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CALIFORNIA ENERGY COMMISSION

In the Matter of:

2020 Integrated Energy Policy  
Policy Report Update  
(2020 IEPR Update)

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) REMOTE ACCESS WORKSHOP  
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IEPR COMMISSIONER WORKSHOP

CALIFORNIA ENERGY COMMISSION

ZERO-EMISSION VEHICLE RESILIENCE  
AND THREE REVOLUTIONS IN TRANSPORTATION

REMOTE VIA ZOOM

SESSION 2: Three Revolutions, Opportunities, Challenges, and Intelligent  
Transportation Systems

SESSION 3: Electrifying Transportation Network Companies

Thursday, July 16, 2020

Reported by:  
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## APPEARANCES

Commissioners from the California Energy Commission:

Patricia Monahan  
J. Andrew McAllister

Staff from the California Energy Commission:

Heather Raitt  
Ben De Alba  
RoseMary Avalos  
Jon Bobadilla

Also Present:

Dan Sterling, Ph.D., University of California at Davis  
Shobna Sahni, California Air Resources Board

Panelists:

Session 2:

Giovanni Circella, Ph.D., University of California at Davis,  
3 Revolutions Future Mobility Program  
Hana Ceger, Greenlining Institute  
Nadia Anderson, Ph.D., Cruise  
Mike Roeth, North American Council for Freight Efficiency  
Mollie Cohen D'Agostino, University of California at Davis  
Maya Ben Dror, Ph.D., World Economic Forum

Session 3:

Jeremy McCool, HEVO Power  
Rohan Puri, Stable Auto  
Don Anair, Union of Concerned Scientists  
Jon Walker, Lyft  
Emily Warren, Nelson/Nygaard

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Opportunities, Challenges,  
and Intelligent Transportation Systems: page 4

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Network Companies: page 105

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## P R O C E E D I N G S

1  
2 JULY 16, 2020

9:30 o'clock a.m.

3 MS. RAITT: All right. Well, it's 9:30. So good morning,  
4 everybody. Welcome to today's 2020 IEPR Update Commissioner Workshop on  
5 Zero Emission Vehicle -- oh, my gosh. I am so sorry -- Resilience and Three  
6 Revolutions in Transportation. I am Heather Raitt, the Program Manager for the  
7 Integrated Energy Policy Report, which we refer to as the IEPR.

8 Today's workshop is being held remotely consistent with Executive  
9 Orders N2520 and N2920 and the recommendations from the California  
10 Department of Public Health to encourage physical distancing to slow the spread  
11 of COVID-19.

12 Instructions for attending or participating in the meeting were  
13 provided in the notice and include both internet and call-in options. The notice is  
14 available on the Energy Commission's website.

15 Instead of a full-day IEPR workshop we have broken this topic into  
16 three sessions over two days to encourage participation. And so this morning's  
17 session is the second of three, and addresses Three Revolutions: Opportunities,  
18 Challenges, and Intelligent Transportation Systems. Session 3 is this afternoon  
19 at 2:00 p.m.

20 The meeting is being recorded. We will post a recording and written  
21 transcript on the website. Also on the website you can find today's presentation.

22 We will be using the Q and A function in Zoom to post some  
23 attendee questions to panelists during the Automated and Intelligent  
24 Transportation panel discussion. Attendees may type questions for panelists by  
25 clicking the Q and A icon. And before typing a question, please check to see

1 someone else has already posed a similar question. And if so, you can click the  
2 thumb's up to vote on it and the questions with the most thumbs-up clicks are  
3 uploaded to the top of the list. So we'll reserve about five minutes at the end of  
4 the panel for attendee Q and A. And given the time restrictions and our full  
5 agenda, we won't be able to elevate all questions received. Also given the  
6 packed schedule today, we do not plan to raise attendee Q and A to the two  
7 presenters before the panel.

8 Now I'll go ahead and provide comments on the material for today's  
9 workshop. There will be an opportunity for public comment at end of this and  
10 each of the three sessions. Please note that we will not have time for the  
11 panelists to answer questions during the public comment period.

12 For those using Zoom online, click the raised hand icon to let us  
13 know you'd like to make a comment. And if you change your mind, you can click  
14 it again and your hand will go down. For those on the phone, just press star 9 to  
15 press your hand and then we will open your line during the public comment period.

16 Alternatively, written comments after the workshop are welcome and  
17 they are due on August 6th. And again the notice gives you all the information for  
18 how to do that.

19 With that, I will turn it over to Commissioner Monahan for opening  
20 remarks.

21 Thank you.

22 COMMISSIONER MONAHAN: Good morning, everybody. It's a  
23 pleasure to be here. And I'm especially excited about the topics today.

24 I am welcomed on the dais by Dan Sperling, who is the professor  
25 and founding director of the Institute of Transportation Studies at U.C. Davis. For

1 folks who weren't on yesterday's workshop, Dan is actually the person who coined  
2 the term the Three Revolutions. So it is particularly fitting that he is here joining  
3 me on the virtual dais today and a number of folks from ITS U.C. Davis who I  
4 would say are the leaders in terms of evaluating the benefits and the central  
5 drawbacks of the Three Revolutions. So we're really looking forward to having  
6 them illuminate us on what we can look forward to and what we're experiencing  
7 today in terms of the intersection of electrification, automation, and mobility as a  
8 service.

9 So I want to see if Dan has a few opening remarks.

10 I'm not sure, Heather, are there other members of the virtual dais,  
11 are there other commissioners here yet?

12 MS. RAITT: Yes, Commissioner McAllister has also joined us.

13 COMMISSIONER MONAHAN: Okay, great. I will turn it over to  
14 Commissioner McAllister after Dan has an opportunity to make some remarks.

15 Dan, I think you're muted. If you're --

16 PROF. SPERLING: Oh, you want me to start.

17 COMMISSIONER MONAHAN: Yeah, I was hoping.

18 PROF. SPERLING: Okay.

19 COMMISSIONER MONAHAN: Because you're the man when it  
20 comes to the Three Revolutions, so if you have nothing to say, that's not good.

21 PROF. SPERLING: I've got plenty to say. Okay, so to introduce  
22 this topic, there's these Three Revolutions. So the electrification in some ways is  
23 on track. Certainly the U.S. is lagging. California is doing better than the U.S.  
24 But Europe is now ahead, China is ahead, but we're on track in some ways.

25 The sharing part of it is really problematic, and I think that's perhaps

1 the most important topic today because at the end of day sharing is central to  
2 achieving a sustainable transportation system. Whether you're talking about  
3 transit or pooling of rides or shareable, dockable bikes scooters, it's absolutely  
4 essential. Carpooling is absolutely essential to creating a sustainable  
5 transportation system.

6 And automation is the interesting kind of wildcard. It's moving  
7 ahead. Some people are optimistic, some are pessimistic. But at the end of the  
8 day it is going to happen eventually. And the challenge is to make sure we direct  
9 it, channel it toward the public interest. And it influences heavily the sharing part,  
10 especially, but also electrification. So I think we're going to hear a lot about this  
11 today.

12 So this is a great topic. It's -- really in my mind these are central to  
13 creating sustainable transportation from an equity perspective, from an  
14 environmental perspective, and from an economic perspective.

15 COMMISSIONER MONAHAN: Dan, I knew you would have  
16 something to say that would set the stage.

17 I also want to emphasize that a lot of the advances in these Three  
18 Revolutions are occurring here in California. I mean I think it's pretty fair to say  
19 that California is the epicenter when it comes to electrification, automation and  
20 mobility as a service. Lyft and Uber were founded here. Silicon Valley and L.A.  
21 are the home of lots of companies working on AI and integrating mobility as a  
22 service with autonomous vehicles and emerging electrification as getting our three  
23 goals. That's where we get the heaven scenario, when all three of these come  
24 together. So it's also I think a place for California to have leadership both  
25 economically in this space and technologically as well.



1                   So it's the perfect topic for today, for California and for the Energy  
2 Commission to delve into. So we really appreciate all the leadership of the many  
3 folks that are participating in this morning's workshop, including the folks at U.C.  
4 Davis, U.C. Berkeley and other -- Lawrence Berkeley National Laboratory -- I'm  
5 sorry, not U.C. Berkeley -- and others.

6                   So I know that Commissioner McAllister is here as well. So can I --  
7 there he is.

8                   COMMISSIONER MCALLISTER: Hey.

9                   COMMISSIONER MONAHAN: Would you like to make a few  
10 remarks?

11                  COMMISSIONER MCALLISTER: Yeah, just a couple. So I am  
12 really looking forward to listening in on this. You know, obviously this is a kind of  
13 a little bit of an extension of my kind of knowledge base, so I'm going to learn a lot  
14 today and probably won't have a ton of comments as many of you listening in and  
15 certainly presenters are way beyond my knowledge on this particular slice of our  
16 energy landscape.

17                  But I did just want to sort of back up and point out that the criticality  
18 of our electric system is becoming, you know, more clear to everyone. It's always  
19 been important for our economy, but it really is that physical infrastructure that we  
20 have invested in over the last hundred plus years is really taking on new  
21 importance in our modern economy. And it's -- you know, traditionally, historically  
22 it's been a static resource, really unidirectional, a static resource just pumping, you  
23 know, power for a limited range of end uses because we had all of this thermal  
24 energy over there doing other things. And it's now really becoming the epicenter  
25 of most of our energy services and will only be more that way over time.

