ON THE GRID: THE ROLE OF EVS IN ENERGY RELIABILITY

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OPENING REMARKS AND SPOTLIGHT SESSION SPEAKER

- Alice Reynolds, California Public Utilities Commission (CPUC), President
- Moderated by Josh Boone, Veloz, Executive Director

OPENING REMARKS AND SPOTLIGHT SESSION TRANSCRIPT

Josh Boone, Veloz: Happy summer everyone, and thank you for joining us today. Today our digital dialogue is titled, On The Grid: The Role of EVs in Energy Reliability. My name is Josh Boone and I have the privilege of being your moderator today. I'm also here today in the capacity of my day job, Veloz's executive director. The Veloz team is excited to bring you a group of action-oriented leaders from our board leadership and membership to discuss the types of solutions and programs we can utilize to support grid reliability as more and more Evs join America's roadways. Allow me to take a moment to first frame today's conversation and then we'll invite our group of experts into Veloz digital stage. Summer is upon us, and currently large swaths of the country are under extreme heat conditions. This is often the time of year when we traditionally hear about grid constraints while HVACs are blasting at home and we're trying to escape the heat.

This is also the time of year where we often see pushback in the media or from certain groups about how the current fleet of Evs, and more importantly, the brand new Evs are going to make a bad problem worse with all the necessary charging they require. From the outset, these are extremely valid concerns for consumers that are being asked to limit their power use at home and simultaneously incentivize to adopt an EV. We think it's important to talk about the current state of Evs and grid reliability and also the solutions of the future. So let's take California for example, where we have over 1.5 million Evs sold or roughly 21% of the overall new car sales market. According to the California Energy Commission, Evs account for 0.4% of the overall demand for electricity. If we start to extrapolate that number to five million plus passenger Evs and even add in 200,000 trucks and buses, the current estimate is that those vehicles will account for about 4% of demand during the evening peak energy use hours.

This is not to say that added load in general is not an issue, but it's important to level set how much of an issue it's going to be. That being said, the industry is being action-oriented in terms of how we find solutions now to tackle future demand, help incentivize charging behavior at non-peak periods, and even innovative software and hardware solutions such as battery storage or vehicle-to-grid integration, which ensures reliable charging for EV drivers. As I mentioned, we're going to be joined by a panel of world-class experts today to talk about their perspectives on the matter, innovative projects and how to scale these solutions nationwide. I'll introduce each of them individually to you in a little while. We'll also have an open Q&A session at the end of their panel so you'll have a chance to interact with them directly.

First up to Veloz digital stage as our newest public policy board member, it's my pleasure to introduce the California Public Utility Commission President, Alice Reynolds. As many of you know, President Reynolds was appointed to the PUC by Governor Gavin Newsom in 2021, and she brings to the role a deep expertise and background in climate, the environment and energy. At Veloz, we feel so lucky that she recently agreed to join our public policy board and that we get the opportunity to learn from her policy leadership. So please join me in welcoming President Reynolds to the Veloz stage. Good morning and welcome, Alice.

Alice Reynolds, CPUC: Hello. Good morning. Thank you for having me, Josh.

Josh Boone, Veloz: Yeah, I understand that you're traveling, so we're extra grateful that you took the time out of your day to speak with us today. And before we jump into the topic at hand, we are curious to know how has your first year and a half as PUC president been and have there been any surprises, good or bad, that you weren't expecting? And in a similar vein, how has your first few months as a Veloz public policy board member been?

Alice Reynolds, CPUC: Yeah, that's a great place to start. So in reflecting on my past year and a half, I think it's kind of like what they say about raising children, but the days are long and the years are short. And it's really true in my position at the PUC. As to surprises, I guess when I started at the Newsom administration, with the Newsom administration, we encountered a lot of surprises. We had catastrophic wildfires. We had large public safety power shutoff incidents. We had COVID. We had incidents on supply chain issues. And so there was a lot going on at the beginning of the administration. When I came to the PUC in contrast, the PUC has been here for over a hundred years. It started as the Railroad Commission in 1911. And I have to say, it was kind of a relief to see all of the procedures in place, all of the regular processes that keep the commission going.

And so I don't know, there weren't many surprises when I got here. More of a feeling of like, okay, we have a system in place to manage what we're doing. At the same time, what we're trying to achieve is huge and exciting, but also daunting. And then with respect to my time as a Veloz board member, I have to say I have, and you might be able to tell this, I've really been enjoying it. The Veloz policy board and the board itself is a group of just incredibly experienced and talented individuals who all come at these issues from a different direction. So sitting in different seats, have different types of expertise, and we get to talk about policy issues and the common goal of getting to a hundred percent zero emission vehicles, fighting climate change. And so to me, that is the most exciting part of my role in my job. And so I really appreciate the space and the time to talk through just how we can do more, how we can do better.

Josh Boone, Veloz: Yeah, that's great on both fronts. And as I said, we're really honored and delighted to be working with you in the context of advancing Evs and in the context specifically of Veloz and our mission. So we appreciate you lending your expertise to the organization. So while many in our audience are familiar with the PUC's role in transportation electrification, some people are just not familiar with the role. So for clarity, could you walk us through the California Public Utility Commission's regulatory decisions or technical program supporting California getting ready for an all-EV future and our governor's mandates on EV sales?

Alice Reynolds, CPUC: Yeah, so I'm going to talk about three things. The first is the PUC manages the process to make sure that the electricity on the California grid is clean, it's moving towards clean energy, and that we have sufficient capacity. So of course this is really important for electric vehicles because electricity is the fuel of the future. We need our vehicles to be powered by clean electricity, and we need to make sure we have enough electricity to fuel the large fleet of Evs that we anticipate to meet California's goals. And so the PUC regulates the three large investor-owned utilities, so PG&E, Southern California Edison, and SDG&E. And they cover about 75% of California's load. And then we also manage the planning and set requirements for all of the retail sellers. So this includes the community choice aggregators and as well as the investor and utilities to make sure that they're planning for procurement in order to move forward and add clean resources to the grid.

