that need?

We have different modes of engagement with our customers. How do we enroll customers? How do we get them engaged with this? Is it through a contract, through a program, through a rate, through an open market? And each of these have different ability to respond. So today, we have very little visibility into all of the resources that are out there. And we need to be able to create a more coordinated portfolio of DERs to drive efficiency across the way. DERs are getting different signals from different actors.

So our third problem statement-- PG&E, CAISO, other serving entities-- we each have different objectives. The customer might have different objectives. This can lead to different devices being operated independently or totally out of sync on the broader grid requirements-- or in conflict. Currently, we lack the comprehensive visibility into downstream devices, limiting our ability to assess and strategically coordinate these resources for optimized performance that meets specific grid needs.

So our third question, kind of bringing it together, is across heterogeneous resources with different characteristics. How might we better prioritize and orchestrate these DERs across these multiple value streams at the customer level, the transmission-distribution grid, and generation? And obviously, at the AI conference here, we're interested in those types of solutions. But whatever you guys have to bring, we're excited to hear it. So we've got three minutes. Have at it.

That amount of data, trying to get it all--

[UPBEAT MUSIC]

--for this last question. And then we're going to go to the results, which will be extra exciting.

[UPBEAT MUSIC]

--name of your company and organization as well as you're answering here. All right. So what we've done is, we have-- our orchestrating these solutions, we found the right DERs for the right problem. We've increased our awareness of what's happening on the system and what's driving what's happening on the system. And all of this gets us to a point of trusting DERs.

And why do we need to trust DERs? Because we can't change our planning until we trust the response of DERs. And so, Jon, what do we get for that? We've done all of this. Why? What do the customers get for that?

Yeah, let's talk through a couple of three key elements that Alex and I have been talking a lot about. So let's run through these. So one of the things you hear Patty talk about and you hear our leadership discuss is the importance of getting that throughput on the system. And we're going to make investments across the system. We want to prioritize those investments to the right locations.

So if we can do all this smarter through this load shaping on the circuit, then we're not designing to the peak as much. And we're investing where, truly, those circuits are overloaded at a higher frequency of time. So we're prioritizing our investments in the places that matter the most and bring the most load onto the system. Meanwhile, these highly peaky circuits that now we're managing, we're load shaping with-- now we get a little bit more bandwidth out of that circuit. And we can get a little bit more throughput on that circuit.

So tricks are-- how much throughput can we get on the circuit before we lose some reliability and some dynamic control of the circuit? So we've got to figure that out. But, essentially, throughput on the circuit in either modes of that-- prioritizing our investments or shaping the load and moderating that peak-- is going to give us the ability to add more load to our existing assets and new assets.

Yeah. And what's exciting-- and you heard the excitement this morning-- is, we're going through a period of growth that almost nobody in the energy sector in their careers has gone through in this country. And the question is not, how do we not make investments in our grid? Actually, we need to make all kinds of investments in our grid. So it's a "yes, and." How

Do we do load shaping, unleash the power of DERs while, at the same time, focusing our investments in the right places, in the places that provide the most value, that create the best downward pressure on the rates? Because the story of electrification, the story of all of this new load, is a story of making electricity cheaper. And so that's what's exciting for us.

Well, I think we're going to go to the results. I don't know. How do I get them up?

Are we ready for results? No, a little bit--

OK.

--more?

All right.

So a trick with load shaping is-- we've responded to load shapes at the bulk system. And when we start responding to load shapes at the distribution system and the transmission system, we have to really be thinking about, what are those priorities? Like, which portion of the system is going to get responded to first? And then which system is going to get the second load-shaping strategy?

So if we do something at the bulk system and it causes the distribution system to actually get more peaky or more exacerbated, then we actually could be driving an outage on the distribution system. Or if those DERs don't perform, we could be driving an outage on the distribution system. So I think we're ready to roll. OK. Let's take a look.

So the first question was, from the lens of infrastructure and investment planning, what might help us significantly improve trust and confidence in DERs as viable grid assets? We chose to select out some of the more-- or not we. Our AI engine in the background chose to highlight a few of the more surprising solutions.

And I'll just say, maybe my first reaction to this is these are-- I don't know that they're all that surprising. They're kind of all yes. The answer is yes to all [INAUDIBLE]--

Yeah. Every one of these are like, yeah, that keeps me up. That's a safety issue. Yeah. All of these things are really important on how we think about orchestrating and using DERs as grid assets. So thank you.

Yeah And I'll just say, maybe the one that jumps out at me the most from here-- and something that we energy wonks forget or maybe don't appreciate quite enough-- is the translating the complex technical topics into clear customer communications.