1           And this combination with mobility is just really kind of a mindbender  
2 for those of us who have been in the power sector for a long time. And having  
3 this static resource really be managed in real time, moment to moment, and  
4 providing mobility services, it really is a brave new world out there with so much  
5 potential, so much upside.

6           You know we're the innovation economy in California. There's  
7 incredible innovation going on with power technologies, power management, you  
8 know, the combination of power electronics and digital technologies is just opening  
9 up all of these doors, these huge, huge doors of opportunity.

10           So this is, I think, a great, great example of that that's going to have  
11 really Earth-changing consequences. So thanks, Dan, for your leadership on this.  
12 And I'm really excited to hear what folks have to say to that extent.

13           So thanks for your leadership as well, Commissioner Monahan.

14           So I will -- I will go onto a fly-on-the-wall mode and listen in for the  
15 rest of the morning.

16           PROF. SPERLING: And I want to add just one little note.

17           COMMISSIONER MONAHAN: Thank you.

18           PROF. SPERLING: Patty Monahan, Commissioner Monahan  
19 actually played a key role in launching this whole initiative when in her previous  
20 position she really played a big role in helping getting us launched at U.C. Davis  
21 and statewide and nationally. So a lot of kudos to Commissioner Monahan as  
22 well.

23           COMMISSIONER MONAHAN: Well, aw thanks, Dan. I'm  
24 blushing.

25           Well, let's -- we have a different format for this morning's workshop.

1 We're going to have two presenters and then a panel. It's because there's so  
2 much interesting research, that to set the stage that we thought would be helpful  
3 for grounding the panel's conversation, so I want to introduce the first speaker.  
4 It's Giovanni Circella. He's Honda Distinguished Scholar for New Mobility Studies  
5 and he's the Director of the Three Revolutions Future Mobility Program at U.C.  
6 Davis.

7 His research interests include travel behavior, the adoption of  
8 emerging transportations technologies, and the impacts of ICT shared mobility and  
9 micro mobility. Giovanni is the Chair of the PRB Committee on ICP in Travel  
10 Choices. He's an elected member of the Executive Board of the International  
11 Association for Travel Behavior Research. So we really do have an expert to kick  
12 this off.

13 Giovanni, can I ask you to turn on your mic and your video?

14 PROF. CIRCELLA: Hello. Good morning, everybody. And thank  
15 you so much for the invitation to speak today here.

16 It's a big pleasure to see so much interest about the Three  
17 Revolutions in Transportation. And I hope that my short presentation this morning  
18 will give an opportunity to think about the two topics that I think have a lot of  
19 attention about research, about planning and policymaking. If we can go to the  
20 next slide.

21 So all of course asking here is transportation involved in the last --  
22 and we can remember, it's almost 20 years since the first car-sharing appeared,  
23 and then a lot of new revolutions with new mobility, smart apps today that can give  
24 a lot of services on demand. The latest thing that is happening in our cities is the  
25 micro mobility with scooters zooming around everywhere. And in the future also

1 more changes with automation will give new opportunities to have different  
2 relationship with traveling with various vehicles . Next slide.

3 So really when you think about the future, and here is a quote I like  
4 to open, it's not really from somebody at U.C. Davis, not Dan Sperling or myself,  
5 but it comes from the car manufacturing sector. And the first thing you note is  
6 really envision that people in the future won't have as many vehicles as we have  
7 today, because they will share one and all only one. So somehow we going into  
8 this transformation. The way to get there and how we would get there is a big  
9 question. Next slide, please.

10 So I had mentioned before Dan Sperling really opened ways to think  
11 about the Three Revolutions. But I have not read his book yet. I am really  
12 encouraged to read his book. but the question is really that we can't ignore this  
13 transforming of transportation very quickly, and very important to think about in  
14 which direction. So the next slide, please.

15 When we think about future mobility and the impact of the Three  
16 Revolution is really like we could go in the direction of a heaven or a hell. And  
17 these are two extremes. Probably the reality in the future will be somewhere in  
18 between. But this works well, and California is a good example. We could have  
19 a little for electric, energy makes this clean. We can get better on transportation,  
20 better mobility with a lot of benefits. But this also could go very poorly if we could  
21 use the electricity of coal, if we have a lot more by trips by car because automation  
22 is seen as more convenient. If we reduce more transit, then there is a lot of risk.  
23 Where the future will go and how it will look like, it really depends a lot on the  
24 policies we shape today. And this we think is important also to think about this  
25 topic. Next, please.

1           So use the launch of the Three Revolutions future mobility will be a  
2 number of products and a panel to study the big changes in transportation supply  
3 and demand, and one of our goals is really to create the research, rigorous  
4 research in the university environment, focusing in on our topic, but also provide  
5 impartial policy analyses that help make good teachings in the future. And we  
6 work for a number of projects and we'll continue to work more with the California  
7 Energy Commission to support your work. Next, please.

8           Among the most list of question that we think are very pressing and  
9 important to investigate are what are the impacts of the new technologies, and not  
10 only the Three Revolutions but also eshopping and everything happening, how this  
11 will affect the traveling behavior but also vehicle ownership. Will we go to people  
12 relying more on shared mobility rather than owning a private vehicle. But also in  
13 the short term, what replaces what. If people take a street by scooter or calling  
14 an Uber, does it mean they leave the car at home in the garage or that they are  
15 moving out of public transportation, or a mix of all of these? And we will talk  
16 about these in a few slides from now. Next.

17           So you could look at the growth of shared mobility, particularly in the  
18 last few years, at least before the pandemic, this has been really massive. If you  
19 look at the growth in the first mobility sector, with the number of trips by Uber, it  
20 really adds fields of one issue which is impressive. Still this is the main and urban  
21 phenomenon, which somehow preceded more promising things because like the  
22 pressure on traffic is actually very strong at stopping the area where the road is  
23 not made to accommodate a lot of cars. Next, please.

24           When we move into the other solutions, the big news in the last few  
25 years has really been the growth of shared mobility. Shared mobility has

1 increased a lot of bike sharing, which has been arranged for many years, but really  
2 seeing where we started to see trips by bike-sharing system, especially the bike-  
3 sharing system, and stations -- and, sorry. And of course bike-sharing but also  
4 the scooter-sharing, this has really boomed, the number of trips made with these  
5 services. So in the next slide we really wonder who is starting to use these  
6 services and what are the impacts.

7           So to do this, -- next slide -- we have been developing a number of  
8 projects. One of these we are managing a California panel study of emerging  
9 mobility factors. So we're really studying people over time to see how their  
10 behavior evolves over time. And we do this with a large sample of individuals  
11 from all ages. Next slide.

12           We are also launching other data collections all around the U.S. and  
13 also with the similar process working with popular institutions and at universities in  
14 other parts of the world, because it is really important to study this topic in other  
15 contexts. Next, please.

16           So, for instance, to dive into some of these data, it's interesting to  
17 see how the prevalence of the use of these services became so big. We see  
18 here, for instance, these started from in the United States, a major city, urban  
19 populations. But we did a number of respondents in our study that reported they  
20 are using the Uber and Lyft app on their phone is really becoming pretty large a  
21 percentage of users, now of course for the urban population. Numbers are lower  
22 in rural areas. But it's also interesting to see how this is starting to become  
23 almost as important to things like, you know, AirBnB that have been around for  
24 many years in our lives. And obviously other services like car-sharing and  
25 scooter-sharing are still smaller and less common, but still like, you know, they are

1 growing off of them. Next slide.

2 In a lot of our work we are really focusing on who are the users,  
3 because we know the population is a lot of may be different segments of the  
4 population. And at the bottom of all these slides I'm actually reporting some links  
5 to some journal papers and some reports where you could find more information  
6 about some of these working. Very interesting data.

7 Now still today we see that a lot of the users of these services, the  
8 early adopters, are among some of the groups, would be the group on the top part  
9 of the slide, they are the better -- the young millennials, the young professionals  
10 leading the field.

11 It's also important to consider there are other groups using these  
12 services. The second one is actually a very interesting one. The second one we  
13 see in this slide, is here in the middle part of the slide, it's actually more composed  
14 of people that are not the traditional early adopters of Uber, but they are people  
15 like, you know, in like an established job, many times living with a family,  
16 sometimes in suburban areas. But they use these services to go to the airport.

17 The one thing that is interesting is that this group of users actually  
18 have a very different price sensitivity of the first group. So somehow when we  
19 think about policies also, we need to think also the reactions to fares and pricing or  
20 any policy that we make would be very, very different for different groups. Next  
21 slide.

22 So now our work has been focusing also a lot on what are the  
23 impacts on the other -- use of the other modes of transportation. Next.

24 And so, for instance, using data we've been distinguishing that Uber  
25 and Lyft trips, of course they have some impact on the use of other modes, but

1 they can be very different depending on who is making the trip and where the trip  
2 is happening. As you see in this slide on the left side, you see that the large  
3 group of urban travelers is trying to substitute the use of transit, the use of walking,  
4 bicycling with the use of ride-hail. So this is something actually that is very  
5 important and we should consider in policymaking. The three standards we we're  
6 talking in a few slides actually is going to be -- on the second group in the middle,  
7 it's more like in a one-to-one substitution. Leaving the car in the garage and using  
8 an Uber/Lyft.

9 But the third group is an interesting one, because these our people  
10 actually that they use transit more because of the ability to use shared mobility.  
11 Very interesting to study this because actually how we like to see this group  
12 growing more and would be of societal interest to a better integration between  
13 public transportation and shared mobility, but also this is not always happening  
14 under market condition. So the need for policy intervention is very important.  
15 Next slide.