So what this means is that we are issuing procurement orders that lead to clean energy projects. We currently have procurement orders out for about over 18,000 megawatts. So this will be clean resources coming on the grid. It's individual projects, hundreds of projects actually, batteries, solar, wind projects that are being brought online by all of the loads, or what we call load serving entities. And these are the retail sellers, the entities that provide power to individual Californians. And so they're all working really hard to get these projects online to make sure that we're meeting the load growth that we expect to see in the future. Part of that load growth being driven by electric vehicles. So the second thing we do is that we regulate with the regulation of the large utilities. These large utilities are the owners of the distribution system in California. And so our regulation of them includes managing the planning to make sure that our distribution system is ready to accommodate the charging and all of the vehicles that we need to bring into the system.

So this is a process that's obviously very much in flux because there's been such a huge change. We've had the success of amazing deployment, especially on the light duty side of electric vehicles, but also our medium and heavy duty fleets. And so all of the utilities are trying to keep up the distribution system and doing all those capacity upgrades that need to be done in order to accommodate the energization necessary for all of the charging stations. We work on cost-effectiveness in all of these projects, because of course the costs are paid through

electricity bills, that's the source of funding for distribution upgrades. And so a lot of the work we do is trying to find the most cost-effective way to make sure that the grid is ready.

And then the third thing we do is rate design. And so one of the main things that we need to make sure is that our rates are ready for the system of the future. And so the audience is probably aware of EV rates and of course, time-of-use rates, which is the default rate for all Californians. But it's going to be more and more important to have rate designs that work for electric vehicles, especially given that we'll have electric vehicles on at commercial properties and at residential properties. And so we're doing a lot of work now on pilots of dynamic pricing so that charging can be done at the right tim', and the individual customers receive incentives to charge vehicles when the grid most needs them. And really to use rates as a way for consumers to save money if they're able to acquire Evs and use them to help the grid.

Josh Boone, Veloz: Yeah, that's great. I sit in PG&E service territory myself and drive an EV, so it's fabulous to take advantage of the whole house time-of-use EV rate. So that's wonderful. So in your opinion, what role could vehicle-to-grid integration play as a solution and how does the PUC support these efforts?

Alice Reynolds, CPUC: So this is a really exciting and innovative area. And so the PUC, we are trying to explore different avenues to allow electric vehicles to support the grid. So a lot of that is done through pilots, but just broadly. Electric vehicles by 2030, we're going to have more than eight million ZEVs on California's load. And when you think about the batteries in those vehicles and how they can provide a source of power to the grid as well as a giant flexible load, which is really what we're going to need more and more as we bring on more intermittent resources. So we have solar and wind and we know that they provide power to the grid, sometimes more power than we can use in California in the middle of the day. And then we have a period at the end of the day where load is still high and the solar is going offline, wind is variable.

And so we have this wonderful supply of clean energy resources, but we're working on storage of that energy so that we can have it when we need it. Vehicles potentially could provide some assistance with this. And so I guess just starting with the load shifting, load shifting is going to be incredibly important as we move far into the future. It's not about not being able to charge, it's about charging at the right time. And so if we can incentivize and encourage individuals and managers of fleets to charge when we have abundant resources, there can be a cost savings there. So we can design rates, as I was saying, to provide incentives for charging in the middle of the day. And then to the extent possible, refraining from charging towards our net peak time. This can be a game changer in terms of the way that we plan our systems, especially as vehicles become more and more numerous in California.

And so that's one. And then the second one is what I think everybody kind of talks about and sees the vision here, and it's also very exciting, which is vehicle-to-grid, vehicle-to-home, vehicle-to-everything. And so the idea that we actually have a mobile fleet of batteries, and if we can use these batteries to do bidirectional, to be used bidirectionally, they can provide power to the grid during the times of day when we need it. And so we're doing a number of pilots in this area. PG&E in particular has some pilots that allow customers to sign up for grid support during emergencies. And even a pilot that has to do with public safety power shutoffs. And so providing some assistance during that time when we need power in certain local areas to the grid. So there's a lot of potential here, but there's also a need to explore th't potential.

And I think we're still learning a lot about when drivers of Evs are going to want to charge and need to charge. And some people have flexibility and some people don't. And so I think it's about providing options and then learning as we go and making sure that we're fully taking advantage of this new resource. But also allowing people to use their cars as cars and trucks as trucks because we know that these vehicles have work to do. School buses, for example, is another great resource that we know, that the primary job of school buses is to transport children in our school system. But there's also a potential to use those batteries when not needed for the primary purpose. So really exciting pilots going on at the PUC and a lot of cooperation among the fleet owners and the OEMs and community groups. And so there's just a lot of work and potential there.

Josh Boone, Veloz: Yeah. Well, clearly the work at the California Public Utility Commission under your leadership continues to be an instrumental part of our all-electric future, and we're really excited about not only the research, but the proactive policy leadership you're doing in the space because we've got to balance it, right? We've got to have a solid, strong grid, we've got to have renewables working, we've got to have Evs being able to be fueled. And so all of that requires special consideration, and we thank you for your leadership on that. Before we wrap up, I want to ask you a fun question, president, if you had an unlimited budget and staff resources, what initiatives would you personally focus on to ensure Evs continue to be part of the grid solution? What inspires you? This could be anything from researching battery diodes to battery storage solutions to virtual power plants. There's a lot going on in your space, so I'm curious.

