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CALIFORNIA ENERGY COMMISSION

COMMISSIONER WORKSHOP

In the Matter of:	)	Docket No. 20-IEPR-02
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2020 Integrated Energy Policy Report Update (2020 IEPR Update)	)	REMOTE ACCESS WORKSHOP RE: Heavy-Duty Zero-Emission Vehicle Market Trends
	)	
	)	

HEAVY-DUTY ZEVS: MOVING PEOPLE

REMOTE

THURSDAY, MAY 21, 2020

1:30 P.M.

Reported by: Martha Nelson

APPEARANCES

COMMISSIONERS PRESENT:

Commissioner Patricia Monahan, 2020 IEPR Update Lead Commissioner
Commissioner Karen Douglas
Commissioner Fran Inman, California Transportation Commission

CEC STAFF PRESENT:

Heather Raitt, Assistant Executive Director, Policy Development
Dorothy Murimi
Michelle Vater, Field and Transportation Division

PRESENTERS:

Nate Baguio, Lion Electric
Brandon Bluh, A-Z Bus Sales
Macy Neshati, Antelope Valley Transit Authoirty
Cris Liban, LA Metro
Brittany Caplin, Proterra

PUBLIC COMMENT:

Jaimie Levin, Center for Transportation and the Environment
Chris Peeples, Alameda-Contra Costa Transit System
Diane Moss, California Hydrogen Business Council
Tim Sasseen, Ballard Power Systems
Nico Bouwkamp, California Fuel Cell Partnership
Heidi Sickler, Silicon Valley Leadership Group
Al Cioffi Plug Power, Inc.
Rajiv Singhal, Mobility House
Ray Pringle, Sierra Club California
Kristian Corby, CalETC
David Warren, New Flyer of America
Lauren Skiver, SunLine Transit Agency

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P R O C E E D I N G S

MAY 21, 2020 1:30 P.M.

MS. RAITT: Good morning -- good afternoon, everybody.

Welcome to our Session 3 of the 2020 IEPR Update Commissioner Workshop on Heavy-Duty Zero-Emission Vehicle Market Trends.

I'm Heather Raitt, I'm the program manager for the IEPR. And I'll just quickly go over our housekeeping items.

Today's workshop is being held remotely consistent with Executive Order N-25-20 and N-29-20. Our recommendations for the California Department of Public Health encourage physical distancing to slow the spread of COVID-19. Instructions for attending or participating in the workshop were provided in the notice to include both Internet and call-in options. The notice is available on the Energy Commission's webpage.

So this is our third and final session of this workshop series which we've broken up into three parts. And this one is focusing on heavy-duty ZEVs with respect to moving people.

The meeting is being recorded and a written transcript and the recording will be posted on the Energy Commission's webpage.

At the end of this workshop segment, we will have an

opportunity for public comment. For folks on Zoom, you can use the raise your hand, the raise hand feature to let us know that you'd like to comment and we'll open your line at the end of the workshop.

And for folks on telephone, you can just press Star 9 and that's going to raise your hand to let us know that you wanted to comment. Alternatively, written comments after the workshop are welcome and they are due on close of business on July 11th (sic). And the notice gives you all the information you need for how to do that.

And with that, I will just turn it over to Commissioner Monahan for a few remarks.

Thank you.

COMMISSIONER MONAHAN: Good afternoon, everybody. Welcome. Very excited to have our third session of heavy-duty ZEVs. This one is, as Heather said, on moving people. And, you know, we planned these workshops initially in a pre-COVID world. Now we're facing a very, very different world. And arguably no sector has been more impacted by COVID-19 than our public transit.

So that's part of the reason why I think this conversation is going to be particular interesting is that I'd love -- we would love to hear what is, you know, what folks are facing, what they're seeing going forward, and how we as a state can support the continued electrification of

the heavy-duty people moving sector. As we also wrestle with the impact of COVID-19 and as we make sure that we're doing all we can to get people back to work and back to work safely.

So I am joined on our virtual dais with Commissioner Fran Inman from California Transportation Commission, and with my fellow CEC Commissioner Karen Douglas.

So have either of you -- do either of you want to make any opening remarks before we start the panel?

COMMISSIONER DOUGLAS: Commissioner Monahan, this is -- this is Commissioner Douglas. I just wanted to say that I'm looking forward to today's workshop. I enjoyed the workshop yesterday morning. And this is a really important topic, looking forward to the afternoon.

COMMISSIONER INMAN: Commissioner Monahan, I would just jump in, this is Fran Inman.

I, too, enjoyed yesterday and excited for this afternoon's session. And I think the combination of what we learned collectively from all three of them will be a really good discussion as well because I expect that we're going to be able to identify lots of work we need to do together. So thank you for including me.

COMMISSIONER MONAHAN: Great. I'll turn it over, then, to Michelle from our -- Michelle Vater from our Field and Transportation Division who's going to be facilitating

the panel on heavy-duty ZEV.

And, Michelle, I think you need to unmute.

MS. VATER: Thank you, Patty. Yes. Thank you, Patty.

Welcome everyone to Session 3 of our Heavy-Duty Zero-Emission Vehicle Market Trends Workshop pertaining to moving people.

My name is Michelle Vater and I'm the supervisor of our freight and transit unit within the Energy Commission Field and Transportation Division. It is an absolute pleasure to be moderating this panel this afternoon.

The focus today again is on moving people and today's panelists are all about that. I'll go ahead and introduce the panelists. From there they will begin their presentation. Once the presentations conclude, I'll reach back out to the commissioners for questions before we begin our panel discussion.

Joining me on the panel today, we have Nate Baguio, he is the vice president of sales in the U.S. for Lion Electric Company. Lion Electric is a manufacturer of zero-emission vehicles primarily known for their electric school buses. But, have also developed a minibus as well as electric trucks.

Next up we have Brandon Bluhm, he is the director of new school bus sales with A-Z Bus Sales. A-Z Bus Sales is a

transportation dealer distributor that is headquartered in California and offers numerous transportation options and various transportation sectors including education and commercial transit.

Next we have Macy Neshati, executive director and CEO with Antelope Valley Transit Authority in Southern California. AVTA has committed to converting their entire bus fleet to 100 percent all electric zero-emission buses. Today over half of their fleet consists of electric buses which have completed over 2 million miles of travel. They plan to add more than 35 additional bus -- electric buses to their fleet this year.

Next we have Cris Liban who is the chief sustainability officer for the Los Angeles County Metropolitan Transportation Authority or LA Metro. LA Metro serves the country's largest most populous country and operates a fleet of over 2300 buses. So with that said, LA Metro has a goal to attain a fully electric bus fleet by 2030.

And last but not least, we have Brittany Caplin who is the director of government relations and public affairs at Proterra. And Proterra designs and manufacturers zero-emission electric transit vehicles that serve various sectors including public and commercial transit, airports, and education.

So Nate, if you're ready, we'll begin our presentation with Lion Electric.

MS. RAITT: Nate, this is Heather Raitt, I don't think we're hearing you.

MR. BAGUIO: How's that?

MS. RAITT: There we go. Thank you.

MR. BAGUIO: Okay. My --

MS. RAITT: I think you're going to have to start over. Thanks, though.

MR. BAGUIO: Yeah, sorry about that. My presentation hopefully is more exciting with sound.

I just want to thank -- thank you, Michelle, and thank you the commissioners for letting me participate in today's panel. Really important topic and an exciting topic. Things are moving forward so quickly with zero-emission and clean air transportation and I'm really proud to be a part of it. Especially with some of the initiatives that have been championed by the California Energy Commission. So thank you.

Just a little bit of background about myself just so you understand my perspective. I started in the transportation business over 30 years ago actually driving a school bus in Sacramento, California. And have been involved in managing operations of over 300 school buses in the greater Los Angeles area. Also worked on the Los Angeles

subway system and light rail system. And have really dedicated my career to mass transit and moving people. So thank you for inviting me to this panel.

Next slide.

I talked a little bit about momentum and where things are going. I work for Lion Electric Company and we are the leader in zero-emission battery electric school buses. Not only in California but across North America with over 300 buses on the road. We've been picking up school children and taking them to school since 2016. So there's information there and data on how this is working and how it's out doing what it's supposed to be doing. It's not a pilot, zero-emission school buses are a real thing along with a number of other platforms.

I think one of the most exciting things to see is the leadership in California and the initiatives not just from the regulation side but from the incentive side with grants are working. You know, just a little over two years ago when I started the pricing in our vehicles was almost twice what it is today. So you can see that these grants are doing what they were intended to do was to get the price down. You know, your range is more than double. You're on our school bus, you're up to 155 miles range which covers just about every route in the country. So it's exciting to see. These electric vehicles are operating in snow, in the hills, in hot

weather. So they're really robust.

One of the other things you're seeing that's really exciting is that there's more competition out there. More people are -- and companies are competing for this business, are engaging this business and embracing it. And I have a national view in my process and you can see companies out there like mine but also Proterra that is really, you know, large transit buses are reality. School buses, when you look at deployments across the country from New York to Minnesota to California, they're a real thing taking kids to school every day.

There's an increased number of platforms. You know, once you have a platform that works like a school bus, you can see on my slide there are a number of different applications that you can use in duty cycles that are more attainable from refuse trucks to delivery trucks to tractors to bucket trucks. And it's exciting to see these things moving forward in transportation in general, not just moving people.

Manufacturing capacity is up. You know, just two years ago when you were looking at pilots, people were putting in one or two vehicles to really see what was being revealed and a lot of these things are changing.

A great example is the California Energy Commission's bulk purchase grant that was awarded. You can see this isn't

a one or two bus pilot industry anymore, it's 10, 20, 30 vehicles going in all at once. And the industry has responded accordingly. You know, we can manufacture two and a half, you know, 2500, 3000 vehicles in a year rather than just one at a time.