16 It's also very important to look at the different services. So, for  
17 instance, the pool services, in the orange slide, the Uber, pool, and Lyft share,  
18 they have a very different impact than Uber on the user mode. But also when we  
19 look at who is making the trips and where those trips happen, for instance, we see  
20 that it is very different because here are trips to and from the airport that is more  
21 likely to be in competition with taxis, versus trips that are substituting for the use of  
22 public transportation. This happens many times for most travelers in the urban  
23 cores during the daytime.

24 I am also mentioning the use demand that Uber and Lyft are  
25 creating, so additional trips are happening. This tends to be more common for



1 nonessential trip increases for leisure. And also individuals that live in big  
2 households, to which you think in the policy perspective what are the options that  
3 are available for these users and we can try to align these services to the goal, so  
4 we can better interests of society. Next slide.

5 I normally here mention scooters, but each scooter actually have an  
6 interesting pattern because in a lot of cases they actually substitute for trips that  
7 have been done by walking, or they're using a private bike for scooter. And that's  
8 an interesting complement because when we start looking at these trips, scooters  
9 are also easier somehow than the shorter range of trips that would have been  
10 done by Uber or Lyft. So here there is potential interesting mode shift from Uber  
11 and Lyft, from riding-hailing, to the scooters. And this is also on the market  
12 perspective today, but in the future with better integration with transit, this service  
13 can serve even more as an additive for public transportation. And we see on the  
14 right side actually of this slide, you can see actually that for longer trips by scooter,  
15 your competition with ride-hailride-hailing and with private vehicles actually  
16 increases. Next slide.

17 So in the next part of our region, really interesting longitudinal study  
18 analysis. Also to see how the adoption of shared mobility services are affecting in  
19 the medium and longterm. This is also a big question with mobility services. As  
20 you see the integration of multiple platforms of services and the same platform  
21 which individuals would be likely to rely on these services instead of owning a car  
22 today, but it could change in the future as these services are provided in different  
23 ways. and so we're actually doing some new studies actually for after the  
24 willingness to join mobility service system, but also studied access to airports, and  
25 this is in cooperation with NREL and UCD to really study, you know, how new

1 technology is changing traveling to and from an airport. Next slide.

2 One important consideration in California in particular is the  
3 commitment for the clean Mile Standards. There are many other parts that can  
4 be developed. In this instance we are working with CARB to really inform our  
5 research on the ways in which we can increase pooling and scooters, in which we  
6 can move to more work more electrification of TNCs, decrease the heading, but  
7 also better connecting public transportation and applications promote active  
8 transportation. We don't have a lot of results on this study yet, but we will have a  
9 lot by December because we are really doing a lot of work in the second part of  
10 this year to support CARB in these efforts.

11 But in the next slide you can see some of the data we are using for  
12 this study, in which we are using both the standard collector of our data from U.C.  
13 Davis but also we are accessing a lot of information through these by SACOG, by  
14 SANDAG, other NGOs, California, and also other data that can be useful to  
15 support the Clean Mile Standards policymaking.

16 And I expected a lot of the people that are at this meeting today  
17 could actually be interested in this product, so CARB is actually creating an  
18 advisory group for this product. If you are willing to serve in that advisory group, I  
19 would welcome experts from the California Energy Commission and other  
20 colleagues in the audience today to really join that group. Next slide.

21 Automation is the big potential for electrification. This is collected in  
22 the Clean Air standards, but also a lot of research is really showing improvements  
23 in this area. My great colleague Alan Jenn has been doing a lot of work in this  
24 area. And he has been showing that a lot of drivers could be actually okay driving  
25 an electric vehicle. Next slide.

1           So to look also at the charging factor, it's very important to consider,  
2 though, to study the charging indicator of the driver, a lot of impact on the charging  
3 infrastructure; because we can see that, you know, for instance, if you start looking  
4 at the charge indicator, the time of day, the frequency with which somebody  
5 charges, or even the amount of energy in each charging event, it's very different  
6 from the TNC driver as opposed to the other user. So an infrastructure that is  
7 defined for privately-owned vehicles that are operated, personal vehicles can  
8 actually be not more for an infrastructure that needs to serve also TNC drivers.  
9 And also they is a potential for a large initial reduction benefits from electrification.  
10 So we need to study more on this topic. Next slide.

11           Automation in the future will bring actually big impacts to -- our study  
12 will be working in collaboration with Jon Walker and other his colleagues actually  
13 simulating some of the future. The bottom line of this study is really showing that  
14 every data that we have today says better if automation happens primarily on  
15 fashion, with our parts become automated, then there is a potential for a sharp  
16 increase in VLC. This is very important to see here because actually the policies  
17 here will really have a big role. If you don't want to get into the future, probably  
18 you need to promote more sharing, more groups of shared automated vehicles of  
19 the future. Next slide.

20           I have been working a lot with CARB also to model potential  
21 scenarios in the future with potential ranges of TNC, the definition of transportation  
22 elimination. But there are certainly a lot of things to consider.

23           Then the next slide you could see, for instance, some of the main  
24 impacts that needs to be considered on the TNC definition when we consideration  
25 automation. And certainly there are aspects of land use, the travel demand, a lot

1 of other issues that should be considered. Next slide.

2 We are already starting to create some policy-friendly documents  
3 that can actually support your work. So I invite you to check on the website link.  
4 We put some guidelines to promote VLC reduction and greenhouse gas  
5 containment where automation will become actually part of our lives. And I would  
6 invite more discussion on these topics, because really key to the deployment of  
7 automation, it would be important to making sure that this is more done in a  
8 sustainable way.

9 The last topic -- the next slide -- is really to think about what is  
10 happening right now. The world has changed very quickly in the last few months.  
11 And with the COVID-19 Pandemic, not only our lives are changing a lot and with  
12 the need for social distancing, impacts on teleworking, eshopping is here, a lot of  
13 the transportation supply and the world is changing, where we are seeing mergers  
14 and acquisitions, in the last one, Uber and -- decided to sell their Jump Division  
15 and merge it with Line (phonetic). This has actually affected the supply of new  
16 modes and the changes in the future. Next slide.

17 We're actually developing a very big study on mobility today. We  
18 are looking mainly at people who -- really discussing some of the early findings  
19 from the study. I want to say that one of the seeds is we're bringing the  
20 longitudinal study citing these changes in a lot of different regions. Next slide.

21 So for a combination of quantitative and qualitative research but also  
22 research on the respondents, we will have a different time, a period of time, in the  
23 past for 2019, for the people who are looking at the study. Right now the big  
24 calculation is 2020, but will continue to collect data in the future. Next slide.

25 We are really collecting more than 10,000 respondents that are

1 participating in this big study. But we're really seeing here like, you know, what  
2 conclusions we can really see and how these afford research and planning for the  
3 efforts. I invite you to check on our project website that is listed there.

4           Some early projects in the next slide, for instance, we can see big  
5 reduction in physical trouble for commuting. I also want to mention this is done in  
6 a very, very different way across different segments of the population. So some  
7 people, featured in the lower income and in some segments of the population are  
8 forced to travel today. They cannot adopt eshopping instead of commuting.

9           But also there are changes that are happening because one day is  
10 they're using the share model travel, which includes transportation for the day.  
11 So a lot of things that are hampered today could really impact what happens in the  
12 future. Next slide.

13           Really today we did not have a lot of time, but I really want to call  
14 some of the considerations moving in the future. First of all, is how much of the  
15 temporary will speak and translate into longlasting turns. A lot of things actually  
16 probably will revert to the past, history has shown after big disruption, when they  
17 go away, people go back to their old habits. However, as the disruption becomes  
18 longer, as is happening in this pandemic, there is a possibility that a more  
19 permanent change will stay. Some things are here to stay. Not only the  
20 changes in behavior, but the eshopping will certainly continue. The retail space is  
21 changing. It could take a long time to recover. Next slide.

22           We also need to think about how to promote shared mobility in a way  
23 that is safe and healthy. I see a lot of mobility, especially the low-risk option  
24 compared to other modes. But today a lot of people have really banded during  
25 the pandemic, a lot of people are scared of using that.

1           We have to think about funding issues also because there is a big  
2 decline in the revenues for public transportation and a lot of the funding for state  
3 agencies.

4           We have to think about the policies can really promote modes and  
5 try to avoid a big increase in car travel in the future.

6           And then these topics are about consideration. Really important to  
7 think about where the future is heading in the future and also how we can make  
8 sure that those that are really disadvantaged today can actually get a chance to  
9 improve their conditions, whether they're being penalized today also by the  
10 pandemic. Next slide.

11           I'd like you to check our website where we have a lot of materials  
12 here. And so we will consider possibilities in the futures.

13           And the next slide is really my final thoughts, some policy  
14 considerations. I really think like, you know, we are changing -- studying the  
15 world is changing quickly, but very important to consider that in the future we  
16 should really put the human beings at the center of our attention and not think too  
17 much about cars.

18           It's really important to see that a lot of things that we're studying  
19 today are really the world the way it is in market conditions, but really pricing will  
20 be central to affecting policies, to affecting the way people do different like  
21 activities and participation in use of different modes. It's very important to  
22 consider how to combine electrification with other modes. We talk about shared  
23 mobility, but computations of big extenders. But let's not forget about it's  
24 important to make policy to push for behavioral changes, and also land use that it  
25 needs to be coordinating with travel. It's very important today. Too many times

1 the land use is even. I know California has been leading already in trying to do  
2 coordination in using transportation, but we need the public to do more.