Alice Reynolds, CPUC: Yeah, that's a great question. I think maybe to answer it in a little different way, I guess primarily I wish I had a crystal ball to see where the deployment of vehicles was going to happen is going to happen first. But it relates to the resources, the funding for doing planning and being able to anticipate where we're going to see load growth first so we can target grid upgrades and investments in those areas where we need them. Because we know this is going to be a process and not everybody is going to switch to an EV overnight. This is going to happen over time. And so we are already doing a lot of planning, but I would really like to do a better job at granular planning and making sure that we're getting those investments where they need to be on time and really anticipating loads.

So moving from a reactive planning to proactive planning so that the grid is ready when the vehicles come. And I think there's an opportunity here for machine learning, for AI to really take advantage of all the tools that we have available in order to anticipate and be ready for vehicles, obviously in a cost-effective way. That's the balance there too. So making sure that we're ready, that it's not the grid that's holding us up on our path to the future. But it's difficult, and so it's something that we're working really hard on, but we'd love to have more resources together with the distribution system owners to do a better job at that.

Josh Boone, Veloz: Yeah, that's great. Well, I know our time has been short together. I want to thank you President Reynolds for spending time on Veloz air today. Thank you for sharing your expertise, what inspires you, what you all are up to. I just want to wish you a really wonderful productive day and we will see you very soon. Thank you for your time.

Alice Reynolds, CPUC: Thank you, Josh. It really has been a pleasure. Thanks so much.

"ON THE GRID: THE ROLE OF EVS IN ENERGY RELIABILITY" SPEAKERS

- Jigar Shah, Electrify America, Head of Energy Services
- Smriti Mishra, WeaveGrid, Senior Director of Strategic Growth and Partnerships
- Jennifer Cahill, Black & Veatch, Distributed Energy Resource Lead
- James Frasher, Sacramento Municipal Utility District (SMUD), Manager of New Business Development, Grants and Innovation
- Moderated by Josh Boone, Veloz, Executive Director

"ON THE GRID: THE ROLE OF EVS IN ENERGY RELIABILITY" TRANSCRIPT

Josh Boone, Veloz: Take care. As the panel comes on the screen today, allow me to take a moment to welcome each of them individually. So joining us today for our panel discussion is Jigar Shah, who is the Head of Energy Services at Electrify America. Smriti Mishra, who is the Senior Director of Strategic Growth and Partnerships at WeaveGrid. Good morning. Jennifer Cahill, a Distributed Energy lead at Black & Veatch. And James Frasher, who is the Manager of New Business Development, Grants and Innovations at the Sacramento Municipal Utility District. Good morning everybody and welcome. Can you all hear me okay?

Jigar Shah, Electrify America: We can.

Josh Boone, Veloz: Okay. Well, I think we're going to just jump straight in. And so I'm going to go to you Jigar for the first question. All of us are very familiar with Electrify America's charging services and actively utilize your public infrastructure today. I see it everywhere, so that's good. Can you talk to us a little bit about the energy services side of Electrify America? I know that's your particular area of expertise and the goals of your team.

Jigar Shah, Electrify America: Absolutely. And thanks so much for referring to our network. It's great to be managing energy for the largest open DC fast charging network in the nation. And so from a context perspective, we have over 800 stations in 46 states, plus DC of course with over 3,500 individual DC fast chargers operational. Each one of those ranges from 150 kilowatts on the low end, to the flagship parallel that we provide of 350 kilowatts to capable EVs. And so those faster charging times that are enabled by 350 kilowatt charging is especially advantageous to those that may not have access to home or workplace charging over time, as President Reynolds was referring to, and making sure that folks have access to charging to enable that EV mission. And when thinking about this from an energy perspective, what do those 3,500 plus DC fast chargers that we have installed mean from an energy perspective? That's over 700 megawatts of energized assets that my team is responsible for from over 230 utilities.

And so that is quite the amount of, of course, interconnected assets. And in addition to that, you can imagine from a utility bill perspective, so rate optimization, paying close to utility rates in terms of reciting decisions and economic viability. Those are some of the things that my team pays close attention to, in addition to looking at alternative solutions to manage interconnection constraints as well as utility demand charges. So for example, we have over 150 deployed behind-the-meter energy storage systems, so over 35 megawatts deployed. Part of that is doing time-of-use energy arbitrage that President Reynolds was referring to earlier, in terms of shifting the use of on-peak energy to off-peak hours so that EV drivers on our network can still charge during on-peak hours without being inconvenienced. And also in other cases, to help with infrastructure constraints where there may not be enough utility capacity, but still providing those fast charging services today.

Josh Boone, Veloz: Great. I have maybe two quick follow-ups for you. One, you mentioned your increasing network of 350 kilowatt chargers, and I'm assuming that more and more of today's electric vehicles are able to charge at that faster capacity. And so that's kind of one comment question. And then two, I'm based in Northern California, so I recently had the good pleasure of driving past one of your large San Jose facilities at a real big beautiful solar canopy. I don't know if you have battery storage at that facility, but I'm just curious if you can share a little bit more about those two topics.

Jigar Shah, Electrify America: Certainly. So in terms of vehicle power levels, we definitely see vehicle power levels increasing as more and more models hit the road. There's relatively few that can charge at 300 kilowatts and above right now, so we're not seeing too many vehicles at 350 kilowatt power level yet. But what we're excited about is that the majority of our network by 2030, we expect that 350 kilowatts plus will be the predominant and prevailing technology just because battery technologies are just improving so much and it's just a better customer experience to get closer and closer to the gasoline refueling speed. Most people used to spend five, 10 minutes at a gas station anyway. And at 350 kilowatts, you're getting closer and closer to that same experience.

Josh Boone, Veloz: Jigar, I don't know anybody that tells me they want to charge slower typically.