Absolutely.

Because I haven't met a whole lot of-- I don't know. My parents are not that interested in responding to real-time energy prices or something like that. So we need to make it simple for our customers and for people that are on the electrification journey. How do we make it easy? So this one really resonated with me. Do I move this forward? All right.

It's a little tougher to read the small print here. However, something that jumped out at me is the second one in the utility workers-- two-sided energy markets balanced by AI and blockchain technology implementation. That's interesting.

Wouldn't it be great if we could do that? That's pretty cool. I love that it came from our peers and as utility coworkers. I think the other piece-- and things that we're already working-- AI-driven interconnection studies and grid-edge device visibility systems. There's a planning session in one of the other breakouts later on. And they'll be also seeking out, how do we make interconnection better?

Open standards for development of DER integration and communication-- you heard from EPRI earlier today about the new Mercury project that we're involved in. That's exactly looking to tackle that.

I love this-- weather-dependent resource planning. Because you heard today that as we get more resources that are sensitive to the weather out on the system that are causing the load and gen balances-- like, what happens with the weather is now an energy problem as well as driving our temperatures.

All right.

Do you want to go on to the next one?

All right. Our next question-- want to read out?

Cool. How can we leverage AI technology for increased accuracy of DER performance, real-time operations, and then also energy market forecasting? So this is the first time we're reading these. I like this. Brian, this is right up your alley-- bringing AI and automation to streamline grid modernization and infrastructure upgrades.

Yeah, the community energy equity advocate ensuring fair access to clean power.

Yeah. There's--

That is the challenge that we-- the energy transition needs to occur for all of us. And I think you heard this morning-- how do we not leave folks behind?

Yeah. We have a big sensitivity to those that can participate in this grid orchestration and those that are not able to participate in the grid orchestration. But we know as a whole, if we get more energy moving on the system, everybody benefits. So parsing that out is really tough topic. Shall we go to the next one?

All right. Let's see what we got from the utility, the industry partners, our stakeholders, and academic researchers. And I'll just say, I think that upper-left one-- the machine-learning analysis of historical data combined with real-time weather conditions-- that's really what we're--

Love it.

--talking about. So looking for those solutions, looking for, how do we integrate those types of solutions into our existing tools and platforms?

We have--

That's a lot of this stuff with AI. How do we integrate these new insights, these new tools, the processes into our existing workflows and our existing processes? We can't just rip and replace everything out. We got a legacy of investment in different infrastructure and processes.

And we have an amazing amount of data. But I think we use a lot of manual processes to manipulate that data. It's striking if AI can process abundant levels of data. We have huge amounts of data.

I'm going to pull out the second one on the industry partners-- so edge computing with report-by-exception monitoring for real-time awareness. I love that. How can we push the decisions, the analysis to the edge of the system to make decisions locally but report back? So it's kind of a connection back to the mothership, but make all the easy decisions there locally with different types of logic. Maybe from a central point, we can send different parameters or settings. That's a really interesting one.

I like this also from the Other Stakeholders section, bullet two-- integration of real-time economic signals into SCADA algorithms. Of course, that gets really complicated. But essentially, you're saying real-time coordination between the SCADA device and some degree of signal methodology, whether it's a price or whether it's a-- I've been joking around with whether it's a price or it's 1-through-100 scale of that DER should perform. Like, what is that? How does it show up?

Yeah. And I think so much of this is-- we have lots of measurement. PG&E has thousands and thousands of SCADA devices that are taking measurements every couple of seconds. We have 5 million smart meters that are taking measurements-- well, they're sending measurements back on a 15-minute time scale. But they're taking measurements on a subcycle level. What can we do with all of that?

And how can we marry that to the grid model, such that we're getting insights and being able to operate the system more efficiently?

Ooh. One that I really have been hypersensitive to lately is that we increase the utilization of our circuits. When does it become that we introduce new risks on the system to manage? And this second bullet, predictive modeling using linear regression for risk assessment solutions-- that leans into that. There's a lot to peel out of that. I'm not exactly sure how that would work. But, boy, if you have something like that, we're interested. Because that risk modeling becomes very important with higher utilization and DERs, which are highly variable. So--

Yeah. And the other piece of the integration--

[? Jon ?] says yes.

[LAUGHTER]

All right, integration of isolated data systems to accelerate learning and forecasting. How do we unlock that? How can we integrate in a way that isn't just a one-to-one integration? How do we put the-- I guess to combine that with the data lake-- how do we get all the data into a place where it's accessible to the different systems?