3 Finally, in the future with the MaaS there is possibility to change  
4 even more the relationship with private vehicle ownership. Private vehicle  
5 ownership in the medium and long term can be a factor when we are instead of  
6 just one of two services, plus the more service that integrates everything. And  
7 this could be actually a very good opportunity for the future. The next slide.

8 And just a link to our website where you can find a lot of -- and by  
9 the research project. But also, to close, I want to give the proper  
10 acknowledgement for a lot of the people who have been really contributing to our  
11 research. Next slide, please.

12 We have a lot of great colleagues and experts that have been  
13 contributing in a lot of various, but also a lot of agencies in California working with  
14 us on many of the projects and they are really supporting our work. And they are  
15 partners that work with us and really provide a lot of expertise. And this way we  
16 can also make our research to policy, to try to really build a better world thanks to  
17 what we learn in our work.

18 I will stop here. I'm sure there will be some questions. And I invite  
19 you to check our website for more details of any of our activities.

20 COMMISSIONER MONAHAN: Giovanni, thank you. That was  
21 really -- there was a lot of information there, and you talked really fast so I may ask  
22 a question that was already on your slide and I just couldn't catch it. But I  
23 encourage the other members of the virtual dais, Commissioner McAllister and  
24 Dan Sperling, to join me on video.

25 So I want to just follow up on what you -- well, I guess I'm kind of

1 integrating two themes which is this hell scenario and a life post COVID. So, you  
2 know, the hell scenario, right, is automation without electrification, without sharing.  
3 And that's where you just have a lot to -- TNC, increase TNC in internal  
4 combustion cars.

5 I always think about this scenario of a family wanting to go to  
6 Disneyland when it opens and, you know, getting in their robocar and having a  
7 sleeping mat in it and just having the car drive them to Disneyland. And then it  
8 will go park far, far away, right. You don't have to pay an excessive amount of  
9 money for parking because you could just drive your robocar into the -- into the  
10 sunset and come back and pick you up when you want to go home and then drive  
11 you all the way home.

12 And that's the hell scenario, right, because you don't really care  
13 about traffic, you're just sitting there, maybe you're working or you're sleeping, and  
14 the vehicle kind of is set up for you and is very comfortable.

15 And you could see in a COVID world where people are afraid to go  
16 onto public transit or shared, to share with anybody else, you could see that hell  
17 scenario being more possible in this post COVID world. And I wonder if you could  
18 just talk about are you seeing any trends towards, like we're seeing in China,  
19 where people are buying more vehicles, or is it too early to say?

20 PROF. CIRCELLA: I would say it's too early to say. Some of the  
21 legal data has shown data, I think it was in May and June there was an increase,  
22 but also there was following a sharp decrease in March and April. So it's really  
23 difficult to say what is job, like, you know, postponing of a purchase that was  
24 already planned.

25 And anecdotally there are some people actually report seeing more



1 in the dealers, because buying the first car. So somehow, like used car cannot  
2 afford a new car, so there is that group.

3 Also China that is really being more -- getting rid of the pandemic  
4 faster than us. They are being show, you know, like car travel is going out,  
5 business being shown also in Europe in many places, car travel has recovered  
6 much faster than other modes. And so somehow it's a decrease pandemic levels  
7 for now in many countries in Europe, but actually transportation is lower. And this  
8 is a big problem for a lot of European cities because actually public transportation  
9 calls for urban trips and innercity trips much bigger role.

10 Here you like, you know, we are still in the middle of pandemic and  
11 it's very difficult to say what the impacts will be. I mean, first of all, right now we  
12 are locked out again at home and working remotely, so locked work remotely.  
13 Some of the people have essential work and they need to go to work. And many  
14 others have lost their job, unfortunately. But, really, like, you know, the future will  
15 be combination of what happens with the pandemic but also what we plan for the  
16 recovery.

17 A lot of money has been put in stimulus support. Europe has really  
18 been showing like, you know, links to some green solution, incentive to purchase a  
19 bicycle, incentive to purchase a bike. People are concerned about sharing a  
20 scooter. Why don't incentivize to buy their own scooter. Many times in Europe  
21 actually do it, but not only for EV but also for electric scooters, personal, and  
22 personally-owned ebikes, and bikes. And this has been successfully in places.

23 Also at the local and regional level there have been incentives and  
24 policies to really promote active travel for example, removing some parking space  
25 and converting more space to bike lanes that have been done in kind of a tactical

1 planning -- tactical planning approaches, really a short time. Sometimes in the  
2 matter of a few days or few weeks, you see bicycling appearing.

3 And this promoting this. It's actually opening in the U.S. in some  
4 places. Actually Oakland was a very interesting example. Some other places  
5 around the country have been showing like, you know, some -- at least on the  
6 level, promotion of active travel. I think it's very important, and I know that here it  
7 depends also about what are the general policies versus the state or regional, to  
8 really make a concerted effort to promote noncar solution, because there is a big  
9 risk that the post pandemic actually might be that people will go back to work  
10 because they will not commute forever. Some sense, but it's likely many people  
11 will go to commute physically not the first time. We will actually rely more car,  
12 and we might actually have negative effect.

13 The other thing promoting electrification is very important. There is  
14 nothing that is creating obstacle during the pandemic electrification. Sharing  
15 concern about that, but why people should be concerned about electrification. So  
16 keeping the push for electrification is very important.

17 But I think it's also very important to think about in the short term  
18 about supporting noncar mode. In the median term to think about the shape of  
19 cities medium and long term, especially as we see like, you know, big change  
20 happening. Regionally it's really happen, a lot of shops are really going away, a  
21 lot of places of physical stores.

22 So can we rethink our cities to a mixed use into, mixed with offices.  
23 More space like, you know, converted to green areas, to active modes of travel, a  
24 better sidewalk, a better place where people feel comfortable and safe to do  
25 things. And we really need to think more, talk more in the median term. And

1 then both in the short and the medium term and long term, pricing is very  
2 important. I think down like, you know, very, very good strategy to promote what  
3 we think is vital interest, we will not achieve really good results.

4 COMMISSIONER MONAHAN: Can you speak to the pace of  
5 automation? I think there was -- you know a number of years, I think it was, a fair  
6 amount of optimism that we could reach level 4 automation in the next several  
7 years. What's your sense of the pace of both technological development and also  
8 acceptance of the technology?

9 PROF. CIRCELLA: Yeah. It's very difficult to say what the exact  
10 timeline would be in automation in the future. You are absolutely correct, there  
11 was a lot of optimism like a few years ago showing that things were really like  
12 intermediate. Like 2020 we would have seen like, you know, full automated  
13 vehicles on our roads. And now we see like, many of them are pretty transparent  
14 and will take longer.

15 I think it's difficult to say one thing actually will happen and option  
16 nothing just like area, but impact on society. Thing is to get ready for the time.  
17 To try to make sure that we promote like, you know, the shared privately-owned  
18 automation type. To create also system that we are promoting integration with  
19 public transit, with walking and bicycle. We try to -- we know what things can go  
20 wrong. Now it's our ability to try to the damages.

21 Whether it what will happen in five years, in 10 or 15 years, it's  
22 problem to some extent. And probably the pandemic is also an unclear tactic.  
23 Many cutting down expenses in research and development. Some actually  
24 saying opportunity to push forward more with the automation transition.

25 COMMISSIONER MONAHAN: So, Giovanni, I want to make sure

1 that Commissioner McAllister and Dan have a chance to ask questions. And we  
2 are actually running out of time, so I'm just -- I'm sorry, I didn't realize we were so  
3 close on time.

4 So if you all have questions, and if I could encourage Giovanni to  
5 answer as quickly and shortly as possible, that would be great.

6 COMMISSIONER MCALLISTER: I guess I just wanted to -- you  
7 almost answered the question I was going to ask. And I just wanted to  
8 emphasize something you said about the opportunity to rethink our urban  
9 landscape and, you know, sort of plug this integrally into the planning function,  
10 right. And it seems like the COGs, the Councils of Governments, and the regional  
11 planning organizations, and certainly the transportation planning, obviously, which  
12 you guys are all expert on, seems like really key actors in this.

13 You know as there are all these questions calculating in the COVID  
14 era about commercial real estate and space and just the physical geography of  
15 our cities, it seems like a huge opportunity to kind of unpack that and figure out  
16 where we need to go in an integrated way.

17 So I guess as you were talking, that was occurring to me that, boy,  
18 what a great opportunity, as we are rethinking our daily patterns in a very  
19 fundamental way, that's going to have huge implications for real estate values in  
20 certain parts of the country, in cities. So this just seems like a great way to  
21 optimize investment with that long-term kind of landscape in mind.

22 PROF. CIRCELLA: I definitely agree. I would also to do that as  
23 much as possible in a futuristic way, you know, combining the land use and the  
24 planning aspect, also with opportunity by technology. We can -- we know today  
25 we can integrate in a bad way.

1           So like, you know, thinking about the streets and the public space  
2 and the land use, also with that today the integration of where we can add like,  
3 you know, , the third, with transportation, with car sharing, with a lot of other  
4 solutions. And really think about in that way to promote a culture of a more  
5 human based, like, you know, with more walkable streets with that would better  
6 pass the offer to use no-car options. Rather that like, you know, too much we  
7 have let our cities grow. Enormous land of parking lot as we the car, which we  
8 know is not the future. In the small like, you know, scale might actually solve  
9 some problems, but in long term creates more issues with congestion, traffic, and  
10 other problems.