Jigar Shah, Electrify America: Exactly. And from a renewable standpoint, that is certainly something we hear a lot from our customers on a daily basis in fact. And so it's great that we have solar canopies at certain locations as you refer to. Many of those are coupled with behind-the-meter energy storage, which those batteries are charging from in addition to our DC fast chargers, of course, for the energy that's delivered to the vehicles. When you think about energy at the scale that I was mentioning, over 700 megawatts of assets, we delivered across over 5.2 million sessions in 2022. We delivered over 173 gigawatt hours of electricity in 2022, that enabled over 493 million miles of electric driving. So when you're thinking about that quantity of electricity, it's hard to have enough local solar and other renewable sources right there to power that. And so that's why we're looking at alternative solutions to make sure that our network continues to be backed by a hundred percent renewable energy as we've

made a commitment to our drivers. And I think we'll go into that a little bit later here in the panel on some of the approaches we're taking there.

Josh Boone, Veloz: Yeah, that's great. Okay, Smriti, we're going to turn to you. Again, welcome to the Veloz digital stage here. We're itching to get into some of your active projects today, but we want to start by asking you about WeaveGrid software platform and how it benefits utilities in managing load and drivers to managing cost.

Smriti Mishra, WeaveGrid: Yeah, thanks so much for having me today. This has already been such an interesting discussion to listen to, so I really am enjoying it. So WeaveGrid's platform connects utilities with their drivers and automakers, and we do that to help everyone have a more optimized experience. So for utilities in particular, we're focused on how we can provide optimized smart charging services for a variety of use cases for wherever that utility is at. And WeaveGrid does have a patent to go all the way down to the transformer level where we'll be optimizing for the bulk system constraints as well as local distribution goals. And so we can do that with proactive, predictive peak reduction and have a variety of advanced tools there. For drivers, we're giving them more insights into their charging behaviors, giving them access to utilities incentive programs that they wouldn't otherwise have to help reduce those costs.

But we also hear things from drivers about a fair amount of pain points that feel new to them about EV charging, like when they forget to plug in or just the anxiety of seeing their electric bills go up and not knowing how it compares to their gas bills. And so our driver-facing tools really help improve all parts of that experience and say, Hey, you really are having savings through this experience. We'll help you remember to plug in when your battery charge is really low. And then finally with the automakers, we get data both from the network smart chargers as well as telematics in the vehicles themselves and automakers are undergoing a transformation in their customer experience. And so we work closely with those partners on what are their vehicle capabilities, how can that be advanced in new models and really helping them deliver the best customer experience from their perspective too.

Josh Boone, Veloz: Yeah, that's great. That's exciting. And it's almost like your platform provides a little bit of EV driver therapy. Because I think as an EV driver myself, having more data at your fingertips to know how to smartly take advantage of not only cheaper electrical rates, but clean renewable energy is all part of the ecosystem. So that's really fascinating. We're going to get back to one of your pilots here in a little bit, so hang tough. But James, we're going to you next. So SMUD is doing a lot in terms of EV acceleration and adoption, from EV rate tiers to charging station incentive programs. We also know that at SMUD you're managing increased loads as more EVs come online, how do you balance those needs and prepare for a future where every one of your consumers are driving and charging their EV on the SMUD grid?

James Frasher, SMUD: That's a great question, Josh. I appreciate it and appreciate the opportunity to speak to everyone. I really like the kind of journey nature of that question, the fact that it's looking at where we're at today and really putting ourselves at that endpoint destination and saying, who are we going to be when we grow up and how did we get there? And what was the best path for it? In Sacramento, we have about 1.2 vehicles on the road today, so of that, about 30,000 are electrified right now. So it's not a considerable number relative to the overall population, but a pretty considerable number relative to where we were, say 10 years ago. And so it's a significant path that we've taken, but it's nothing compared to what we need to do as we move forward. One of the things that comes up a lot when we talk about that endpoint destination is that at that 1.2 million vehicles, all of those being electrified, it's possible that roughly one in every three kilowatt hours that we generate and deliver as a utility will be used for transportation fuel.

That means one third of our business will no longer be just powering homes and businesses, it will be powering the mobility sector. And so it becomes a major planning component for us and thinking about how we're going to deliver that energy long term. But when we zoom all the way back to where we are today and thinking about those 30,000 vehicles, the challenge is a lot different than just how do we deliver in mass. The challenge that we look at is when we see adoption today, oftentimes it's very regionally focused. It's very concentrated in particular areas. And other areas, there's very, very little adoption. And so from a charging infrastructure planning standpoint and a deployment standpoint and incentive standpoint, we really have to be thoughtful about how do we support the

adoption that is already ramping up that is underway. But also, how do we make sure that we're enabling those opportunities to benefit from electric vehicles to have that, that opportunity to participate in this transformation?

How do we create that opportunity for those areas and those communities that aren't yet receiving that benefit or don't yet have that opportunity? So there's one side of the conversation that is we need to build it so that the opportunity exists in terms of infrastructure, incentives, access to charging. And the other side is we need to do everything that we can to keep up with the adoption that's happening in these higher density areas. And from a utility standpoint, the biggest challenge is that 30,000 vehicles out of 1.2 million means that most of our customers don't yet have those electric vehicles, albeit we know that we will get to that point. So as we're walking this journey from 30,000 to 100,000 to 500,000 to a million, the other thing that we need to keep our eye on is making sure that we're creating equitable benefit and equitable pricing through our rates and incentives and programs that we are accelerating the mission but we're not doing it on the backs of our rate payers and those non-participants. Making sure that we're approaching it in a fair way that creates this benefit for all of our customers and lets us move forward together.

Josh Boone, Veloz: Great. Let's move over to you, Jennifer. I haven't forgotten about you. We heard President Reynolds talk about the PUC's investment in battery storage, and we know that your team has world renowned experience in these types of projects. So can you give us any insight into how commercial battery storage can support increased load from EV charging?