That's common enough that it can actually be usable instead of one type of data with certain attributes and another type of data with different attributes. And we can't easily aggregate all that to make sense of it. So how do we normalize that?

All right, so you're kind of getting a sense of where we need to go. And I'm hoping that these solutions are out there. All right. So our third question was across heterogeneous resources. How might we better prioritize and orchestrate DERs across the multiple different value streams? And we have the communications again and yes.

Yeah, the customer side to this is like, the customer is the success story here, without the customer being completely understanding but also not having to be-- the stuff needs to be invisible to them. I know, for one, I don't have the time and bandwidth to manage my energy at my homestead all the time. I want that to be automated. But I want to understand it. I want to be part of the story. I want to make sure it's doing the right stuff and it's going to be available for me-- customer side.

Yeah, I think all four of these are customer-oriented solutions. How do we engage people in this orchestration journey?

Ooh, a lot to digest here.

Economics-- do we translate it all into economics? I'm looking at the industry partners-- economic value calculations must balance the customer bill reduction versus the grid needs. Maybe I would take it a step further and say, well, how can we align the customer bill reductions with the grid needs? I think that's going to be a key. How do we send the right incentives?

A couple of flags here on the academic researchers-- if you are in the audience and wrote the explore transformer-level signal processing to detect granular end-use load patterns, please see our next-generation smart meter booth outside and find a couple of people-- I know Chris Morris is somewhere out there. Find him. He can talk your ear off about what he's thinking about there.

Yeah. And I think that that really speaks to the fact that we have constraints on our system at every layer of the system, even in the home-- the constraints on the panel, constraints on the service transformer, constraints on the distribution substation transformer, constraints on the energy system. So the orchestration journey is really, how do you manage these constraints at the various levels and choose what actions-- sometimes they conflict with each other.

And the energy market might be sending a signal to say, charge at midnight. If everyone charges at midnight and they're all on the same transformer, that transformer's overloaded. So those are the types of things that we're talking about here in the orchestration category.

I love the notion of Other Stakeholders, second bullet-- focus on establishing clear resource control mechanisms. So we've been having a lot of active conversations around, what's the effectiveness of rates and price signals? What's the effectiveness of price signals or rates with automation so that now you're starting to get firm delivery without a customer interface in there to make a decision around it? And then we can start to trust it, that it's going to show up.

And then, what does it mean to have a different kind of control signal? And then building standards around that and getting our partners-- our regulatory partners and our industry partners-- and all of the utilities to align on, what does that look like? How does that work? And then going back to the OEMs and working with them to get the devices to function in that way and respond to those signals-- that's a big piece of it. If we all get aligned behind some standards, then we can actually start building systems that talk to each other.

Yeah. And having that response or that level-- the attribute of the DER program or the mode of engagement matched to the need. So we might be able to use a large behavioral program to solve a need at a bulk scale, where you have millions of participants or thousands of participants. And it's pretty resilient. If any one doesn't show up, you still have the law of large numbers.

As you get more granular, you're operating at a service transformer level, where there's three people responding to that signal. You got to be certain. You got to be certain. So it's a different level of-- the mode of engagement will solve different types of grid challenges that we have, and we have to be fit for purpose.

I love this extension of what you just said. And where this whole conversation is going is like the second bullet under Industry Partners. Whoever's got this one, please seek us out-- decentralized systems using AI to dispatch local resources for specific challenges. That's a reach in a big direction that assumes that we have good grid-state awareness, that we understand what the grid need is, and we understand the resources that are on the system in order for that AI thing to do it on its own.

That's going to take an immense amount of trust, not only with our planners but with our operators that are sitting in the control room that have a very serious, real job to keep the lights on and not cause any damage and keep people safe. And so you put AI in there, making those decisions, we got a whole different thing to think about. That's complex. That's interesting.

Yeah. So hopefully-- we're just about out of time, but hopefully-- we came out here with three key challenges, with the hypothesis that AI can help us increase the visibility of DERs on the system, build confidence and trust in DERs as grid assets. We looked at, How do we increase the situational awareness? and then, how do we orchestrate that?

And I think many of the ideas here-- thank you for providing us with all the content. Now we'll take it back. We actually need the real solutions. So find us afterward, and we'll be able to put the--

If you're focused--

--[INAUDIBLE].

--in this area, please bring it to us.

Super exciting. Thank you all for your participation. Thank you for making this and providing the insights here because without you, it wouldn't have happened. So thank you so much.

Really excellent. Thank you.

[APPLAUSE]