11           COMMISSIONER MCALLISTER: Thanks.

12           Go ahead, Dan.

13           PROF. SPERLING: Okay. So I'll just make two comments to make  
14 it quick so we can move on.

15           One is that with automation, while there is a lot of skepticism there is  
16 a lot of hype, the investment continues to pour in. And we just saw, for instance,  
17 Amazon just bought a California automation company, Zoox, and spent a lot of  
18 money on it. And Amazon's not going to do that unless they have some real  
19 intent.

20           Now of course in that case a lot of it's going to be for delivery of  
21 goods, as opposed to passenger. At least that will be probably their first  
22 application. But it's -- the investment's continuing, so I think it's going to happen  
23 and it will be in a more limited way, but it's going to roll out.

24           And one other quick observation is from a policy perspective, transit  
25 is at the heart in the near term of what happens, because, you know, the transit

1 industry was in big trouble, now it's in desperate trouble. I mean they're just -- I  
2 mean they're just going to disappear in many cases unless something  
3 revolutionary or transformational happens. And so probably the strategy forward  
4 is the shared mobility companies working more closely with transit. You know, let  
5 transit be more efficient and let the shared mobility companies provide services  
6 and serve low-income people, in particular.

7 Now to do that sounds simple, but there's a lot of financial  
8 revolutions and other changes that have to take place. But both industries are  
9 moving in that direction, so that is -- and so the role of policy is to encourage  
10 those.

11 COMMISSIONER MONAHAN: Great. Thank you --

12 PROF. CIRCELLA: I do notice that --

13 COMMISSIONER MONAHAN: Dr. Circella, thank you so -- I'm  
14 sorry. We have to move to our next speaker. I want to make sure that Zach has  
15 a chance to -- but this has been a great discussion. And I think one of the  
16 heartening things is that Zoox is actually an electric company, so that's a good -- a  
17 good sign, for Amazon to invest in.

18 So let's move on to --

19 PROF. CIRCELLA: Thank you so much for having me.

20 COMMISSIONER MONAHAN: Thank you. Thank you for joining.  
21 That was really helpful and a really informative presentation.

22 So we're moving on to Dr. Zach Needell. He is an Energy and  
23 Environmental Policy Project Engineer at Lawrence Berkeley National Laboratory,  
24 which is one of my previous jobs -- not that specific one that Dr. Needell has, but I  
25 worked there as well. He holds a Ph.D. in Transportation from the Massachusetts

1 Institute of Technology.

2 So we welcome you to give us more information about Three  
3 Revolutions.

4 DR. NEEDELL: Thanks. And good morning, everyone. And  
5 thanks for joining.

6 And thanks, Giovanni, for that excellent framing for this talk.

7 So today I'm going to be talking about integrated modeling of Three  
8 Revolutions. And I'm going to do it through the lens of the BEAM model, which  
9 we developed at Berkeley Lab. But I'm going to do it as general interest and then  
10 in as general a way as possible. The next slide, please.

11 So I'm going to start by talking about what aspect of a transportation  
12 system we're modeling and why I think this kind of modeling can add value. I'll  
13 then give some background on how to model transportation systems, both in  
14 general and in particular BEAM, and give a little more detail about how we model  
15 Three Revolution type behavior, specifically within BEAMS.

16 And then the results section of this presentation is going to be  
17 framed kind of at a high level as to what types of questions do I think this sort of  
18 detailed modeling is best equipped to answer. The next slide.

19 So, yes, getting into details about modeling transportation. The next  
20 slide, please.

21 So as kind of context and motivation, big technology changes like  
22 electrification and automation are going to lead to fundamental transformations of  
23 how a transportation system works. And at the same time that the HERO  
24 response to these technology changes are kind of going to be just as important.  
25 And so kind of better understanding how this behavioral and technology change

1 can interact with each other is really important to understanding how the  
2 transportation system evolves.

3           And to make things more complicated, the changes we're talking  
4 about will occur on vastly different time scales. So for automation, for instance,  
5 automated vehicle technology will affect how individual vehicles interact with each  
6 other while merging onto the highway, on one hand, that's a second best -- second  
7 level, but it will impact at least indirectly land use and development patterns that  
8 evolve over decades. And so kind of pulling both of these two vastly different  
9 effects into the same conceptual framework is really interesting but also really  
10 hard. So why do we bother doing it?

11           We still need to make decisions, so, you know, in the short and  
12 medium term, even if there is this great deal of uncertainty about where the  
13 transportation system will go. And I think that modeling can add value to that as  
14 long as we're honest about what we can and can't promise with the modeling.

15           I think detailed modeling is especially important for systems where  
16 we don't have empirical observed data to rely on, so we can't go and observe, you  
17 know, a fully automated electric ride-hail suit operating in a different country and  
18 extrapolate it to the results here because they just don't exist. And so often the  
19 next-best thing we can do is build a mechanistic model of how these fleets would  
20 function from the ground up and what we can learn from it.

21           And I think that gets at what I think is one of the main values of this  
22 level of detailed modeling is that it kind of keeps you honest. So, you know, if  
23 you're expecting some certain, you know, possible evolution of the future, you  
24 should at least be able to build a ground-up model that leads to that kind of  
25 behavior. And by building this model, you can really look under the hood and



1 better understand how a potential transportation future works and what the main  
2 levers are, what the main interactions are, and what the main constraints are.  
3 That would lead us to or away from that future. The next slide.

4           So, yeah, how do we model transportation system? We can think of  
5 a transportation system as having a supply side and a demand side. So on the  
6 supply side, we have travel speeds on the length of the road network,  
7 transportation system, parking availability. And there are a lot of models out there  
8 that like really focused in detail on modeling the supply side. And they can be  
9 really valuable for terms like, you know, modeling the effects of signal time or  
10 lane configuration.

11           There are also a lot of models that focus on the demand side, in  
12 particular, of the transportation system. So how many trips people take, where do  
13 they go, what mode do they use. And a lot of the interesting modeling on this  
14 side -- or analysis on this side too that kind of treats the supply side of the  
15 transportation system in a kind of fixed or a simplified way. Next slide.

16           There are certain kinds of questions, though, that really rely on  
17 linking the supply side and demand side and considering them both integrated at  
18 the same time. So kind of the classic example here is land use demand. So if  
19 you widen a congested highway, all of a sudden there's more capacity, speeds  
20 can go up, but then more people, you know, -- the car mode becomes more  
21 appealing. More people drive their cars. You have more cars on the highway  
22 and then you're back to congested conditions. So that kind of linkage of supply  
23 and demand requires a new set of models.

24           And for a long time the kind of state-of-the-art way of doing this was  
25 with the four-step model, which starts by taking a city or metro area, dividing it into

1 transportation analysis zones, and then modeling travel behavior as loads  
2 between community zones. So, yeah, this has been kind of state of the art for a  
3 long time. It's still widely used by metropolitan planning organizations. It's really  
4 valuable for lots of sorts of planning tasks. Next slide, please.

5           But modeling are always trying to make things more complicated.  
6 So for the past 10, 20 years, the kind of state of the art of this has been with ABM.  
7 And the term ABM can be sometimes confusing because sometimes the A refers  
8 to agent-based model, sometimes it refers to activity-based model. I think  
9 fortunately, though, most of the models people are talking about when they're  
10 talking about transportation ABM are both.

11           So what I mean by an agent-based model is that it's made up of a  
12 discrete set of agents that operate with their own set of rules and can interact with  
13 each other. And in the transportation context these are often individual travelers.  
14 So you can simulate a city with millions, multiple millions of people as they move  
15 around. And, as you expect, this can be computationally hard and require a lot of  
16 computational resources in order to resolve.

17           In terms of an activity-based model, that really refers to how the  
18 simulated agent structure, their travel behavior. So instead of thinking of travel  
19 behavior as just a set of trips, we model how travelers structure their daily plans  
20 around a sequence of activities in different places that they choose to participate  
21 in. And what this let's you do is capture whole-day correlations and constraints  
22 that you can't -- or at least are very hard to model in simpler models like forced  
23 model.

24           So, for instance, in the real world do you really see people walk to  
25 work in the morning and then drive their car home because, you know, then there

1 wouldn't be some way of getting their car to work during the day. Or, for instance,  
2 if congestion is really bad during the evening commute, people may shift some of  
3 their shopping trips from the evening commute to some other time of the day.  
4 And this kind of integrated whole-day framework of the STBS model let's you  
5 capture these constraints and correlations. Next slide.

6           So BEAM is one of these agent-based models. And so the current  
7 slide about our philosophy for why we made a new model rather than rolling out  
8 the other ones out there. And I just want to, you know, start with the disclaimer  
9 that we're not trying to replace MPO models with BEAM. The idea is to develop a  
10 model that is, you know, designed to be applicable to long-term scenarios where  
11 there are fundamental changes to the transportation system rather than, you  
12 know, smaller proto mutations. And so our kind of hypothesis is that by focusing  
13 less on, you know, predicting the precise feed on a precise link of the system at a  
14 certain time, instead by really starting from scratch and modeling mechanistically  
15 the -- the way in which the resource markets that make up the transportation  
16 system function, this model will be more applicable to futures where everything  
17 changes. So people might structure their decision-making processes differently in  
18 20 or 30 years, but as long as we get a way that road-capacity or, you know,  
19 vehicle-sharing services operate, well, we'll at least have a good -- you know, the  
20 underlying structure of the way the transportation system evolves, we'll be able to  
21 capture well. And I will get into some of the details on how we can employ  
22 resource markets more in the next slide. So next slide.