Jennifer Cahill, Black & Veatch: Absolutely. This is a very popular conversation that we're having with many of our clients right now. We want our clients to be able to charge at the power levels that they want, at the times that they want, but not have a significant impact on the grid. I think that's everybody's goal. So we often encounter projects or clients that have asked for an interconnection application which may be denied. They can't get the power rating that they want at the times that they want because most of our clients aren't charging consistently from an EV base. It's at a certain time, they need a certain amount of power. So what we've done is we are able to look at it at an overall standpoint, so how much power do they need in a 24-hour period? Energy storage allows us to charge our batteries at the times that the power is available. So over a 24-hour period, we can charge at times where maybe the rates are lower.

And then be able to charge the EV charging on demand when they want without having a great impact to the grid. So energy storage allows us to control that. Our clients get a better operating value when they aren't charging at peak hours where the demand charges are high. And then they're able to just charge at times when their users need it and that they want to make sure it's available. And in areas such as California where solar is more abundant, you could charge during the day, but then your storage still allows your clients to charge during the evening hours and the power is available on demand without putting the excess on the grid.

Josh Boone, Veloz: Yeah, that's great. If I can ask you just a little bit of follow up here, are you seeing a lot of demand from your clients for installation of battery storage?

Jennifer Cahill, Black & Veatch: We are. We're seeing, I think a lot of the utilities are struggling. We all are aware of the failing infrastructure, the high demands on the utilities right now. We have a lot of clients, especially larger demands where they go to the utility and say they need 17 megawatt hours or 17 megawatts at a certain time, but they can only get three. At that time we come in and bring a distributed energy solution, which is a behind-the-meter solution so that we can allow that facility to create the extra energy without putting that on the grid.

Josh Boone, Veloz: Yeah, that's great. Okay, back to you Jigar. So your team has installed hundreds of charging installations with onsite battery storage. How do those systems benefit the consumer, the EV driver? Have they had any impact on the ability to charge during periods of grid constraint?

Jigar Shah, Electrify America: Absolutely, great question. So as Jennifer was mentioning, right, there's a lot of interest in behind-the-meter energy storage. And so as I mentioned before, we have over 150 locations with that technology deployed today, over 35 megawatts worth of energy storage. And so those systems, what they do,

especially in California where there's time-of-use rates in place throughout the state is that they charge during off-peak or super off-peak hours, especially when there's excess solar energy. As President Reynolds was mentioning, when those rates are super cheap and then use that energy to discharge during on-peak hours to serve EV drivers. So right now our pricing in California is static throughout the time, regardless of time of day. We wanted to make sure that when consumers are adopting EVs, they're used to the gas station model of not having to worry about what time of day they're refueling. And especially for low and disadvantaged communities that may be adopting EVs, they can only refill at certain times of the day without access to home or workplace charging on a readily accessible basis.

And so we do not vary pricing by time of day. Instead, we use that energy storage to provide that uniform pricing to customers while reflecting on promoting vehicle grid integration from those time of use rates that President Reynolds mentioned and helping support vehicle grid integration. Of course also, decreasing the GHG carbon intensity behind the energy that we deliver to drivers. I think in addition to that, really from a GHG and a cost standpoint, that stability we provide to customers. Going back to the other topic that I brought up regarding infrastructure constraints. So if you look at one of our sites in Baker, California, for example, that was a case where Southern California, the California Edison was not able to provide the full two and a half or so megawatts that we needed to increase the number of 350 kilowatt charters at that location on a prominent highway route.

And so we were able to put in one and a half megawatts, approximately 1.3 megawatts of energy storage to supplement approximately a megawatt of utility interconnection capacity available to serve that full two and a half or so megawatts of total DCFC capacity today without waiting a few years. And so we're increasingly using energy storage to bridge those gaps and provide that accessible charging today to continue to support EV adoption. And I think beyond just public charging, it's important to mention that we have a commercial division, Electrify Commercial, that also supports fleets. And so one of the flagship products that my team has a privilege of working on is with a partner called NFI, and that's building out one of the largest depots in the state to support medium duty and heavy duty EV charging. And so that's a location, like Jennifer was mentioning, it's going to be above 11, above 10 megawatts, 11 megawatts of assets interconnected at a single point of interconnection.

And to ask that much within a year or so is very difficult for utilities to provide that, right? If you take this into context, the Empire State Building at peak uses nine megawatts. And so each one of these depots is considerable to what the Empire State Building would use at peak, and that's kind of crazy to think about it that way. And so what we're doing is we're putting in four megawatts of energy storage, megawatt of solar to support that six plus megawatts of DC fast charging that we're putting in with micro grid capability for those public safety power shutoff events. And of course, those time-of-use energy rates that we've been discussing, to provide that comprehensive fleet solution so that cost per kilowatt-hour is reasonable and comparable, and if not, better than moving from the internal combustion engine world that a lot of these fleet operators are used to. And so we're proud to be on top of that mission.

Josh Boone, Veloz: Yeah, I liked your Baker, California example in terms of battery storage, really makes a lot of sense and pretty exciting how you're leveraging that technology. Okay. Going to you, James. From your perspective, what role could home-based battery storage systems play? How can we make it easier for consumers to afford and access battery storage at home? I want battery storage at my home. It's really expensive. Tell us how you do it, James.

James Frasher, SMUD: Well, so I also want battery energy storage at my home. Actually, before joining SMUD, I was a battery engineer for about 14 years. Running battery test labs and working on behind-the-meter battery systems. So that's something that I'm particularly passionate about. At SMUD, we really think about battery energy storage and DERs more generally as a portfolio of solutions. And so when we do that, thermostats are part of that portfolio. Water heaters are part of that portfolio. Electric vehicles are absolutely part of that portfolio. The biggest difference about battery energy storage and stationary storage when we think about it in that context is that a vehicle's primary application is to provide mobility. A thermostat is to maintain the temperature of your house. A water heater is to make sure that you have hot water when you want it. A battery energy storage system, when you install it, it really serves kind of two major functions.