You know, just from my viewpoint we opened a couple of locations here in California, others in -- across the country. But we're bringing research and development jobs to California because of these grants. We're bringing manufacturing jobs to California because of these grants.

And, you know, there's not only clean air goals that are being met but there's economic goals. And at this point in time, I think more important than ever.

Next slide.

During these difficult times, you know, in looking at what is happening with the economy, people's health, it -- zero-emission vehicles, in my opinion, it's more important than ever. When you look at, you know, school children, for example, the worst air they'll breathe during the day is in that diesel school bus that takes them to school and then brings them back home. And by implementing zero-emission school buses, that not only protects their health and safety, but also the community around them. And with our current health crisis, largely affecting respiratory systems, zero-emission is more important than ever. And also jobs that

have that longevity to bring that economic boost to California are really, it's more important now than ever.

Other opportunities. If you look at what is happening out there in the market, infrastructure challenges. When you bring a new vehicle, you have to fuel it and put energy into those batteries. And expanding our infrastructure network is going to be critical moving forward. And again, the CEC grant for the bulk purchases of school buses had a component in there to help move that along.

Education. Getting the world and California to really embrace that this is not a pilot or an experiment. It's a real thing. It drives down your street very quietly and it's not necessarily noticed. But it's out there working and it's a new and improved version of the school bus, the transit bus, and the truck that serves your communities.

Next slide.

You know, I'm talking about excitement and you can't talk about excitement in zero-emission without looking forward and what is to come. We're already in an exciting spot with the adoption of zero-emission vehicles and so many fleets embracing it. But I talked a little bit about statewide job growth and what it's bringing not only for companies that, you know, you have on the call today but the supply chain that is going to feed the manufacturer of those

companies and California is really leading the way there. So there's some really encouraging signs to helping this economy recover.

Again, I talked about pilots really being a thing of the past. I was on a webinar in another state and they were talking about well, let's put out a couple of buses and see how they perform. And I was able to point to, you know, many districts across California that have already been doing this since 2016. So that data needs to get out to people and they're excited to see it. So once again, California's leadership is really at the forefront of this entire movement of improving the movement of people and goods.

Multiple battery life use. You know, when you look at transportation in the rearview mirror, it's a vehicle, you fuel it up, it performs its duty cycle. But what is opening up in today's environment is, you know, transportation is going in so many different directions. You can not only use it to power your vehicle but you optimize the energy in the vehicle with vehicle to grid components where you can power a building or give energy back to the grid to offset peak use. When the battery is no longer useful to move a vehicle, it's still very useful for energy storage. And then also these batteries are also recyclable. So you're seeing such a dynamic use of these vehicles and the batteries that power them, that it's really an exciting time for California and

this discovery of how these things can benefit the community at large. And I'm excited to be a part of it.

A book life on a vehicle. You know, when you're done using a diesel vehicle, it really doesn't have a lot of work to it. And as I'm talking about these generations of batteries, you know, there's a book life on these vehicles just add to the economic argument of switching to zero-emission.

Creative finance options. People are leasing just the battery on the vehicle. So fleet operators can leverage other mechanisms to, you know, defer costs of these vehicles.

So it's a really exciting time. I'm really proud to be a part of this and really thank the California Energy Commission for having the foresight and the leadership to develop programs that are useful now, that are putting vehicles on the road now, and putting children in a better situation now.

So thank you and I look forward to your questions.

MS. VATER: Thank you, Nate.

Brandon, with A-Z, you're up.

MR. BLUHN: All right. Can you hear me?

MS. VATER: Yes, we can hear you.

MR. BLUHN: Great. I'm Brandon with A-Z Bus. I'm the director of sales for our new school bus division. And we represent transit, commercial, as well as school on the

electric front.

So excited to share with you a little bit today about what we're seeing in the industry, and my conversation with gear more toward the school side as far as what we're seeing.

Let's go ahead and move to the next slide.

So as Nate mentioned, you know, right now nationwide, 90 percent of school buses are diesel powered. This has been over the ages and we're seeing the effects of that and are very aware with the studies about the effects that has with children, which really is our most sensitive receptors which obviously is a huge part of why there's such a focus in this market.

We can go ahead and go to the next slide.

This is kind of what we're seeing as far as the trends that have been happening. It's important to note Blue Bird was the first manufacturer who brought an electric school bus to market in 1996. Technology has obviously changed a lot since then and in 2014, we had the first adoption of electric vehicles here in California with newer technology.

At this time it was really about accessibility to the technology itself. It was very much in development, limited providers, and really had some early adopters that were willing to kind of be those guinea pigs and go through that learning process.

Fast forward a few years, 2017, it was more about the viability of the product, helping people to understand what the commercial aspects of electric would do for their routes within their schools, helping to dispel the rumors, and help them realize that electric will work within our markets.

2018 and 2019 we really saw the focus around reliability of the product. How is the electric being supported? How is the uptime performance? What is the telematics delivering as far as the information and how these buses are performing. We're fortunate with Blue Bird to have Cummins as the electric provider so a school district can take their bus to any local Cummins dealer who has technicians that have been trained and are able to work on those vehicles.

And now in 2020, we're really seeing the change in focus is moving towards the affordability. A lot of grants continue to drive the zero emission and put a focus on that which has been great to see the adoption start to increase. There's certainly a rise in acceptance of the technology, people are seeing that it's working. They're hearing that it's working, and that's an important part of this growth. And there's a continued importance around a savings with fuel and maintenance cost.

So looking forward, really this becomes a matter of sustainability. How do we get the pricing to a point where

the total cost of ownership absolutely makes sense for every school district? And that's going to continue to develop with V2G technology, with taking advantage of different programs that the Air Resources Board has in place like low carbon fuel credits. We're going to see continued innovations with manufacturers that will enable further range, will enable more applications within the school districts. And training and really supporting those districts is going to remain a critical component to make sure that that integration of technology into their plates enables a school district to have a successful deployment.

We can move on to the next slide.

So really everything that's happening, I feel that if you compare this to a marathon, we're really just running out the starting gate as far as the deployment of electric and we're taking some amazing first steps towards this future.

Similarly, I would like to thank the Energy Commission for the school bus replacement program, this is a great program with a focus on our school districts and the sensitive receptors. We're seeing over 231 electric buses awarded through this grant which is just an amazing concept and an amazing start.

It's important to realize, too, of the 231 buses, there were over 1500 buses that were requested for replacement and the number of diesel buses and even older CNG

buses or buses with older technology still needing to be replaced created a difficult burden for school districts who have a lot of concerns over budget crises, especially in light of the COVID situation and how that's going to affect them. So the funding towards these programs is going to be critical to continue that adoption in the near future.

We're grateful as well for the Air Resources Board and their focus and continued support around these programs to help school districts in this regard.

And that's it for me. I appreciate the time, appreciate the opportunity to be a part of this panel.

So thank you.

MS. VATER: Thank you, Brandon.

Next up we have Macy Neshati with Antelope Valley Transit Authority. Macy?

MR. NESHATI: Sorry about that.

MS. VATER: Perfect. Thank you.

MR. NESHATI: I just -- yeah, sorry.

Thank you very much for this opportunity, distinguished commissioners, members of the panel, people listening in.

We started converting our fleet in earnest in 2016 and we've just -- we're just a couple of hundred thousand miles short of 3 million miles. We would have been there this month if we hadn't had this slow down to COVID-19.

I just want to give you a couple of things to think about. You know, when we past 2 million miles, we did some calculations and realized that we saved 29,000 pounds of PM, 2.5 are being dumped into the atmosphere. We avoided 37,000 grams of NOx. We avoided 12 million pounds of CO_2 emissions. And we saved $801,000 over our diesel fuel consumption versus electric.

So there's in a real quick snapshot there, there's economics and there's environmental benefits. We started out doing this for environmental benefits but soon realized the amazing economic benefits.

At this point today we're at 58 buses which converts our entire local fixed route transit fleet to 100 percent electric. We have 25 more buses we need to purchase to covert our commuter fleet, the big old coaches than run from here down to L.A. And we hope to award that contract this coming Tuesday at our board meeting. So that will get those 25 coming and we will be 100 percent on both sides of the fleet. So the unlimited savings that I just gave you are from just the local transit fleet.

So there's a couple of things I wanted to emphasize just from our -- what we've learned. One is that it's been a great initiative on the part of the state of California and Energy Commission and CARB to give incentives and help kick start this program. Because once we got going on it, the

benefits become so obvious that -- I believe a very quick quarter will become self-sustaining.

I set my slide up here to show you our average consumption per mile. The reason is significant. If you look back eight months, you see some pretty tall spikes there. And if you look at the last four months, it's become very steady, very smooth.

And what that is is in real estate we talk about the three Ls, I'm sure you're familiar with that, location, location, location. In electrification I've decided that the key to successful implementation is the three Ts, training, training, training. The more you train, the more educated your operators are, the more educated your technicians are, the more educated your dispatchers are, the more successful you will be and the faster you arrive at those successful numbers.

Our operators have to learn a different way to drive a bus. You have to understand and appreciate the health benefits to them and to the public. And that a little bit of behavior modification and some incentivizing led to a remarkable drop in fuel consumption and then flattened that line. And it -- those numbers, our savings will increase greatly.

So I would stress to you that anybody who is undertaking this conversion which is virtually all the

transit fleets in California by mandate, really needs to start early on even before the first bus arrives and start educating and getting buy-in throughout the whole organization. That's been critical to our success.

Next slide, please. Thank you.

This is just a quick demonstration, again, of some of the economics. In large, had we been all the way electric, we would have spent $38,000 in fuel cost and maintenance. If we'd stayed all diesel, we would have spent 374,000. So you can see the stark difference, we would have saved $336,000. As it is, we were mostly electric in March, our savings over a pure diesel fleet is $223,080 just for that market. And that's not including the LCFS credits. If we add those in, the average fuel cost actually at this point positive about 22 cents a mile.