23           And also as I had mentioned before, the aspect of different time  
24 scales is really important in this kind of modeling. So, you know, we can think of  
25 some aspects of the transportation system that evolve over a multi-year time

1 scale, so the land use, makeup of the vehicle fleet for instance, some aspects vary  
2 day to day and hour by hour. So mode choice of individual travelers, operations  
3 of shared mobility fleets for instance, and then some things really vary second by  
4 second. So, you know, the energy use of an individual vehicle as it accelerates to  
5 merge on the highway, for instance. Next slide.

6 So, yeah, in BEAM we focus on this day-to-day behavior, but BEAM  
7 exists as part of the shared mobility workflow, which is a collection of separate  
8 models developed mostly in the National Lab -- National Lab space funded by the  
9 Department of Energy. And all of these models are designed to innovate well  
10 with each other, talk to each other. So basically when we run BEAM, we can  
11 communicate directly with a model of land use evolutions or with, you know,  
12 advanced models of individual vehicle energy function to better understand the  
13 way both of these time scales affects what we're seeing, and vice versa. Next  
14 slide.

15 So for this within-day, you know, system that we're modeling in  
16 BEAM what we're doing is we're generating a synthetic population of agents and  
17 running them through a day of travel, including mode choices, you know, all sort of  
18 modes, transit, walk, bike. And, basically, at the end of the simulated day, we  
19 have these agents evaluate their score, how they did that day, and then potentially  
20 replan for the next iteration in order to improve how they score. And by iterating  
21 through this multiple times, you end up at a user equilibrium where everyone is  
22 doing basically the best they can. Next slide.

23 So to give a little more detail about how we model Three Revolutions  
24 and BEAM. Next slide.

25 So for sharing, one of the ways we model sharing is that we spend a

1 lot of effort modeling the ride LC which involves modeling kind of in real time the  
2 dynamic allocation of individual vehicles to individual customers and the pooling of  
3 individual customers into pooled trips. And what this allows us to do is provide  
4 the simulated agents with real time price and wait time quotes for trips. So, you  
5 know, this captures the feedback where, for instance, if there is an under supply of  
6 vehicles in the market, wait times go up and then, you know, people are seeing  
7 longer wait times for their trips and people are willing to take shared modes. So  
8 the next slide, please.

9           One of the ways in which we capture the impacts of automation is by  
10 modeling household automated vehicles in detail. So here we assume that  
11 households coordinate to deploy all of their automated vehicles in order to best  
12 serve as many trips as possible on the household. And so what this means in  
13 terms of impacts on the transportation system is more household vehicle  
14 automation leads to more vehicle miles traveled in two ways. It means that  
15 individuals are more likely to take longer trips and take more trips when they have  
16 access to an automated vehicle because, you know, we're assuming at this time  
17 an electric vehicle is more -- or an automated vehicle, excuse me, is more  
18 enjoyable, but also because these vehicles are serving multiple people's needs,  
19 there is more shuttling between locations as these vehicles try to serve multiple  
20 people's needs. The next slidee, please.

21           And, finally, in terms of electrification, this is agent-based middle let's  
22 us or the individual state of charge is -- individual vehicles over the course of the  
23 day, which allows us to model charging detail. And in BEAM we do this distinctly  
24 for personal electric vehicles, for human-driven ride-hail vehicles, and then for  
25 automated ride-hail vehicles that were all simulated. The next slide, please.

1                   So in terms of the results, I want to frame this kind of results section  
2 in terms of what at a high level are the directions and types of questions that, you  
3 know, a model like BEAM, a detailed integrated travel demand model is best  
4 equipped to answer. And so, yeah, I want to frame this by saying that a lot of  
5 these results are still working their way through the peer-review process. So I  
6 direct you to -- you know, adjust your main takeaways to be more along the lines  
7 of the big-picture questions and the big-picture direction. So the next slide,  
8 please.

9                   So the one question that I think is particularly important is what types  
10 of -- what are the important interactions and constraints associated with  
11 paradigms. The next slidee, please.

12                   So here we ran some big scenarios of long-term future evolutions of  
13 the transportation system. We did a high-sharing, high-automation case. So the  
14 heaven scenario that Giovanni was talking about and a low-sharing, high-  
15 automation case, the hell scenario. To make things more complicated, we  
16 modeled high-technology and low-technology versions of these slides -- of these --  
17 of these future scenarios.

18                   And on the left we were showing the energy consumption of these  
19 different scenarios. And a big takeaway was that the hell scenario, the low-  
20 sharing scenario, didn't really do any better than the heaven scenario. And so we  
21 kind of looked in more detail at that and we looked at the performance of -- and we  
22 found that a lot of this empty -- a lot of this extra vehicle miles traveled was coming  
23 from the ride-hail fleet driving around empty.

24                   And so we -- we looked in more detail at where this is coming from.  
25 And basically it came from the fact that we had calibrated our -- excuse me -- we

1 had calibrated our repositioning model, so our model of where these ride-hail  
2 vehicles go when they're idle and don't have passengers in them to match  
3 observed behavior right now. And when we expended that in the future, it led to a  
4 very large number of empty miles. And so, you know, we played around with  
5 frames to see the effect on systems and we found that, yeah, we could reduce the  
6 this amount of empty-vehicle miles traveled by reducing the sensitivity of  
7 repositioning. So what this meant is that all of a sudden the vehicles were in the  
8 right place and so wait times went up a lot for ride-hailed trips.

9           And so, okay, we can adjust for this by increasing the size of the  
10 ride-hail fleet, meaning that there are more vehicles to go around people. But  
11 where -- where this ends up is that you have a lot of vehicles sitting around empty  
12 for most of the day not making money for whoever owns the vehicles.

13           And so my main takeaway here is not necessarily that it's impossible  
14 to imagine a very efficient high-sharing, high-automation future, but just that we  
15 shouldn't assume that it's going to happen automatically; that, you know, even in a  
16 situation where people are very willing to take shared rides, you know, as a profit-  
17 driven provider of these ride-hail services won't necessarily end up providing a  
18 service that is very energy efficient. The next slide, please.

19           Another question that I think this kind of modeling is well equipped to  
20 answer is what are the order-of-magnitude-sized effects of competing processes.  
21 So next slide.

22           So here is an example of work that's ongoing now, that's -- the long-  
23 term goal is to measure the impact of fast-charging on the electric grid distribution  
24 network. And so we started out so by looking at the impacts of electric-vehicle  
25 charging on the bulk-power system. We ran two scenarios with different levels of

1 reliance on -- and shared, automated, electrified ride-hail fleet. So the -- on the  
2 part on the left shows a scenario where a lot of people have given up their  
3 household vehicles and rely on the fleet. And the scenario on the right shows a  
4 scenario where a much smaller percentage of people have given up their vehicles.

5           And what we can see is that in neither case the bulk of the bulk-  
6 power system demand is still driven by slow charging from household automated  
7 vehicle, which is not to say that, you know, this blue area on top coming from DC  
8 fast-charging is not going to be really important, especially at the distribution level.  
9 But, you know, this kind of modeling allows us to put some kind of a sound and be  
10 able to compare at the high level, you know, how the impact of this fast-charging  
11 ride-hail fleet compares to slow charging from the personal-vehicle fleet. Next  
12 slide, please.

13           So my final kind of case study is a question of what can the  
14 distributional affects of the large-scale transportation look like. So what we did  
15 here is we looked in detail at the impact of household vehicle automation on the  
16 transportation system. So we varied the penetration of household automated  
17 vehicles from zero percent to two-thirds, which is the X axis on the slots. And you  
18 can see that on the left slots, if we look at total vehicle miles traveled in the  
19 system, the more automated the household vehicle fleet is, the more vehicle miles  
20 traveled you have. As expected, this increase in VMT is driven largely by empty  
21 movement of these household vehicles as they shuttle from place to place.

22           However, if we look at the impacts on individual mobility, we see that  
23 actually as you increase -- increase household vehicle automation, you decrease  
24 the amount of person miles traveled, so how much people are moving around,  
25 which is a kind of counterintuitive result because we expected -- we expected



1 people to be more willing to travel long distance in these paths.

2           And so, looking more into that, we looked at the differences between  
3 households that did and did not have access to CAVs, and we found that as you  
4 increase CAVs you increase congestion on the road network. And, therefore, if  
5 you have access to one, you don't really care about spending another 10 minutes  
6 in your automated vehicle, but if you don't travel becomes much more  
7 burdensome. So the negative effects of this congestion are falling almost entirely  
8 on households without automated vehicles, and that's where these decreases in  
9 mobility are coming from. Which leads to a kind of an interesting tragedy of a  
10 common solution, where if you can afford one it always makes sense to buy a  
11 CAV, an automated vehicle, but the negative societal impact of that are going  
12 mostly by the households who don't buy one. So next slide.

13           And so, yes, that's my presentation. I just want to show that this is  
14 all open source. We welcome new -- new users, new collaborators, and feel free  
15 to reach out by email. Yes.

16           COMMISSIONER MONAHAN: Great. Thanks, Dr. Needell. That  
17 was really interesting and some counterintuitive. I'm wondering if you can  
18 elaborate a bit on the equity question? I mean that's really important for us in  
19 California as we think through what are the right policies to make sure that we  
20 create a system that's equitable -- or at least try to create a system that's  
21 equitable, to foster that in all of our investments and strategies.

22           Does your modeling provide any insights into the policies that we  
23 would need to make sure that we are creating an equitable transportation system?

24           I mean this idea that rich people buy CAVs and that's going then  
25 create more of a burden for people who don't have CAVs, who can't afford them,

1 what does that mean in terms of policy for California?