One is either a cost optimization function or backup power. The neat thing about those two primary applications is that when a customer needs backup power, there is no grid to be supported. And so they're largely exclusive or mutually exclusive use cases. And so when we think about the portfolio of DERs and how that integrates with things like our virtual power plant solutions, batteries really become kind of the anchor tenant in those types of solutions and it becomes the most reliable resource. We don't have to worry about it being winter. So a thermostat isn't going to show up to turn off an air conditioner or being four o'clock in the afternoon and an electric vehicle isn't home from work yet to provide good services. The battery is there and creates a reliable baseline response for some of these virtual power plant programs. I start the conversation there thinking about how do we drive adoption for battery energy storage and how do we bring that forward, because what it takes is it takes creating these additional value streams for that battery to reach a cost-effective threshold.

It's not just optimizing against the rate. It's thinking about how we can create programs and design programs that pay customers for their contributions to the grid for supporting that electrical system, where they can offset capacity that we otherwise would have had to procure from a conventional power plant or from a thermal generator. At SMUD, we're targeting zero carbon by 2030, which means that we're going to transition away from natural gas-fired power plants over that timeline. We have five that we operate now, and so we're looking to transition two in the near term and then continue to refuel, retool and transition the remaining three. But as we bring resources offline or as we reduce the operation of those resources, we're still left with a utility that we have to operate and energy that we have to deliver to our customers.

And where those resources come from and where things like that resource adequacy and capacity comes from are solutions like these virtual power plants. And so in the sense that in the past we've paid those power plants and those power plant contracts for those services, as we look forward, we need to develop programs and solutions and relationships with these technologies that allow us to procure those services from these different types of DERs and virtual power plant portfolios. And by doing that, we enhance the cost-effectiveness of things like battery energy storage. We make it easier for customers to adopt them because the value proposition is more robust, more reliable, and more long-term sustainable.

Josh Boone, Veloz: I promise I'm going to get back to you, Jennifer, but I'm going to go to Smriti next. So I have a couple of questions coming your way. Let's talk about the exciting EV pulse program that WeaveGrid has operated with PG&E here for the past two years in California. What is the goal of the program and how does it work?

Smriti Mishra, WeaveGrid: Yeah, so this is the program that President Reynolds actually mentioned that PG&E is working on helping EV drivers ahead of those PSPS. And just understanding that drivers, EV drivers have a disproportionate impact from planned outages where there's an anxiety level that frankly anyone living in California and increasing parts of the country is worried about evacuation risk at any given time. And when charging your vehicle is so important to be able to rely on that grid, having a better understanding of PSPS is particularly important for those drivers. And so we launched this with PG&E last summer, ahead of the deep fire season and used it where we gave drivers the option to either have an experience focused on additional messaging ahead of those PSPS events and more driver education or they could opt into full managed charge. And we actually found that 80%, well over 80% of people actually decided to have managed charging.

And so for that managed charging experience, in addition to helping them with their PSPS experience, we also helped manage for rates, renewables and other grid goals. And so that actually resulted in a very positive customer experience where customers are getting some of that education understanding that they need and reliability while the grid's getting access to just a broad set of reliability and flexible tools. We actually quantify, there's been a lot of discussion about how flexible charging really is. And so that's something we directly measure. As anyone who drives an EV knows, that flexibility varies by location. You have a different amount of flexibility when you're in a public charging location, workplace and home. And so that's something that we all quantify and have as an input into the managed charging experience and is information that we can give utilities for planning purposes, that can be really, really powerful.

So yeah, this has been a great program in the last few years already. And so we started with targeting all parts of the PG&E territory that have ever had a PSPS event in the last five years. So it's not necessarily where they'll need them this year or going forward, but it's anywhere that drivers could have that anxiety and say, oh, I've experienced an outage before, what if I have this again? And so just thinking from the driver's perspective rather than the grid perspective I think was something really powerful in the design of this pilot.

Josh Boone, Veloz: And as a little bit of a follow-up, this program is being implemented today for a subset of PG&E's customers and communities that may experience power outages like you said. Can you speak a little bit more about how you've scaled the platform and other use cases and other utilities?

Smriti Mishra, WeaveGrid: Yeah, so talked about this one was really focused on the PSPS, but we're serving other grid goals like renewables matching, and that's something that's actually active and it was the targeted goal for some other utilities. So we have a 24/7 renewables match with Xcel Energy in Colorado. We're also doing territory wide programs with Xcel Energy with BGE and other areas that are really incentive programs that are designed for EV specific load shifting and goals that they want for off-peak charging. And off-peak can be defined as the fixed daily time-of-use schedule or something that's a lot more dynamic, where really grid constraints we know are dynamic even at the bulk system level. And so we can integrate multiples of those inputs. And then finally, the last piece that is starting to scale with a few different partners is that distribution level support and saying, look, we were talking to panelists.

We're all kind of joking around a bit ahead of this webinar starting about how hot the weather has been. There's a real grid impact from that, right? You've got transformers heating up and not having the ability to cool down overnight. The pressure to increase our support for distribution level assets is really increasing. And so that we are able to shift charging in a way that the grid doesn't need to come up with a signal, wait for the emergency condition to send out the need for reduction, can really proactively and in a predictive way reduce peaks where transformers don't have that same burden is making a real impact for a few of our different utility partners. And I know that's one that some of the California utilities are already talking about as a real pain point.

Josh Boone, Veloz: Yeah, that's really exciting. I have a hard time cooling down at night when it's 109, personally, so I can only imagine how it's stressful on the grid and transformers. And I'm impressed with your ability to say PSPS because I think it's such a tongue twister to be able to articulate that.

Smriti Mishra, WeaveGrid: Talked about this pilot a lot.

Josh Boone, Veloz: Yes. So back to you James, SMUD has a program that looks very similar called the Managed EV program. Can you walk us quickly through that program and the impact that it has had so far and what are the challenges and successes? We have about, I think about eight more minutes until we need to go to Q&A.