And the last slide.

There's a lot of common myths about the liability of the electric bus, oh my gosh, are they going to be reliable? Are they going to break down? What are we going to do? And I tell people, you know, electric buses have been around really since the turn of the century in 1890 or thereabouts. Portland rolled out its first electric trolley. Now granted it was on steel wheels and it was connected to an overhead cable system, but you get rid of the steel wheels and you take the cable system off the roof of the bus and put it on

the bus in the form a transformation from that to a battery system, the propulsion system has been around for a long time.

So here's a 12-month glance at what our electric availability which is a green line. The average for 12 months is 94 percent availability, pure average throughout the nation of 77 percent, our target is 90 percent, we're beating our target. You can see our diesel fleet in yellow has been as low as 70 percent. 100 percent is actually a false number because that -- we didn't run any in that month so it's not accurate to have, that 100 percent should just be no run.

So that's our experience. We are advocates of this program. We've over last the year probably given 30 or 35 tours through our facility showing off our -- not showing off but showing our infrastructure, our charging systems, our buses, our routes to transit systems throughout California, to the East Coast, and throughout South America, and some of our friends to the north in Canada have all been through our facility. We welcome anyone and everyone to come by and see what we're doing and how we're doing it.

But we hope to be living proof that it works. And for us, the next -- the next exciting challenge is to go all solar and 100 percent off grid of our charging capabilities. And we awarded a contract to a company and we're now

finalizing our strategy of how we're going to do that. But it's going to take about 40 acres of land and about 24 million kilowatts a year. And we're really looking forward to getting that done in the next 18 months and maybe not being a burden on the California electric grid.

And with that I'll wrap it up and hopefully I stayed in my time limit and (indiscernible).

MS. VATER: Fantastic. Thank you, Macy.

Cris with LA Metro, go ahead and begin.

MR. LIBAN: All right. Thank you so much for the opportunity, Commissioners, as well as CEC staff for being here. Just wanted to mention that, you know, while I might be referencing publicly available information, the comments I have today for you, are my own. Again, my name is Cris Liban. I'm the Chief Officer of LA Metro.

So just to focus on our organization and what we are, you know, we're a state charge special jurisdiction. We're not a county agency. We currently have a budget of about $7 billion, 2300 buses, CNG buses, that is, the largest in the country. And about 43 percent of that currently run on renewable natural gas with a full RNG portfolio by the end of this year.

We're a multimodal agency. We also work on planning function, a little bit construction function, in addition to the transit that we operate. We also plan for highway

programs for CalTrans and beginning this year, we'll be building some highways for CalTrans.

We operate, express lanes, bike share, car share, and provide funding for what we call the Muni, here in the L.A. County.

We have a -- we're a multi-revenue organization. Most of our revenue comes from sales tax. Some of them come from farebox revenues, express wings, grants, and we also have revenue coming in from the LCFS sales from the clean fuel that we use (indiscernible) as propulsion power.

A couple of building equity are key pillars in our activities. We have documents that include a how will and travel study and equity platform for all of our planning and construction in operating activities. We have a long recertification plan as well as studio, the master plan that will be out in its final form later this year.

We also have a CBO engagement program that we're completing, a community-based organization, that is.

With our situation right now, we used to move approximately 1.2 million people a day, but since March, that number has gone down to by about 70 to 80 percent. And then in addition to that, because of this pandemic, in the next six months, we're actually going to see a structural deficit of about $1.8 billion. And even with some assistance from the CARES Act, we're still looking at approximately a billion

dollars in structural deficit.

So in a time that we're essentially trying to adjust, make adjustments not only on our service, but seeing some of the projects that we are working on and the activities that we're doing as an agency.

In addition to that, in the context of our meeting today, we are - our board is very aggressive zero emission bus program. You know, by 2030, our goal is to be a hundred percent ZEB, in your status state mandate. And we also are looking at that in context of resiliency in our operations toward managing resiliency. So those two topics might be of interest later on during your discussion.

From operations adjustments, we have enhanced cleaning, our patrons enter from the back, we have splashguards in the bus operator area. We'll also have an enhanced Sunday service.

In terms of operational challenges or after we somehow reopen as a state, you know, there are these public perceptions in riding transit in a post-COVID world. Social distancing will also limit, you know, our bus and rail capacity, the ridership. Even though we want to pack as many people as we can to serve as many people as we can during peak times, specifically, that would be a challenge, given social distancing.

There's also a conversation about the lesser use of

transit. You know, there's cheaper fuel, fossil fuel out there. A lot of people are out of work. People are commuting less in general, and telecommuting might be here for a while. So in a sense, now we have a recovery task force that was established by a senior leadership here at LA Metro. And it's going to look at and allow us to work through some of these challenges.

In terms of the challenge for electrification, just wanted to mention it sort of quickly. I won't go into details. Infrastructure, speaking footprint, charging equipment, cost of infrastructure. The bus itself interoperability is a big issue for us. Charging logistics and protocols and then as well as the delivery of those buses. Cost of operations, our energy cost, our electricity cost in particular will at least double you know once we pull electrify and then workforce development.

So something that we're really grappling on and struggling with is, you know, what does the tipping point look like and what does -- what does that look like in terms of all these different factors that I mentioned here.

So just to conclude, in addition to our transportation and transit system and all the things we do, we also run electric vehicles chargers here in our agency, how we have a newly master planned development. We're also leading the effort in the movement master plan, some of those

items you might have heard as an issue and we're struggling with that and looking for solutions for these here as we improve and complete our master plan.

So with that, I conclude my remarks and ready to answer any questions or expand on any of the items that I have indicated here.

Thank you again for the opportunity and ready for any questions.

MS. VATER: Thank you, Cris, that was really great.

Brittany, with Proterra, you're up.

MS. CAPLIN: Thanks, Michelle. And thank you to the CEC for hosting this conversation today, we really appreciate it.

My name is Brittany Caplin, I'm the director of government relations and public affairs for Proterra. Proterra is the leader in the design and manufacture of zero-emission electric transit vehicles as well as being an EV technology solutions provider for commercial applications such as electric school buses, electric coach buses, and electric delivery trucks.

Just a quick additional background on Proterra; to date, we have sold more than 950 electric transit buses in about 43 U.S. states and Canadian provinces. Our headquarters are here in Burlingame and we also have a manufacturing facility in City of Industry in Los Angeles

County. And we have about 25 customers that have deployed vehicles in California.

Next slide, please.

So one thing that I wanted to quickly point out is that a lot of our attention in the EV space goes to the electric passenger vehicle. But what this graph is showing us from research from Bloomberg BNEF is that electric transit buses continue to lead the EV market. They are -- they are a great application of electric vehicle technology and you can see there's leadership across the U.S. from major cities and states adopting mandates and goals to go 100 percent zero-emission with their transit fleets. And, of course, to bring up California which has been a global leader in this space with the ICT mandate.

And thank you so much CEC and CARB for advocating for EVs and making California a leader.

Next slide, please.

So as we can see from the HD ZEV market today, there's a lot of barriers that have been eliminated when it comes to zero-emission electric transit buses. We have improved range. Vehicles are now getting around 150 to 200 miles of range, which meets the needs of most transit agencies across the country. There's proven performance with our transit vehicles. The Proterra electric transit bus gets about 25 miles per gallon equivalent compared to a diesel

bus. And it delivers nearly twice the horsepower and five times better fuel efficiency.

So now we're seeing a transition to electric transit buses, not just because of the environment and public health benefits but because of the performance of the vehicle and helping to instill that competence with customers that they know their electric transit bus can meet the needs of their route.

There's also been a sharp decline in battery costs which is helping to lower the upfront cost of the vehicle. And they'll also see, like my colleagues have pointed out, a lower total cost of ownership with electric vehicles due to the maintenance and fuel savings throughout the lifetime of the vehicle.

We're also seeing a move towards charging standardization so we know that the chargers that we're putting in for the vehicles can be used for all EV fleets that a city or state is using. And my photos here is of the beautiful fleet deployment from San Jose Airport which has a dozen buses lined up with a dozen chargers, it's very cool, highly highly encourage everyone to go check it out. So what's really important right now is that we can't lose this momentum. And I know that the COVID situation has thrown a lot of challenges in the way of our transit agencies.

We have a big opportunity to make investments in an

area that's not only helping to clean up our air and help the public health within our communities, but it can also be a huge job creator. So electric vehicles, according to a recent study from NREL, EVs are going to contribute around 100,000 jobs per year through the next two decades. And that's going to be a huge opportunity for us to capitalize on pairing with all the benefits of EV.

But we still have some challenges as well. One of the biggest challenges that we hear from customers is that they're comfortable with the vehicle, they're comfortable with the EV technology, but they are not comfortable managing the infrastructure and managing the energy ecosystem. And Proterra's unique in the sense that we build to be battery technology. We build the vehicle. We also build our chargers and we manage the deployment and installation of the infrastructure. And we view this as a whole system because EVs go beyond just operating one vehicle.

Next slide, please, Michelle.

So this is the future that we see for customers in California. We see an opportunity for renewable energy charging. We see an opportunity to maximize space and lower upfront costs of the infrastructure installation by smart planning. We see chargers that have V2G capability that are intelligent and can manage charging time. And we see it as being universal and scalable as well.

So looking forward to this conversation and thank you again for having me.

MS. VATER: Thank you, Brittany. So that concludes the presentations we have for this afternoon.

Commissioners, I'd like to open it up to you, if you have any questions for the panelists at this time.

COMMISSIONER MONAHAN: Yes, this is Commissioner Monahan for the Energy Commission. There I am. And I do have a few questions.