2 DR. NEEDELL: Yeah. I mean I think that's a really interesting and  
3 really important question. And I don't necessarily want to over promise what this  
4 kind of modeling can do on its own.

5 So, you know, with a model like BEAM, you know because we're  
6 representing individual agents, it's easy to just like divide agents into categories  
7 and look at, you know, the grade of effects on different categories of agents, but  
8 when we're talking about, you know, policy responses, it -- you know, it all of a  
9 sudden becomes, I think, really nuanced, because you have a feedback effect in  
10 terms of, you know, what groups of people respond to the policies in which ways.  
11 And so there's kind of this sort of in dodging a problem.

12 So I guess my takeaway from that is I think modeling like BEAM can  
13 be really useful in as part of an integrated way of thinking about the impact of  
14 policies, but it's not a solution on its own. And I think it needed to come with a lot  
15 of, you know, further thinking and research into the behavioral responses to those  
16 policies at kind of short time scales and in terms of longer-term time scale  
17 decisions like, okay, does this household buy a CAV or, you know, which  
18 households in particular are more likely to buy more.

19 MR. DE ALBA: Commissioner, you're muted.

20 COMMISSIONER MONAHAN: Sorry about that. We're going to try  
21 to get back on time track. But if Commissioner McAllister or Dan has a burning  
22 question, you're welcome to ask it of Zach. We'd like to turn it over to the next  
23 panel at 10:40, which is two minutes away.

24 COMMISSIONER MCALLISTER: I'm good. I really liked the  
25 presentation. I really agree with equity concerns. I mean just today there was an

1 article in the New York *Times* I believe about, you know, how homeownership is  
2 driving -- you know the desire for homeownership is driving movements and with  
3 kind of an ethnic kind of overlay, what the article was about was just different, you  
4 know, different folks moving to different places. And access to transportation is  
5 kind of just be really an important overlay there.

6 So Commissioner Monahan's question about the equity implications,  
7 I think there's a lot of nodes there, so I agree that modeling can help us. If we  
8 could be integral about how we talk about demographics within that, how we  
9 include demographics in that so we make sure to see those trends and appreciate  
10 them along the way, that's going to be important.

11 PROF. SPERLING: Yeah. And I would note that one of the key  
12 premises of that hell scenario was exactly what Zach laid out in terms of the equity  
13 impacts. So we have been aware that's a likely implication for a while.

14 But I do have one -- one question. It's a hard question, so Zach will  
15 probably just -- I think it's probably just better to give a short answer and then we  
16 can -- others can pursue it. And that is, you know, this agent-based modeling is  
17 great stuff and it's, you know, very important research. But at the end of the day  
18 what we're trying to really get at is when do people buy cars and when are people  
19 willing to share. And the question is what are the set of rules that are being  
20 developed to explain how people make those choices. And it has to go beyond  
21 cost and time, into what are called the hedonic costs, the nonmonetary costs.  
22 And I'd be interested in just a short take-on response, because we need to figure  
23 this out.

24 It's like what I said at the beginning, how do we get people to share.  
25 So we need to understand how do we get people to give up cars and how do we

1 get people to share. And we need to understand that before we can conduct  
2 policy. Any quick thoughts, Zach?

3 DR. NEEDELL: Oh, yeah. I mean, yeah, absolutely agree that I  
4 think that's crucial. In a lot of this work we were kind of treating, you know, a lot of  
5 those questions as, you know, exogenous scenario parts, which I -- which I agree  
6 is like not fully satisfying because those are things we're trying to influence. And  
7 so, yeah, I mean we kind of -- that is in our long-term plan for where we want this  
8 model to go to better integrate the kind of day-to-day decision we're talking about  
9 with longer-term decisions of, yeah, like am I person who takes ride-hail or not,  
10 you know, and I personally like shared mobility or not.

11 And so, yeah, I mean I think that, you know, any kind of detailed  
12 modeling work that happens needs to come from a place of, you know, deference  
13 to the fact that a lot -- it is really difficult to capture all of these factors within the  
14 modeling framework itself.

15 PROF. SPERLING: Keep at it.

16 COMMISSIONER MONAHAN: Great. Thanks. Thanks, Zach.  
17 We really appreciate the insights you have given us.

18 And now it's time to turn on to, to move to our panel discussion.

19 Heather, do you want to kick this off for us?

20 MS. RAITT: Sure. I think -- Commissioner, I also just -- before we  
21 get into it, I just wanted to let folks know that we have a couple of presentations  
22 that are still working their way to getting posted on the web, so you can look for  
23 that, and just know we're working on it.

24 So thanks, everybody. And now we will move on to our panel  
25 discussion on Automated and Intelligent Transportation Systems. And it is

1 moderated by Ben De Alba, from the Energy Commission, who is a policy advisor  
2 to Commissioner Monahan.

3 So go ahead, Ben. Thank you.

4 MR. DE ALBA: Thank you for that, Heather.

5 \* Good morning, everybody. As Heather said, my name is Ben De  
6 Alba. I'm an advisor to Commissioner Monahan. I'm very excited to moderate  
7 today's Panel Discussion on Automated and Intelligent Transportation, one of the  
8 components of the Three Revolutions.

9 We have an esteemed panel representing a diverse set of  
10 perspectives on this topic. Each panelist will have eight minutes to provide an  
11 opening presentation. Then I will invite Commissioner Monahan and others on  
12 the virtual dais to ask any questions they may have of the panel before we  
13 transition to a moderated discussion.

14 Before we get started, though, I wanted to add some context to  
15 today's conversation. There is no question that the time for mobility technology  
16 has arrived in California. The California Department of Motor Vehicles  
17 established California's first autonomous vehicle testing program in 2014.

18 Today, just six years later, there are over 70 entities that hold a  
19 permit to test autonomous technology on California roads. And some sectors  
20 have already adopted automation. Terminal operators at the Ports of Los  
21 Angeles and Long Beach are utilizing driverless vehicles to move cargo containers  
22 on and off ocean vessels. Major auto manufacturers now offer semiautonomous  
23 systems in their passenger vehicles, such as Tesla's Auto Pilot and Cadillac Super  
24 Cruise. And platooning technology, a stepping stone to automation, has had  
25 some success in the trucking industry. Automated and intelligent will have a

1 profound impact on how we move both goods and people.

2           What we don't know is how automation will impact other aspects of  
3 the transportation system. Will the technology improve equitable access to  
4 mobility or be a luxury for those who can afford it? Will autonomous vehicles  
5 contribute to congestion or reduce it? And can we expect this technology to  
6 enhance the interaction between zero-emission vehicles and grid? There are  
7 many questions that remain unanswered, as we heard earlier this morning. So if  
8 California is to avoid a negative response to those questions, then we need to  
9 listen to all impacted by the technology, including those on our panel today, to  
10 develop a sensible policy framework for autonomous vehicles.

11           With that, I want to welcome our first speaker, Hana Creger. She is  
12 the Environmental Equitable Program Manager at Greenlining Institute. She  
13 works on the deployment and implementation of policies leading to clean  
14 transportation and mobility investments that will benefit low-income communities of  
15 color. She was the lead author of "Autonomous Vehicle, Heaven" and Hell -- or,  
16 excuse me -- "Heaven or Hell, Creating a Transportation Revolution that Benefits  
17 All, a Report Outlining Policy Recommendations to Ensure Mobility, Health, and  
18 Economic Benefit to Marginalized Communities."

19           Welcome, Hana.

20           MS. CREGER: Hi, everyone. Thanks so much for having me here  
21 today.

22           For those of you who are not familiar, Greenlining is a research and  
23 public policy nonprofit and we have been advocating for racial equity for 27 years.

24           Now I always like to begin with a brief summary of country's explicit  
25 racist public policies so that we can better understand the equity impact in the AV

1 and mobility space. And then I will discuss how to center equity in the planning,  
2 decision-making, and development and implement of AVs. Next slide, please.

3 So redlining was one of many racist policies and was the  
4 institutionalized and systematic practice of government working with Realtors and  
5 banks to draw these red lines around communities of color, segregate them into  
6 undesirable areas, and deny them loans to buy homes or open businesses, out of  
7 the racist perception that it was too risky to lend money to people of color.

8 And so for decades while white Americans were amassing  
9 intergenerational wealth to buy homes, start businesses, and fund their children's  
10 education, people of color were effectively locked out of those same opportunities.  
11 Next slide, please.

12 And the result is a racial wealth gap that looks like this today. For  
13 every dollar that a white family has, an Asian family has 68 cents, a Latino family  
14 has 10 cents, and a Black family only has 8 cents. And, unfortunately, these  
15 numbers are outdated. The wealth gap is only getting wider. And so we have to  
16 keep this in mind as AVs and new mobility technology rolls out. We have to be  
17 super conscious about the very real job loss impacts of AVs and how it could  
18 exacerbate the widening racial wealth gap. Next slide.

19 And today low-income folks and people of color suffer from higher  
20 rates of pedestrian fatalities, largely because their communities are less likely to  
21 have a sidewalk and lighting. And so it's important to think about AVs and safety  
22 in this context. We have to be tracking AV collisions based on location because,  
23 you know, they're much more likely to occur in low-income communities of color  
24 where there is less safe infrastructure. Next slide, please.

25 I wanted to share that context because that is the context that AVs

1 have hit our streets, where the playing field just clearly is not level. And if we're  
2 not careful, just like Uber and Lyft, AVs may actually exacerbate existing  
3 disparities if we allow them to perpetuate automobile dependency and compete  
4 with transit, if we don't ensure that all people have equal access and if we fail to  
5 safeguard with driving jobs from companies who would put profits above people.