James Frasher, SMUD: Excellent. So I'll move quickly through this one. So the program itself is a residential managed charging program. We're targeting about 2,000 vehicles enrolled, which on its face seems like a small number. But 2,000 out of a 30,000 population starts to be a pretty significant participation threshold. We're at about 500 vehicles right now. The program itself is focused or utilizes an OVGIP, Open Vehicle Grid Integrated Platform communication. So we're communicating to the vehicles. Really, we're focusing on two levels of use case or operation. We're looking to manage those EVs to reduce a system level coincidence peak. And so thinking about how all of the vehicles in the entire territory affect our overall energy portfolio. And then the pilot is really looking at how we overlay locational elements to that. And so how we can simultaneously reduce the overloading characteristics of individual transformers at a distribution or delivery level while at the same time supporting that overall system performance.

And so that's the objective and we're starting to see results in that. Mainly today, looking at those as independent use cases. But as we move forward, looking at them as overlaid use cases. That pilot is going to run through December of 2024, at which point we'll hope to make a scope and scale decision. So that can be a more standardized load management solution. Real quick on the challenges that we see in this space, oftentimes some

of the challenges that we see are that we're approached by EVSE manufacturers, automotive OEMs, network operators, everyone wanting to try and control the device, everyone wanting to try and operate the device. And oftentimes there's a conflict between multiple operators trying to operate the same device and trying to build business models off of those same resources.

And when they don't use the same communication standards when there's not open standards at play, it makes it difficult to know that the decision that we're making is going to be the lasting decision that will become the standardized solution five, 10, 15 years from now. And so as we think about the path that we're on, the partnerships that we're establishing, there's a lot of uncertainty around potential stranded investment or stranded assets or walking down a path that was best fit for us, but turns out not to be best fit for the industry. And because this is such a new technology area, that uncertainty creates majority of the challenges that we see and have to overcome in this particular space.

Josh Boone, Veloz: Wonderful. And Jennifer, as I committed to you, I'm not forgetting you. I'm coming back to you with another question. So Black & Veatch's engineering, procurement, construction services can be found in hundreds of charging sites as many of us know nationwide. That includes solar canopy or similar solar components. We've talked about this a little bit, but tell us a little bit more about the benefits and challenges of onsite solar installations associated with EV charging.

Jennifer Cahill, Black & Veatch: So we've talked about this on several aspects and several different questions, but overall, solar can add, obviously take the reduce the use off the grid. We can produce more solar, and then if you overproduce, you can always sell it back to either the utility or maybe even to the facility or areas where you're around. We recently had a large warehouse that had a very low usage. They didn't use a lot of energy, but they had a lot of space on top and they put EV chargers out front. They wanted to get three new interconnect applications, pull all those power in, and we actually were able to put enough on the roof to electrify their fleet. They didn't have to have the three new utility interconnections, so we were able to reduce their delay from any permitting, interconnect that activity. So there are other options that you can look at. Also, we've talked about cooling and shade. Obviously with carports, people enjoy shade. And then it also keeps your equipment cooler, which can save on energy costs.

It can also save on maintenance and installation. Some of the downsides, car boards can be a little expensive. You got to watch deal prices and buy on economy of scale. So if you have several that you want to install, it's nice to buy them all at once. I would also encourage to look at it holistically when you go to install the chargers. Look at all of the considerations. So if you're looking at a distributed energy micro grid, nano grid, some other source of energy other than the grid, the earlier you can look at it and the earlier you integrate it into your design and your planning, the more cost-effective it will be. When you try to retrofit at the end or add on later, it tends to be more costly and not as effective because you're not looking at the time of use and the ability to incorporate maybe some things that you wouldn't have caught earlier. You're not able to introduce those later. So those are some of the benefits of adding some of it.

Josh Boone, Veloz: Yeah, that's great. Well, in true Veloz fashion, when we have our digital dialogues, we always want to convene subject matter experts such as yourselves. We always try to have relevant and rich content like we've had today, and we try to get the timing right. But we also like to have a little bit of fun. So my final question for you, and admittedly, the topic we've been talking about today is fairly dense. It's towards the end of the week. It's getting hot, at least in Northern California and across the Western part of the country. So before we jump into audience questions, I just want to ask you a fun question. With all the time and all the range in the world, where would you drive your EV this summer? So let's start with you Jigar, and then Jennifer, and then Smriti, and then James.

Jigar Shah, Electrify America: Niagara Falls.

Josh Boone, Veloz: Niagara Falls. Never been. It looks amazing. What about you, Jennifer?

Jennifer Cahill, Black & Veatch: Well, I'm in the Midwest, so I'm going to take a little shorter trip. I'll probably drive down to the Lake of the Ozarks and enjoy some little time at the lake. But definitely with water somewhere.

Josh Boone, Veloz: Yeah. Fantastic. What about you, Smriti?

Smriti Mishra, WeaveGrid: With unlimited time, I think I'd take one all the way down to Cabo.

Josh Boone, Veloz: Oh, I like it.

Smriti Mishra, WeaveGrid: I would love to hit up Crater Lake.

Josh Boone, Veloz: Can you take a friend? I'm going.

Jennifer Cahill, Black & Veatch: Right. I am too. I'm just going to go out there with you.

Smriti Mishra, WeaveGrid: Yeah. Car got space.

Josh Boone, Veloz: What about you, James?

James Frasher, SMUD: So I love camping, and one of my least favorite things when I go camping is when somebody brings a generator along and it's making noise at the campsite. And so I would go on a long range camping trip and just enjoy the peace and quiet that is in electric truck as you're hitting campsites all across the country.

Josh Boone, Veloz: Fantastic. Well, I want to thank each of you for participating in our panel discussion this morning. And I want to take a moment to invite Veloz Strategic Partnerships Director, Munni Krishna, to join us for Q&A. Welcome, Munni.