Thanks to all the panelists, that was really excellent and a good overview of all the different issues. And I have a number of questions actually. Well one for each panelist. I'm going to go quickly through them.

So Nate, you talked about the leasing of batteries and that's something that I've heard in contextual terms but I didn't know it was actually happening. Can you give me an example across the country where that's happening? Or I'm assuming you're talking about a utility leasing a battery to the bus company? Or how is it working? How does that work?

MR. BAGUIO: Yeah. There are different concepts out there but we're getting a lot of interest from utilities. And you're exactly right, Commissioner Monahan, they're not necessarily interested in the vehicle but what is going to happen to that battery afterwards. And also how they're seeing this, you know, as electric vehicles are -- the

adoption rates are going up.

The amount of energy that is in a community or a city is compelling. And being able to offset those peak use times and then the second step being able to use those batteries as storage later on. So we're seeing a lot of interest. There was a high profile one in Virginia with Dominion Energy financing school buses, but behind that they're really looking at the battery operation. There are pilots in Florida, New York, as well as California, obviously, that are building in this capability. And, again, a plan to use those batteries. Almost like an iPhone plan where you have a certain availability of power, once it reaches a certain threshold, they'll switch them out and move them to their second life.

So really excited to hear these conversations and I think you're going to see a lot more of that moving forward.

COMMISSIONER MONAHAN: And is this mostly in the school bus arena or is it also happening in the transit bus side?

MR. BAGUIO: It --

MS. CAPLIN: I can step in here.

MR. BAGUIO: Yeah, go ahead, Brittany. I was going to let you --

MS. CAPLIN: Sorry, Nate. Thank you, Commissioner. Good question.

So we have about a dozen Proterra customers that are utilizing battery leasing right now. And as Nate mentioned, there's a lot of benefits with that. It helps lower the upfront cost and then transit agency customers pay for the battery over the lifetime of the vehicle.

COMMISSIONER MONAHAN: Fascinating. I mean, because that really does, I mean, when we're talking about the -- the only difference, the challenge of course is that the vehicles cost more and that they should save.(indiscernible) is TCO takes a long time to be able to accrue and a lot of school districts, cashed out school districts just can't look out that far in terms of financing. So this really -- if this is unlocked in a large scale, that could really help accelerate electric transportation broadly.

MS. CAPLIN: Uh-huh.

COMMISSIONER MONAHAN: Is that a fair statement?

MS. CAPLIN: Yes, and we've seen with our battery leasing program. It puts the price of the vehicle on cost parity with a diesel vehicle.

COMMISSIONER MONAHAN: Hmm, fascinating.

MR. BAGUIO: And I know this is --

COMMISSIONER MONAHAN: Go ahead.

MR. BAGUIO: I'm sorry. Yeah, I know this is the moving people section, but, you know, as our, you know, the truck market is emerging and just the amount of energy on

those particular vehicles, I think that's only going to accelerate this conversation as well.

MS. CAPLIN: Uh-huh. Plus I would add the second life opportunity, they're also exciting. Because even though the battery is not usable for transit, it still has a very, very long life cycle within the battery. And so we think that there's exciting opportunities with energy storage by stacking up those batteries.

COMMISSIONER MONAHAN: Uh-huh. Interesting.

So my next question is for Brandon. Although I think also other folks will have something to say about this.

But Brandon, you mentioned the V2G as being part of this co-cost of ownership question, right? As we try to figure out how to bring electric transportation into cost parity with conventional vehicles. There are all these different elements in total cost of ownership especially in school buses, but I'm also hearing -- actually Brittany with Proterra maybe this is (indiscernible) the transit bus side. The V2G capability brings some interesting economic opportunities and we probably got it more for the school buses, of course, because our investment is in California and the fact that school buses may be idle during the times of day when we have a lot of curtailed renewable energy.

We could have this happy marriage where these vehicles absorb our curtailed renewable energy allowing us to

actually accelerate our goals for a clean electricity system.

I'm just curious about how much both the users of the buses and the bus manufacturers are thinking about V2G as being an important aspect of that cost equation.

MR. BLUHM: Great question, Commissioner Monahan. I appreciate the opportunity to answer this.

Really, to me, V2G is going to be the bridge in getting us from where are today to where we want to go with this technology. And even though it's fairly new here in this state, you know over in Europe, V2G has been integrated for over a decade. So the model is there. But there's still some pieces that need to happen with utility companies and then the PUCs to really make those inner connections available and be able to properly monetize that.

But for the school side, the route length and the ability to have these buses sitting with that amount of battery, it could be really managed as there are needs in the grid is just probably you couldn't find a better scenario to really take advantage of that technology.

COMMISSIONER MONAHAN: Also my ears perked up when Macy said that when you include the LCFS as 22 cents per mile positive which you're actually getting 22 cents per mile. Did I hear that right, Macy? And so the LCFS value is that high?

MR. NESHATI: Can you hear me?

COMMISSIONER MONAHAN: Yes, now we can.

MR. NESHATI: Yeah. You know, it's -- it's like a little stock market out there and the credits are fluctuating value depending on what's going on in the economy at any point in time. But, yeah, the last couple batteries we sold, we spread it out over 18 months and there were only electric buses in earnest and it really turned into a positive number.

COMMISSIONER MONAHAN: Thank you. Could you give me an sense of just how many miles your fleet is traveling in a month to get an understanding?

MR. NESHATI: Yeah, about 165,000.

COMMISSIONER MONAHAN: Oh. All right. This is my last question. And it's for Brittany, but I think others might have thoughts on this as well.

So, you know, we at the Energy Commission are very focused on promoting charging at the right times of day to be able to help us integrate renewables and, you know, provide other grid services. And we're worried, you know, with the big electricity load that's unmanaged where we have to provide more baseload electricity that makes it harder for us to integrate renewables and reach our clean energy bill.

So I'm curious about how you all are thinking about vehicle grid integration as you develop these smart charging capabilities, and also whether in the transit bus world, whether the V2G is an important part of vehicle grid

integration.

MS. CAPLIN: Great question, Commissioner.

So we think that the absolute most important thing for transit agencies right now is the planning process. If they don't have a thorough planning process for full fleet electrification, that's where we start to see the higher cost of maybe installing infrastructure and needing to move it. Or installing too many chargers than what they actually need. And then that's not only causing a spike in the energy use, but it's expensive to install as well. So a proper planning and fleet modeling session where you can really look at what chargers are needed is key.

The other thing about infrastructure and energy use is there's opportunities now to use multi-dispenser chargers. So having multiple dispensers to one power control systems unit and that will help lower the amount of overall energy use. With that planning and proper utilization, we just recently did a large scale deployment and we're expecting to see 75 percent lower cost just because we did smart planning and smart utilization.

A V2G is a really interesting opportunity as is VGI. All of Proterra's chargers are V2G hardware capable. Something that we are continuing to push within the industry is a standard around the software for V2G so that still needs to catch up. But we also have smart charging where you're

able to monitor against your demand charges, specifically for some parts in California. And you can see when your spikes are and better plan. We will soon move to a situation where that's all done digitally and the chargers will be smart enough to turn themselves off and turn themselves back on to avoid peak times.

COMMISSIONER MONAHAN: I mean it begs the question with me, then is Proterra moving towards V2G in the buses themselves with a battery, the bus battery?

MS. CAPLIN: Yes.

MR. BAGUIO: And, Commissioner Monahan, one of the other exciting things that we've seen, there was a grant program with the California Air Resources Board called the Clean Mobility in Schools Grant. And what it really did was pushed all of these different technologies together from, you know, the electric mowers to the school buses, to the solar panels. You know, and it was exciting to hear Macy talk about how he's trying to have off-grid power.

But it was really to put challenge the private sector to be innovative and like Brittany said plan on how all of these different technologies need to think about one another in order to maximize not only what's there presently in the grid but also grow effectively so that all of these technologies are complementing one another. And, or at the very least aware of one another when they plan. So it's

exciting to see programs like that popping up.

MR. LIBAN: Yeah, I just want to weigh in as well on the comments been made so far. Maybe this is unique to us because of our size as an organization. You know, a lot of, actually all of our bus depots, communities have grown around them and, you know, while we have a commitment to electrify fleet by 2030, part of the challenge there is, it's already been mentioned, how do you actually, you know, put in the electrical infrastructure in such a constrained space where buses are essentially within inches of each other right now and there's not a whole lot of space around to maneuver. And during this transition, we need to move, you know, if not millions of people every day, hundreds of thousands of people every day.

So really the point I'm trying to make there is, you know, we have been monitoring a significant number of the opportunities and how people throughout the country, even the world, you know, have actually adopted electric bus and zero-emission vehicles. And, you know, we're struggling in the context of, you know, how do we, again, you know, keep all these people moving?

We operate within a 5,000 square mile area of Los Angeles. And, you know, in certain times of the day, we need to bring some of our buses from say the south bay area of southern California of Los Angeles County to the San Fernando

Valley. And, you know, by the time, you know, based on the current modeling, by the time, you know, that bus gets in San Fernando Valley, you know, it might not necessarily have the full charge that it needs to run, you know, the route that it was being called for to serve all of our riders over there.

So it's a lot of not only planning on infrastructure, not only on the technologies are available to us, I did mention earlier about the transition, you know, aspect of this. There's no tailpipe emission, but the grid is still not as clean as we want it be. You know, when you look at our vehicle greenhouse emissions reductions, we've tried to look at it on a whole life cycle point of view and discount, if you may, you know, some of these tailpipe benefits, you know, that we might be enjoying, you know, once we full electrify the 2300 bus fleet that we have.