Munni Krishna, Veloz: Thanks Josh, and thanks everybody on the panel. Smriti, I am also joining you to Cabo, so please look out for me in the back seat there. I just want to say today our audience questions are really, really funny. Starting with, "Were you all nervous to speak after Alice, the grid expert?" So wanted to make sure you knew that was a question. So Jennifer, our first audience question is to you, knowing that Black & Veatch is responsible for almost all of Tesla's supercharger network, how are you guys preparing for the tsunami of charging deployments that are going to occur with the new North American charging standard news?

Jennifer Cahill, Black & Veatch: Well, that's a great question. We have experts all over the world learning about the new regulations, new standards that are coming out. We're building our teams. We're building our own little army here, ready to serve all of our clients and figuring out how we can scale more effectively and efficiently. We're looking at automating a lot of our processes, trying to figure out just how do we build and take what we've done. We have a lot of great experience both from the Electrify America and the Tesla programs. Just really figuring out how to take that, scale it and help all of our clients with the tsunami that's coming. We're eager to help out, so looking forward to it.

Munni Krishna, Veloz: Awesome. I don't know, maybe it's because it's so sunny outside, but our audience is really interested in solar today. So Jigar, we got to ask you, there's big news from your team with a 75 megawatt Solar Glow photovoltaic project. Was hoping you could talk to us a little bit about the projected output and your team's new approach on the underlying credits?

Jigar Shah, Electrify America: Absolutely. So this 75 megawatt solar PD facility in San Bernardino County is going to produce, projected to produce 225,000 megawatt hours annually. And so as I mentioned, our 2022 energy delivered to our customers was 173 gigawatt hours. So this is a large part of our promise in terms of backing a hundred percent of the energy we deliver to our customers with of course, renewable energy and also a key concept called additionality. And so we're making a strong environmental commitment that when we make these

renewable energy claims to the extent possible, we want it to be from new additional renewable energy hitting the grid. And so we're proud to be leading the mission on that front to make that strong message to EV drivers that this is, you are on board the mission, this is the right move to make.

Munni Krishna, Veloz: Great. I've got a final question that's up for anybody on the panel to answer, but today we've really been talking mostly focused on light duty passenger vehicles. Can any of the projects like V2G or battery storage, can that be utilized towards heavy and medium duty projects? How do you see us being able to utilize some of the grid upgrades that we're doing, for one, to help the other?

Jigar Shah, Electrify America: Go ahead.

James Frasher, SMUD: I really liked the example given early on thinking about school buses. We actually have some school bus pilots that are active right now that we're starting to see early results from. It's a great example of where the primary use case of a resource from a grid perspective and from its primary application don't overlap. Our hottest months of the year in Sacramento tend to be late July, early August, and school hasn't started yet. And so the fact that those batteries which are significant in size and capacity are idle and potentially available to provide grid services without undercutting that primary application of mobility for kids getting to school means that we can share in that investment cost. We can offset that capacity that we'd previously been buying from power plants and deploy that through school buses, which then provide cleaner air for kids as they're traveling to and from school. And so it's a nice overlap of a use case and a co-investment that creates a mutually beneficial outcome.

Munni Krishna, Veloz: Great. Jigar, I think you had some thoughts on this as well.

Jigar Shah, Electrify America: Yeah, so I just wanted to chime in quickly. I mentioned that NFI collaboration earlier in terms of medium duty and heavy duty working with storage, using those same lessons that we've learned from deploying our public DC fast charging network. We're also seeing more and more fleets adopt dual public slash behind the fence application at once. And so we're supporting other partners like Akeo, for example, in deploying their commercial fleets. But also having a public charging site at the same time from synergy's perspective. And so I think more and more of those partnerships are the way forward where you can get the best of both worlds. You can have the load management for those commercial fleets while providing those reliable public fast charging services to continue to promote EV adoption.

Munni Krishna, Veloz: Great. Well panel, I want to take a moment to thank you all so, so very much for taking the time to chat with us today. I think we armed our audience with a whole bunch of facts to help us combat those inevitable text messages we get from our friends and family over summer. And I'm going to let you excuse yourselves from the stage, and once again, say thanks so very much.

Smriti Mishra, WeaveGrid: Thank you for organizing. This has been great.

Jennifer Cahill, Black & Veatch: Thank you.

Munni Krishna, Veloz: Wonderful. Okay, everybody, before we let you all go today, and I know we're right at the 12 o'clock mark, I want to take a moment to also heartily thank the generosity of all of our Veloz member companies who provide the funding that actually lets us put on summits and digital dialogues. We are entering a new year here at Veloz, and with all the changes in the EV ecosystem, from charging standards to the very first NEVI projects hitting the ground, you do not want to miss out on the exciting conversations that we're having in our membership. Many of you are familiar with the Veloz EV Market Report. We release it quarterly in conjunction with the California Energy Commission, California Air Resources Board, and the Governor's Office. We have newly introduced the tracking of medium and heavy duty EV trucks, buses, and delivery vans because we do, as we talked about on today's panel, need to monitor the growth of all sectors of transportation electrification.

This is a really exciting addition to our report on behalf of our communications team here at Veloz, because just this month, CARB reached an agreement with the Truck and Engine Manufacturers Association, its commercial engine and vehicle members and Ford, which included a commitment to meet the California ZEV standards of a hundred percent clean truck sales by 2036. And finally, I encourage all of you to follow us on social media, sign up for our newsletter because Veloz has really, really big news coming soon that I would love to tell you today. We're going to talk a lot about the new direction of our organization and how we're going to keep continuing to accelerate the EV market. We also have a really big announcement coming soon about who's going to be our October CEO spotlight so stay tuned. And finally, I just want to thank each and every one of you for joining us today. Have a cool, happy and safe summer. Thanks so much. Bye.