I think the last point I wanted to just mention there that I might have just glossed over is the whole context of workforce development. You know, we have an aging workforce within our agency. We have a lot of these folks, you know, or 5,000 or so maintenance workers who we need to retrain. We need -- many of them are used to maintaining a natural gas vehicle and now with the electrification, we need to somehow move all those folks to some form of skill set. Not necessarily all of them might want to go and maintain

electric buses for whatever reason that they might have.

And the other point there, too, is that in terms of the number of buses we have, we anticipate a number of buses we need, electric buses we need, to actually be more than what we have right now simply because of this interoperability issue across significant number of square miles we operate in.

COMMISSIONER MONAHAN: Thanks, Cris. I guess it works -- comes back to the three Ts, training, training, training.

So I know that Commissioner Douglas has a question. And Commissioner Inman does as well. So I'll pass it over to Commissioner Douglas.

COMMISSIONER DOUGLAS: Really just a brief question. I wanted to see, I know Cris spoke recently about the impacts of COVID-19 on transit generally and I just wanted to ask. In the current environment, you know, what are steps that can be taken to, from your perspective, to maintain momentum to the shift to zero-emission buses and also vehicle to grid? You know, what are -- what are we potentially needing to do differently or better or more of to keep the momentum and keep this moving forward?

MR. LIBAN: Yeah, that's an interesting question.

I mentioned this in the -- my concluding remarks for the last question that, you know, we might need more buses in

the next, you know, as we transition from natural gas to ZEVs. But, you know, the types of buses may be different from what we are looking at right now. I don't want to preempt, you know, the recovery task force, the LA Metro recovery task force's recommendation to the Metro board in the next few months but, you know, a lot more people are not necessarily traveling right now.

You know, as I joked around, you know, I miss my bus ride every morning. For those folks who might be traveling on our system, those are the folks who are dependent on the system. Those who are chance users of the system might not necessarily use that anymore. With social distancing maybe becoming the norm for a little bit of time, you know, we can't pack at peak times. And so it's really going into a direction wherein we need to rethink not only how our service looks like, but how we operate the service.

Going back to your question in terms of, you know, increasing or I mean at least maintaining the momentum, you know, we have a commitment of a 2030 zero-emission bus fleet. At this point of time, as I speak to you, there is no change in that commitment. We actually have a structural deficit that we're anticipating. I did mention that earlier. It's a publicly available piece of information up to $1.8 billion.

We had a meeting with OEMs, you know, I think late last year and we put notices that anticipated decrease in the

per bus cost will most likely not happen. And so, you know, if I had my crystal ball, I think, you know, people will still be concerned about the benefits that electric buses or ZEVs or similar types of vehicles and people will be continually interested in those.

But, you know, the volume, the number, the upgrading of those, and the types of those types of fleets out there will most likely significantly change, given the environment we're in right now. So specifically the fiscal environment that we're in right now if these piece of equipment are going to consistently be at the price that they will be.

You know, obviously it's my opinion, I did mention earlier, just for the record that, you know, we have a recovery task force within LA Metro. And the task force, looking at all the different angles on how this might look service-wise, as well as operation-wise for our agency.

MR. BLUHM: Commissioner Douglas, if I could add, you know, on the school bus side, we've seen a huge adoption primarily driven through the funding that has been available. And in light of COVID and how that's going to affect school districts and their budgets, you know, Commissioner Monahan mentioned school districts sometimes have a difficult time looking at the total cost of ownership over the actual initial investment, right. They're not built like a business where it's about the profitability for -- or the long-term

cost. It all comes down to that acquisition cost and how much is really available in their fiscal budget. So the funding and a continued support in that regard is going to be critical, especially right now in light of the challenges which is just as difficult in light of, you know, state budgets and what's happened as well due to this crisis.

So it's an interesting dilemma, but we certainly don't want to see the brakes put on this momentum that we're all seeing in this regard. That would be the worst thing to have happened is this great forward push kind of come to a stuttered stop.

MS. CAPLIN: Uh-huh. I'd love to echo those comments as well. With transit agencies, we know that ridership is down but also sources of their funding like gas tax, sales tax, are not coming in at the same strength that they were previously before COVID as well. So we're anticipating a lot of transit agencies are going to be using their earmarked funding to keep their operations moving as opposed to making investments in new vehicles.

So one of the things that we want to keep seeing is funding opportunities for transit agencies so they can invest in their emission vehicle. Like Brandon just said, we really don't want to lose this momentum right now and also the Coronavirus pandemic is showing us how -- it's showing us the benefit of getting ICE and diesel-powered vehicles off the

road.

And we so appreciate the CEC's infrastructure grant that'll be coming out soon as well as the blueprint grant to help some transit agencies offset the upfront cost of infrastructure and that's going to be a continued important role to play not just for the funding but with information sharing as well so that transit agencies can make smart decisions and potentially spend less in the long run.

COMMISSIONER DOUGLAS: All right. Thank you.

MR. BAGUIO: Just I'd like to echo those as well, but I think one of the things is this continued investment is going to help us, you know, dig our way out. I think zero-emission vehicles, the supply chain, the manufacturing that's happening here in California, it's not just been asked to help offset budgets, but I think that the economic development that the zero-emission industry brings to California is going to help contribute. So it's not just all one ask, but it's a mechanism to help us contribute to this recovery as well.

MR. NESHATI: If I may, from a different transit perspective and than my colleague at LA MTA, we're in, you know, mind you this is, if you want a program to succeed, you'll think of a million ways to make it succeed. If you're not committed to the program, you'll think of a million obstacles to prevent it from succeeding. We're committed to

zero-emission fleet and as we encounter problems and obstacles, we work to overcome them and keep moving forward.

I don't see a choice in not electrifying the whole country, the whole world. So we cannot continue to burn fossil fuels and expect to be a viable planet in a few more generations or centuries.

Commissioner Douglas, she also asked specifically in your question about vehicle to grid. And I think that -- that has a lot of potential in passenger cars where they're parked all day and can spear the energy back to the grid when you have sunshine and you're building is solar and you've got an overcapacity of power. And certainly school buses, in the many school districts, you know, have a couple-hour run in the morning and six hours of quiet time and a couple-hour run in the afternoon so batteries can easily be committed to the grid for several hours as I see it.

Transit, for most fleets, run all day until the wee hours in the night. Our fleet runs from about 5 in the morning until midnight. So the only time we have to charge is, you know, that midnight to 4:30, 5:00 in the morning. We don't have any opportunity to give the power back so while it may not, in my view in talking to many of our transit colleagues, the V2G isn't a really a great fit for transit per se, but it certainly has potential and a great opportunity in a lot of other fleets and a lot of other

electrical vehicle applications.

COMMISSIONER DOUGLAS: That makes sense. Thanks.

COMMISSIONER MONAHAN: Commissioner Inman, did you have any questions?

Well, you can chime in if she has a question later.

So Michelle, why don't we turn it over to you. I know we've eaten into a lot of the time that we had originally anticipated for you. For you to --

MS. VATER: That's okay.

COMMISSIONER MONAHAN: I'm going to take -- I'm going to just take an executive decision and say, we had talked about ending it 2:50, but why don't we say closer to 2:55 or even 3:00, if the discussion is going, but.

MS. VATER: Yeah, I mean, I touched on a lot already.

COMMISSIONER MONAHAN: Unless that's all the questions that you were going to ask. Sorry about that, Michelle.

MS. VATER: No, you guys touched on everything. I think we're done. No, I'm just kidding.

Commissioner Inman, will you chime if you have a question.

We've talked a lot about, you guys have answered a lot of questions that we have already discussed and that I wanted to pose for you. I do want to sort of bring back towards the moving people and incorporate the people back

into it. But I did want to ask Cris a question and open it up to you guys as well.

Cris, being in LA, you mentioned lack of space. And I know that is not just with transit, it's with schools, installing the charging infrastructure for their fleet is -- it's not easy. And you can't just snap and have more space created.

So have you -- what are the viable options that you guys have come up with like can you elaborate on what your plans are as you grow your fleet?

MR. LIBAN: Yeah, so there's -- there's a lot of technologies out there. You know, there's catenary technology that we're looking at, there's, you know, en route charging technology that we're going to build into our Orange-Salina-Fullerton, our silver line, for example. There's also, you know, a way to kind of do, you know, charging at the divisions where you have as little infrastructure as possible.

So, yeah, there's a lot of technology. And part of the challenge too, you know, and I respect what Macy mentioned earlier in terms of the obstacles that, you know, that we face. Believe me, we are racking our brains out in terms of all of these challenges relative to zero-emission buses. But, you know, the size of our fleet is the one that is actually limiting us in our ability to actually have a

wholesale solution, you know, across the system.

You know, what might be good for one location where, you know, for example in Sun Valley where they have a little bit of space and, you know, the type of infrastructure we can put in for EVs, might not necessarily be true, you know, for areas near Silver Lake or in South LA. Because, you know, for whatever reason, we can't do that.

So that's kind of like, you know, where we are in those. We're also looking at, you know, what does the battery look like, right, on those buses? I did mention earlier just some thoughts that are floating around. You know, are these types of buses that we are using right now, given the new normal, if you may, of social distancing and maybe more fleets. Are the sizes of the buses that we're using right now, are those still the appropriate sizes of buses that we need to kind of go out there and deliver people where they need to go.

And obviously, of course, you know, farebox recovery is only up to 30 cents per dollar, you know. With the structural deficit we have with the number of people that we can put into those buses after we come out of this, you know, that would significantly come down even with an increase in the number of buses that might be traveling throughout LA. So.

MS. VATER: Okay, great. Anybody else have any

comments in regards to that? Maybe a new innovative technology. Otherwise, we can move out.

So we've touched on a lot of the barriers in the heavy duty sector. The programs and some grants that have been available that can assist companies and the state attain our zero-emission vehicle goals. So I just want to turn it back a little bit on equity and people. And how can the state and public and private entities ensure that this electrification in transit and school supports our state goals of equality and equity in disadvantaged communities? We touched on it a little bit earlier, but if you guys have any thoughts in that direction and how we can engage the community in this as we move towards fully electric.

MR. LIBAN: Well I can start. You know, I did mention earlier our how women travel study. You know, there's a lot of good points in there wherein, you know, the planning of infrastructure needs to shift a little bit in terms of what and how women might use, you know, the transit system as well as those affiliated infrastructures, especially with the transit systems.

The other part there, too, is that, you know, there's -- there has always been a big push, you know, to put more funding, project funding into those applications that have a vulnerable communities component to it. You know, I've seen that, for example, in EV charger applications, I've

seen that in some of these climate change applications that, you know, we put in alongside with the communities like Watts, communities like South LA, just, you know, wherein Watts part of.

And, I think the challenge, though, is that, you know, are we -- and I just pose this out there maybe for the commissioners to actually think about, you know, the challenge, you know, has there been a wholesale in like a measurement of what might be the dollar return on whatever, you know, is the benefit that's been expected, you know, for those funding. You know, on the health benefits, for example, of those investments. An economic development that's essentially stirred up in those locations.

You know, we're trying to do that in sources we can in a lot of our construction sites. You know, we try to kind of quantify, you know, avoided hospital visits for example. Or what are the economic benefits to small businesses, the increase in land values that might impact the, you know, home and housing equity challenges in those areas.

So I just want to put it out there because when we're looking at, you know, and I've been seeing a lot of these kinds of investments and, you know, we haven't really seen anything more concrete and maybe wholesale study on that. So.

MR. BLUHM: I would add, Michelle, that, you know, I

think the Energy Commission and the way that a lot of the grant programs are put together as well as local air districts and car really put an emphasis on the disadvantaged communities and a focus on making sure that these deployments are focused around those areas. And most of the electric deployments that we've seen within the state have really been within those communities.

I think it's important for the communities to realize that whether it's an electric truck, transit bus, a school bus, whatever it is, these deployments really do need to be celebrated because it is much more than just helping a transit agency or a school district, it is helping our community. So it's certainly something that we strive to make sure that that recognition is there for the community and that it's something that can be celebrated.

MR. BAGUIO: I mean, one of the other important things that's happening is training programs, job training programs. We've worked with the community college districts and school districts as well to train the vehicle technician of the future, or even the bus driver of the future to, you know, kind of open up the perception and the view of, you know, the transportation is turning into the tech industry and to just kind of add of what Macy was saying, training, training, training, is really going to be an important part to again to the economic development of some underserved

communities where these buses are deployed.

As Brandon said, there is a lot of focus of them going into disadvantaged communities or free and reduced lunch areas, and then backing that up with on-the-job training will just, you know, kind of build on that effect of, you know, working with communities.

MS. VATER: Thank you. Sorry, I'm having technical difficulties, it seems like. I appreciate that insight.

It looks like we're about 2:51ish. That is all of my questions. You guys touched on a lot of different topics today in this moving people workshop. So I really appreciate your input, your ideas, suggestions.

I am going to turn it back over to Heather for public comment.

MS. RAITT: Great. Thank you, Michelle. Thank you panelists for all of that great discussion.

So, yeah, we're going to move on to public comments and we're asking for one person per organization to comment for a maximum of three minutes per speaker.

And if you're on the Zoom platform, you can use the raise hand feature. I see we have a number of people who've done that already, and we will unmute your line. We'll let you know of each time. And before you making your comments, if you could spell your name, identify your name and affiliation, and spell out your name out loud for our court

recorder for the record.

And then if you're on the phone line and you're not using the Zoom platform, just press Star 9 and that will raise your hand to let us know you want to make a comment.

And Dorothy Murimi from our Public Advisor's office will go ahead and conduct that for us. Thank you, Dorothy.

MS. MURIMI: Thank you, Heather.

As Heather said, once your name or last four digits have been called, you'll be unmuted. Please unmute, make sure you're unmuted on your end as well.

So first public commenter, we have CTE11. Please state your name and spell it. Thank you.

MS. LEVIN: Yes, this is Jaimie Levin, spelled J-A-I-M-I-E; Levin, L-E-V-I-N. I'm with the Center for Transportation and the Environment.

We're heavily engaged in both deploying fuel cell electric and battery electric transit buses here in California and around the country. And we're also quite engaged in transition planning to help transit agencies make the transition to zero-emission to meet the innovative clean transit regulation.

It was great to hear the presentations. I was especially impressed with the advances that Macy and Antelope have made with battery electric buses in their fleet. But I wanted to emphasize, and I know Michelle and Commissioner

Monahan are planning a fuel cell workshop for IEPR later, but I wanted -- but regardless, I wanted to emphasize, there are two electric buses. The battery electric that we all speak of, but the fuel cell electric and we will absolutely need both of these technologies to meet the innovative clean transition regulation.

Fuel cell electric buses are going to play a major role. Our organization has recently deployed 20 of these new fuel cell electric buses in Orange County in AC Transit, reaching upwards of 300 miles of range. So the vehicle performance is really showing its worth in the fuel cell technology.

But to really address Commissioner Douglas' question and concern, I think what we have to look at is how can we best leverage scarce funding? And it is scarcer because of COVID and the impact on the state budget. And scalability is a big factor in all of this. How does all of this technology and zero-emission buses scale to handle not just a few buses, but 100, 200, 300 buses at a single operating division?

And we've got to move in that direction to fund projects that will show cost efficiency and operational efficiency. And this very much relies on how the infrastructure systems operate in the fueling recharging systems.

CEC plays a big role in bridge funding helping us

move towards these new technologies. And so we've got some major challenges ahead of us, but we very much appreciate CEC's interest now in transit and in heavy duty fueling and we look forward to working with staff and with CARB to effect a zero-emission future that will not only include battery electric, but very importantly fuel cell electric technologies.

Thank you.

MS. MURIMI: Thank you. Next we have Tim Sasseen. Tim.

Tim, if you can unmute on your end, you have the floor.

Okay, we will come back to Tim. There might be some technical difficulties.

Christian Peeples. And folks when you're done with your comment, please lower your hand. Just click that button and it will take off your hand. Thank you.

MR. PEEPLES: Great, thank you.

MS. MURIMI: Christian.

MR. PEEPLES: My name is Chris Peeples, P-E-E-P-L-E-S.

And I'm elected at-large director of the Alameda-Contra Costa Transit District.

We provide bus service on the east side of the San Francisco Bay to about 1.4 million people using about 600

buses and 2400 employees. We have been operating hydrogen fuel cell heavy-duty electric buses for almost 20 years. We've now run hydrogen fuel stacks to failure. They've lasted over 32,000 hours which is better than the 25,000 hours that DOE and DOT set as a goal for them. We have then rebuilt them in-house and one of them is actually running a bus as we speak today. We're working on trying to get that documented and get that public.

A few years ago, the American Public Transportation Association, Bus and Paratransit Conference was in Reno, Nevada, so we drove a bus from Oakland to Reno, Nevada and back. Going up, it had to refuel in West Sac but coming back, it made it all the way from Reno to Oakland on one refueling. Our newer buses which are made by New Flyer have about a 300-mile range as Jaimie mentioned and they refuel in under 10 minutes. So they're really a one-to-one replacement for diesel.

We're in the process of starting up a 30-bus by 30-bus by 30-bus by 30-bus, 30 battery electric, 30 fuel cell electric, 30 diesel electric, and 30 diesel test so we'll have some real world work on this stuff. But we've got few hydrogen fuel cell electric buses that are out there working. We've accumulated several, or well about 30 million miles on them and they work. And we are really looking for CEC to help us provide the infrastructure for in raising that fleet

because we've got the CPUC money to provide the infrastructure for the battery electric so we need some kind of equivalent so we can provide infrastructure for the fuel cell electric.

Thank you very much.

MS. MURIMI: Thank you, sir. Next we have Diane Moss.

MS. MOSS: Thank you. I just -- I saw in a chat that Tim is ready to speak and just have his screen frozen so I would love to defer my time back to him and come later, if he is available because I know he was eager to speak. So.

MS. MURIMI: Oh, thank you very much, Diane. We can go ahead and check --

MS. MOSS: What's that?

MS. MURIMI: I said, thank you very much, Diane. We can go ahead and check Tim's audio now.

Tim Sasseen?

MR. SASSEEN: Okay, I think got through that time. Okay. It says I'm talking. Fantastic. Thank you so much.

Thank you, Commissioner Monahan, everyone at the CEC, everyone in attendance for these great meetings. It's been really productive. Thank you so much.

Obviously I'd like to speak to the other electric bus, fuel cell electric buses. Conspicuously absent so far except for the comments and one of the reasons may be because

of cost. And that situation has changed quite a bit in recent years. Fuel cell electric buses have made massive cost advances by limited deployments relative to battery counterparts.

In 2010, a fleet of 20 fuel cell electric buses was deployed in Vancouver at $2 million each. This reduced to just $1.3 million in 2017. And the last Department General Services contract released for zero-emission buses had a price for just over one million for fuel cell electric buses which was within 11 percent of the closest battery electric bus to create our operational capability. This cost reduction came almost exclusively from design advances from field experience going back more than 20 years.

Fuel cell manufacturers are only now just beginning to implement the sort of very high-volume role to role manufacturing processes that drove down battery prices so rapidly over the last five years. Even ahead of this, our latest generation of fuel cell modules have reduced cost, weight, and volume, all by 35 percent or more while extending lifetime by nearly the same amount.

Recycling costs which still remain a concern for batteries are minimized as 97 percent of our platinum is recycled. Fuel cell electric buses are electric buses but with about a sixth or less of the batteries of the battery bus while providing superior range and operational capability

with no performance degradation from full tank to empty, cold weather to hot. The lifetime cost of this small battery pack is also improved as fuel cells maintain the batteries in a state of charge in a narrow band reducing stresses that can rapidly degrade battery packs.

Hydrogen storage tanks are the other additional cost component. And they have big cost decreases in store as carbon fiber, precursor fiber costs are rapidly reducing and radical new architectures allow performance to vehicle packaging (indiscernible).

Servicing costs are also rapidly reducing. NREL's estimates for service costs for AC Transit's 2010 fuel cell buses were about a buck 61 a mile. While they found for the 2014 buses at SunLine, they were a buck 25 per mile for the first prototypes, then dropping drastically to 32 cents per mile for later models equal or better than the CNG costs.

These will drop even further through new technician training that's going to happen at the West Coast Center of Excellence at SunLine, as well as at AC Transit through their advanced training facility. And from the latest maintainability advances in the newest buses.

All of this is confirmed by recent studies by groups like Deloitte and McKinsey, which show fuel cell electric bus total cost of operations dropping below that, not only of diesel and CNG, but also in battery electric buses before the

end of the decade, as soon as 2027. This TCO advantage comes not only from rapidly dropping capital in fuel costs, but from the lower operational costs of operating a bus with equivalent capabilities to diesel and CNG buses that our transit systems were designed for.

Thank you very much.

MS. MURIMI: Thank you, Tim Sasseen. Next we'll go on to Diane Moss.

MS. MOSS: Hi. Thank you so much. Diane Moss, policy director for California Hydrogen Business Council.

And I just -- I'm going to stay very brief and thank the Commission so much for having this important conversation. And echoing Tim and some other commenters today, just wanted to echo the call for a diverse set of technologies as we tackle this challenge of transitioning to zero-emissions, electric vehicles, in the important sector of moving people around.

I also was going to call on that McKinsey study that showed that by the end of the decade fuel cell electric vehicles and bus, and battery electric vehicles in urban use are probably going to cost about the same. Or fuel cell electric buses beating them out when longer ranges are needed.

And also they point out that some of the -- some of the in the shorter ranges, that there's going to be a

dependence on variables like electricity costs and fuel costs and space limitations. Very location-specific variables that are uncertain at this point. And so a reason why it's important for policymakers to keep both types of electric zero emission bus technologies in view when making policy and having conversations like this.

And I just touched briefly also, Commissioner Monahan, you brought up an issue dear to my heart which is how does all of this fit into integrating renewables? And we do talk a lot about VGI, something that I've worked on for a long time in the electric, the battery electric sector. But one of the benefits I also want to point out in the hydrogen fuel cell technology arena is that in here, renewable electricity can be taken, for example, when there's more solar wind then's needed to be made to use hydrogen. I mean to produce hydrogen from that electricity that can be used a later time. And that ability to integrate renewables at a separate time for when it's needed for transportation as one of the, I think, really exciting things about including hydrogen fuel cell electric vehicles in the conversation.

So with that, I'm going to leave it to, I know there's a bunch of other speakers who want to speak. And just thank you so much and I look forward to continuing the conversation.

MS. MURIMI: Thank you, Diane.

Next we'll have Nico B. followed by SVLG.

As a reminder, please state and spell your name. Thank you.

MR. BOUWKAMP: Hello?

MS. MURIMI: Hi, we can hear you.

MR. BOUWKAMP: Okay. My name is Nico Bouwkamp. N-I-C-O; B-O-U-W-K-A-M-P. I'm the technical programmer manager with the California Fuel Cell Partnership. And previously I've also been creating the bus team at our organization.

Thank you for the opportunity to comment and we appreciate CEC's continued participation in the CEC. In the context of this workshop and the focus on the 2020 IEPR updates and planning for the future based on current trends, I'd like to make a few comments.

From my understanding is that transit is all about providing a reliable service to riders with the least complexity and the maximum performance vehicles within the budget that has been allotted to them. One trend that has not been mentioned much during this workshop and that would be good to hear more about maybe in future workshops is the impact of the innovative clean transit rule by ARB. Transit agencies are currently in a scramble to organize around that and decide on what the mix of vehicles is. If it's battery electric or fuel cell buses or a mix of the two and how they

can continue their operations that are within the budgets that have been allotted to them. And that's all largely relying on FTA and regional funding.

In this context with regards to hydrogen, I won't get into the details too much because I think the four previous speakers have mentioned this as well. But hydrogen infrastructure appears more challenging but has delivered as well as emphasized by AC Transit for transit heavy-duty bus applications in the past, in the last 20 years. With that, I'd also like to point out that for cost reduction which is an important trend to follow as well and maybe track at some point is that both battery electric and fuel cell bus electric buses have similar drivetrains and this is important to reduce the cost of both of these bus technologies, as well as the development of the electric drivetrain components supplier base which is very important to move towards the future where the costs are so manageable.

One last point that I want to -- like to bring up is that it's not clear to me how these discussions and these workshops and info provided both feed into the updated 2020 IEPR updates.

So I'll leave you with that. I think there are plenty of other comments to consider and we're looking forward to working with the CEC in this regard. And we're also looking forward to provide our input here in the fuel

cell and hydrogen-specific workshops in the future.

Thank you.

MS. MURIMI: Thank you, Nico.

Next SLVG and Hugh Wynn afterwards.

MS. SICKLER: Thank you so much. This is Heidi Sickler with the Silicon Valley Leadership Group. Thank you, Commissioners, for the opportunity.

Don't have a comment so much as a question for Cris Liban, who I know from my time at LA Metro when I was working for the former L.A. mayor there on transportation policy, and also for Macy. Really interested in your feedback on how transit agencies can partner with utilities and cities on deployment of microgrids to provide backup power. You know, along with being in the age of COVID, we're also in the age of power safety, power shutoff. So I'd love to get your thoughts on the type of guidance or tools that public transit agencies are looking for from either local organizations or agencies to be able to deploy those microgrids and also to provide resource adequacy as you pull in more and more renewables.

Those are just some thoughts and questions. Thank you.

MS. MURIMI: Could you spell your name. Sorry.

MS. SICKLER: Of course. Commissioner Monahan knows me. I'm one of your advisor committee members on the Clean

Transport Advisory Committee. Heidi, S-I-C-K-L-E-R.

MS. MURIMI: Thank you.

Next we have -- let's go to Al Cioffi. I hope I'm saying that right. Al Cioffi.

MR. CIOFFI: Yeah, hi, can you hear me?

MS. MURIMI: Yes, we can. Go ahead.

MR. CIOFFI: Okay. Hi, my name is Al Cioffi. It's spelled C, as in Charles, I-O, two Fs, as in Frank, I. I am with Plug Power.

And what I'd like to do is I'd like to make two points in support of consideration for the alternative electronic technology which is fuel cell electric technology.

Just a couple of points about Plug Power. Our business is built completely by supplying fuel cell electric drive products into the forklift business. Now our customers exclusively today operate electric forklifts which means that they're running batteries in their fork trucks. And we have 33,000 units that are deployed throughout the U.S. and now actually throughout the world. It is estimated that 30 percent of the groceries in the United States are touched by in some way shape or form by a Plug Power enabled vehicle.

Now our customers, as I mentioned, they will run battery electric technology. 33,000 times they have willingly replaced their battery electric technology with fuel cell electric technology and these are people like

Kroeger, Walmart, and Amazon. So these aren't -- these are some very large logistically intense companies. And the reason why they willingly replace them is because the fuel cell electric has demonstrated to provide significant operational and management efficiencies and management improvements. They're able simply to move more product in their facilities by using a fuel cell electric than a battery electric technology.

Those same issues are also present and will be present in on road vehicles that move goods, that move people, and move basically anything. So I would like to offer that I would be willing to participate either one-on-one or with any public forum to take people through in-depth this value proposition we have and show you why fuel cell electric vehicles are worthy of equal consideration with battery electric vehicles. We don't profess that we can solve every single problem but we solve quite a number of problems.

The other thing that we do is we also provide the fuel. We currently provide about 24 tons of hydrogen daily for customers. By the end of this year, it will be 32 tons a day. We have recently announced that we will be moving into production of our own hydrogen and that will be 100 percent green hydrogen. Many industry analysts expect and project the price of hydrogen and green hydrogen to drop below the $2

a kilogram rate which is going to be equivalent to about $1 diesel gallon equivalent. The infrastructure costs our customers find also are about 80 to 90 percent lower with hydrogen than they are with battery electrics. And to the point that was made earlier, hydrogen fueling station is a perfect microgrid enabler.

So I would look forward to engaging with anyone in the future in getting more in-depth thoughts on this topic.

Thank you.

MS. MURIMI: Thank you, Al.

Next we have Nick Mitica (phonetic), followed by Rajiv Singhal.

Nick, and please spell your name. Thank you. Nick Mitica, are you on the line? No. We'll go on to Rajiv Singhal. Rajiv?

MR. SINGHAL: Yeah. Can you hear me?

MS. MURIMI: Yes, we can hear you. Go ahead.

MR. SINHAL: This is Rajiv Singhal; R-A-J-I-V; S-I-N-G-H-A-L.

Thanks for giving me this opportunity to make a comment. So I just wanted to touch base on two things. Number one, there's a discussion about the second life battery and second discussion was about the smart charging. And we work for a company called Mobility House and we've been doing this for over 10 years where we help fleets

monetize their zero first and second life batteries. And we also have programs under leasing where we work with different finance companies and energy service companies to provide those programs.

Number two, the smart charging, we charge some of the biggest fleets in the Europe currently, 150 buses in a single fleet, all electric buses, where we use our software we charge the buses smart fleet. Just wanted to share that, so that's been there and Europe is pretty heading in that technology and we're bringing that to the U.S. now the last couple of years.

And I have a question for AVTA, I'm not sure if they can answer right now or I don't know how it works, but I just wanted to learn what sort of charge and energy management AVTA is using for their 58-bus fleet currently.

Thank you.

MS. MURIMI: Thank you, Rajiv.

Next we have Ray Pingle followed by Kristian Corby.

Ray.

MR. PINGLE: Hi, can you hear me?

MS. MURIMI: Yes, we can. Go ahead.

MR. PINGLE: So Ray Pingle; R-A-Y; P-I-N-G-L-E. I'm with Sierra Club California.

So when CARB was going through the innovative clean transit rulemaking, I was a participant in the subcommittee

on total cost of ownership, so I have some insight and experience on total cost of ownership. And I wanted to talk about that with respect to battery-electric buses. And first of all, I would like to congratulate Macy and AVTA on the phenomenal progress they've been making in their transit agency. They really are not only pioneers but the gold standard, in my view, of how to do it right.

And I think I was very delighted to see the facts and figures that Macy presented, which is a proof statement for the very significant fuel and maintenance savings that can be realized with battery electric buses.

So the fuel costs and maintenance costs can be in the neighborhood of 50 percent of the total cost of ownership of a transit bus over its lifetime. So savings in these two areas are really critical. When we talk about the fuel cost, first of all, just the raw cost of electricity, according to some CARB TCO studies, is actually lower than the cost of fossil fuels to begin with, so there are savings to be realized there.

And then as Macy pointed out, the low-carbon fuel standard incentives can be tremendous, and in fact, we modeled out the impact of LCSF and different transit agencies, and some transit agencies, the LCSF credits can actually pay for the entire cost of the fuel, and in some cases more. So transit agencies can actually realize net

income, if you will, from LCSF.

And then what Macy's doing is putting up solar when he completes that project, his -- not only will his electricity costs become even lower, he'll have net -- further net savings from excess LCSF, but the LCSF credit is greater because he's getting this electricity from renewable energy.

And then when you look at what's happening with the utilities, they're putting forward new tariff structures to stabilize and lower demand charges, they're coming up with new -- other new tariffs that are going to benefit heavy-duty vehicles. So the fuel savings, and actually even some cases net revenue generated from using electricity can be phenomenal.

Just very quickly on fuel cell vehicles. So fuel cell vehicles can be fine, it can compete with some pros and cons of battery electric, but the most important thing is they need to be fueled with green hydrogen because conventional hydrogen has a higher greenhouse gas output per mile than fossil fuels do, so that's the most important thing for hydrogen-fuel vehicles. They need to be using green electrolyzed hydrogen.

Thank you very much.

MS. MURIMI: Thank you.

Next, we have Kristian Corby. Please spell and state

your name. Followed by David Warren.

Kristian.

MR. CORBY: Hi, this is Kristian Corby with CalETC. My name is spelled with a K, so it's K-R-I-S-T-I-A-N, and it's Corby, C-O-R-B-Y.

Can you guys hear me?

MS. MURIMI: Yes we can, sir. Go ahead.

MR. CORBY: Okay, great. So I just wanted to say that CalETC really appreciates and supports the CEC's work in this area, and we want to recognize that these are really challenging times with the pandemic that we're all experiencing right now, and that that is going to have some very significant effects on the funding that becomes available for these projects, including electric buses, which are so necessary during these times and so ready to convert to zero-emission.

So we just wanted to emphasize that we have a really broad coalition of support for these incentives and really hope that we are able to see the State budget reflect that even during these really difficult times.

We also wanted to call for a public private partnership that addresses some of the infrastructure challenges that were discussed today. We really see that space constraints can be really difficult and funding can also be difficult there. There are certainly a lot of

challenges that CalETC and its utility members have -- we really started to appreciate and we're working really hard to try to streamline those processes and come up with unique and creative solutions for them. So we think a public private partnership would be really great in that -- in that respect to help -- help build -- build on those ideas.

Also just, I've been working a lot on the act rule that's coming out from CARB right now and I really see these electric buses being a great way to help meet a lot of the sales targets that are going to be coming out for those as well. So I just wanted to show how these projects at the CEC and CARB, really there's so much overlapping and beneficial characteristics to them.

Thank you.

MS. MURIMI: Thank you, Kristian.

Next we'll have David Warren. Followed by Lauren Skiver.

Please state and spell your name. Thank you.

Go ahead, David.

MR. WARREN: Good afternoon, this is David Warren from New Flyer. Spelled D-A-V-I-D; W-A-R-R-E-N. I'm the director of sustainability and transportation for our company.

And I have two comments to make. One related to battery electric and the second related to fuel cell

electric. New Flyer's a manufacturer of transit buses and we produce all types of propulsion systems, including trolley electric used by San Francisco Muni. We have fuel cell electric buses deployed at AC Transit. Chris Peeples mentioned that. And we also have battery electric buses at AC Transit. And then LA Metro on the panel, we have battery electric buses in Southern California as well as other locations.

My comment on battery electric is that our company, New Flyer, as well as Proterra, and other battery bus manufacturers worked extremely hard on standards so that our charging equipment was interoperable. That you could charge a New Flyer or Proterra, anybody's bus off of the same charging equipment. We've demonstrated at New Flyer that we can charge a Chevy Bolt off of our charging equipment, and so on the light-duty side. And I see no reason that the heavy-duty trucks where you discussed yesterday won't be able to charge off of the same type of equipment.

The en route charging, perhaps, that's going to be a little bit different, but the standard that was put in place, 3105, may work for utility and work trucks very well. So I just want to emphasize that the investments that CEC is making in an infrastructure for battery electric vehicles can apply to all types.

Now my comment regarding the fuel cell electric buses

is that a fuel cell electric bus and when I say bus, vehicle, is essentially a very close variant to a battery electric vehicle. The architecture is essentially the same. The fuel cell is added to essentially be an on-board battery charger.

So the technology is from a user's standpoint, is very compatible. It's not extremely different. The infrastructure certainly is. And all the comments that have been made by multiple public speakers today regarding the fuel cell technology, we at New Flyer, strongly support the fuel cell buses.

And one reason it hasn't been mentioned today, and I know my time is running out, is that the weight of a battery electric bus can be quite extensive. We carry up to 7,000 pounds of batteries on a bus for a long-range bus. In California, Assembly Bill 1250 provides some exemptions for transit buses to deal with weight. And the heaviest configuration transit bus we manufacture is a battery electric bus.

So fuel cell buses generally carry 38 kilograms of hydrogen. You obviously have to have tank and infrastructure or storage system on board to carry hydrogen, but the actual configuration of a fuel cell electric bus is substantially less than a battery electric bus.

Thank you very much.

MS. MURIMI: Thank you, David.

Next we have Lauren Skiver.

MS. SKIVER: Thank you. Lauren Skiver, S-K-I-V-E-R. CEO, general manager for SunLine Transit Agency.

I'd like to comment on two past comments and I want to thank the Commission and the CEC for having this meeting.

SunLine is zero-emission technology agnostic. We run both all battery electric and fuel cell electric buses. On the comment about microgrid, I did want to highlight that SunLine currently has a project to create a solar to hydrogen microgrid. The first phase will be a solar farm that will run our 900-kilogram electrolyzer. The second phase will be a solar to hydrogen for storage. We believe one of the best ways to store renewable and green electricity is through the use of hydrogen. And the third, we hope in the future will be a truck stop dedicated to clean hydrogen and possibly electricity available to trucks traveling along the I-10 between our location and the L.A. basin.

We think that it's going to take both of these technologies to accomplish the state's goals and we believe there's room for both. I think that transit is going to have to look at a mix of propulsions to be successful in their ICT plans and we're happy to continue that work at our location.

Thank you for the opportunity to speak today.

MS. MURIMI: Thank you, Lauren.

And, folks on the line, if you want to make a public

comment, please press Star 9. At this time, there's no more public comment.

I'll hand it over to Heather. Thank you, Heather.

MS. RAITT: Hi. Thanks, Dorothy. Sorry it took me a moment to get to unmute.

So thank you. That concludes our public comment.

And so Commissioners I don't know if you have any closing remarks you'd like to make.

COMMISSIONER MONAHAN: So this is Commissioner Monaham. Just a quick thank you to everybody for joining this. Again, we're learning how to use Zoom and integrate telephones and trying to make this more dynamic. I think our next -- for next time, we'll utilize the Q&A function, trying to get more questions coming live into the -- into the discussion from the folks on the phone. Or just participating via video.

I also want to, I mean, there's been a lot of public comment around the need to have hydrogen as a solution in the heavy-duty spaces. I couldn't agree more so I, too, think it's important that we think of both fuels, hydrogen and electricity from the grid as potential solutions for cleaning up our diesel good movement, people movement, and offer equipment sector.

So just want to reiterate that we are not trying to exclude hydrogen and fuel cells from the discussion and we'll

make a special effort to especially during the hydrogen workshop and throughout just so continue to explore the role of fuel cells and hydrogen. Especially, I think, in the medium- and heavy-duty space where we have a big need from a public health standpoint to electrify and clean up.

So thanks for the panel. So that was a really good discussion. And to Michelle, for facilitating that. So, yeah, just appreciate everybody joining in for this discussion.

Commissioner Douglas, do you have anything to say?

COMMISSIONER DOUGLAS: Just -- just that I appreciate everyone's participation. I think the clock form worked well. I think we were able to have a very great and productive workshop. Everything went smoothly so that's fantastic.

Thanks everyone.

(Thereupon, the Hearing was adjourned at 3:31 p.m.)

--oOo--

CERTIFICATE OF REPORTER

I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were reported by me, a certified electronic court reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

And I further certify that I am not of counsel or attorney for either or any of the parties to said hearing nor in any way interested in the outcome of the cause named in said caption.

IN WITNESS WHEREOF, I have hereunto set my hand this 23rd day of June, 2020.

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