6           And so instead of just revolutionizing vehicles, the real opportunity  
7 here is to revolutionize the transportation system that they're operating, because  
8 I'll admit there are some incredibly exciting equity opportunities around AV, such  
9 as the potential improved mobility, reduction in vehicle collisions, and lower  
10 transportation costs. And all of this would particularly benefit marginalized  
11 people. But to get there, we first need to center equity and community  
12 engagement in how we research and plan for any new mobility technology. Next  
13 slide.

14           And just to be clear, I mean equity goes way beyond just access.  
15 Equity is really about transforming the behavior, the institutions, and the systems  
16 that disproportionately harm oppressed groups of people. Equity is also about  
17 increasing access to power. It's about redistributing resources, eliminating  
18 barriers to opportunity, and empowering marginalized communities to survive and  
19 reach their full potential.

20           And in the context of transportation, equity really is reimagining the  
21 way we've been doing transportation planning and decision-making, which largely  
22 has been centered around white supremacy, racism, and capitalism. Low-income  
23 folks of color have systematically been shut out of the transportation planning and  
24 decision-making process, while the private sector and wealthy, white able-bodied  
25 people often do have that direct access, both as decisionmakers themselves and



1 in the public-engagement process.

2           And so we can't expect that by simply introducing a new  
3 transportation technology we'll somehow create equitable outcomes when  
4 marginalized people continue to be barred from participating in shaping what that  
5 world even looks like. Next slide.

6           And so now I want to share Greenlining's solution to this, which is  
7 our Mobility Equity Framework, a tool that determines which mobility options most  
8 equitably meet the needs of a community. And this framework has been adopted  
9 in San Francisco and the Seattle region.

10           So there's three steps. The first: Conducting a community mobility  
11 needs assessment. Second, running an equity analysis to compare the various  
12 mobility options. And, third, placing that final decision-making power in the hands  
13 of the community to determine which mobility options to deploy. And so this  
14 process is how we should be making plans and decisions around AVs and all  
15 other mobility options, because equity is not about first developing a technology  
16 without any community input and then, you know, going back, trying to mold it into  
17 something that might meet a community's needs. I mean equity is about  
18 marginalized communities having the appropriate -- or deciding on the appropriate  
19 solutions that meet their mobility needs because, in reality, they are the experts in  
20 their communities, not the mobility companies, not researchers, and not their  
21 government. And so, you know, through a process like this framework, maybe  
22 the community says all they really needed was safe sidewalks or better bus  
23 service, or maybe the community is indeed interested in AVs, and in that case the  
24 community can help determine if that should come in the form of AV micro transit  
25 or ride-hail.

1                   However, even if a community does select AVs as their desired  
2 mobility option, that's still not enough. We still need equitable guidelines and  
3 accountability for how that AV service is developed and deployed. Next slide.  
4 Next slide, please. Thank you.

5                   And good news. We developed a tool for that. So this is our four-  
6 step roadmap for turning equity commitments into an equity practice. So as in  
7 any mobility pilot, policy, or funding stream, equity must be embedded throughout  
8 the goal, vision, and values, the process by which it's developed, the outcomes,  
9 and the measurements and analysis. There are very detailed subsets within each  
10 and the complete toolkit is on our website under the same name. Next slide.

11                   The last resource I will mention is Greenlining's "Report on Equitable  
12 Policy Recommendations for AVs." And it covers every topic from transportation  
13 to climate to jobs, and it's all on our website. Next slide.

14                   But what I really hope that I convey today is that, you know, trying to  
15 retroactively mold AVs to be more equitable should not be the guiding force in  
16 these conversations, because even if we do develop the most equitable, the most  
17 accessible AV service, at the end of the day we'll still have unsafe streets, a  
18 broken car-dependent transportation system that's reinforced by inequitable  
19 planning, policy, and decision-making structures.

20                   And so we can't keep trying to just fix all of our transportation issues  
21 with more and more technology. And instead we have to proactively build equity  
22 in throughout our transportation system as a whole, not just through any one piece  
23 of technology. And we have to do this by first fostering transportation planning  
24 and decision-making processes that are centered around the needs and voices of  
25 our most marginalized populations and then appointing the appropriate mobility

1 solutions.

2 Thank you so much, and I'm looking forward to the rest of the  
3 conversation.

4 MR. DE ALBA: Thank you so much.

5 Our next speaker is Nadia Anderson. Nadia is a member of  
6 Cruise's Government Affairs Team where she focuses on legislative, regulatory,  
7 and policy priorities in San Francisco and California. Prior to joining Cruise, she  
8 led Uber's Global Public Policy work on road and traffic safety, and has spent the  
9 majority of her career working on policy issues related to technology and mobility  
10 and equity. Nadia holds a Doctorate in Urban Affairs and Public Policy from the  
11 University of Delaware.

12 Welcome, Nadia.

13 Nadia, we can't hear you.

14 DR. ANDERSON: Sorry about that. I think we're good now?

15 MR. DE ALBA: You're good. All right, take it away.

16 DR. ANDERSON: That's great. Sorry about that. Thank you,  
17 Ben.

18 Also I want to say thank you to Commissioner Monahan, McAllister,  
19 and Dr. Sperling for the opportunity to be here today.

20 As the slide says, my name is Nadia Anderson. And I'm here today  
21 to share Cruise's approach to shared automated and electric transportation. Next  
22 slide, please.

23 So a little bit about Cruise. We are a relatively new entrant to the  
24 transportation space. We were founded in 2013 and we're working to safely  
25 introduce a fully electric, self-driving car service into the transportation system.

1 From our view, we are uniquely suited to contribute to this conversation, because  
2 we are the embodiment of the Three Revolutions. We are fully electric. We  
3 have been this way since the beginning and have no plan for shifting course.  
4 We're automated. We're working to solve one of the toughest challenges out  
5 there when it comes to transportation with the self-driving technology. And the  
6 last piece is that we are shared. We have a future vision for efficient travel and  
7 encouraging more passenger mile travel and providing people and things with  
8 viable options for getting around. Next slide, please.

9 I wanted to share is our reason for being here and our ongoing  
10 engagement with a number of stakeholders, who are also working within this  
11 space. We have an innovative business model, one that aligns the statewide  
12 goals for transportation electrification and overlaps with a number of areas where  
13 the Energy Commission is also working and committing resources.

14 Now what's different and worth noting about us is that our model and  
15 our presence of scale, is that first we intend to directly provide the public with an  
16 option for travel via green miles. That is not personal car ownership and more in  
17 line with the traditional sense of ridesharing.

18 The second is the fact that we are fully electric. And for us this  
19 means building, owning, and operating the electric vehicle station that are vitally  
20 needed to support our vehicles. Next slide.

21 Now the Commission and many others are actively working on  
22 programs related to the transportation fuel sector, specifically targeting their  
23 shared potential to reduce greenhouse gas emissions and promoting economic  
24 development. Now at Cruise, we believe meeting these goals would be  
25 intentional and thinking outside of the box when it comes to policies and programs.

1 And in keeping on this slide, not only reflects our approach but our thoughts on  
2 how we can move along the path toward meeting statewide goals, specifically as it  
3 relates to transportation and electrification.

4 The first piece is supporting electrification by getting more EVs out  
5 on the road. Now we're continuing to see that consumer education and exposure  
6 are key to increasing adoption and in overcoming some of the traditional barriers.  
7 There is a growing body of research that supports this, and that people are more  
8 interested and state an increased likelihood that they'll purchase an EV once  
9 they've been exposed to one.

10 The second is addressing how we think about travel to include the  
11 promotion of EV miles. We know that everybody's situation is not the same and  
12 that people have unique travel needs. So when we talk about zero emissions in  
13 the transportation sector, we need to also consider the ways to make EV travel  
14 more widely available, regardless of whether you're able to purchase an EV, install  
15 or readily access an EV charging station at your home or at your place of work.

16 And when we talk about travel, we also immediately go to vehicle  
17 miles traveled. However, we should also consider in ways what's lesser known in  
18 circles which is passenger miles traveled, or PMT, and what a shift in focus can  
19 mean for our statewide goals. We should expand this conversation to include  
20 what an increase in greener miles traveled can do for travel and mobility, and also  
21 recognizing that there are models out there, including ours, that are incentivized to  
22 not only be efficient in our operations, meaning reducing MVPMT while also  
23 increasing PMT.

24 Now along these lines, innovative models that align with the Three  
25 Revolutions also have the potential to address what I'm going to call the backend

1 of transportation electrification, something that is also of interest to the  
2 Commission and other organizations, which is grid integration, energy storage,  
3 and demand-charge management.

4           Now at Cruise we own and operate, which opens up a world of  
5 possibilities when it comes to how and when we interact with the grid. For  
6 example, we currently participate in CARB's Low Carbon Fuel Standard Programs  
7 and are powering our cars on a hundred percent renewable energy. This is  
8 something that we are able to do not only because of how the program was  
9 designed but also based on our business model, the fact that we own and operate  
10 our own stations. In the future, this interaction could reflect the goals and support  
11 many programs and initiatives being run by other organizations by CARB and the  
12 CAISO regarding transportation emission reduction and align with the needs of the  
13 electrical grid at large, so there's tons of opportunity here. And if we're able to  
14 continue to expand our thinking and change the way that we can leverage the  
15 benefits of all these supportive models can have not only on our electrification  
16 goals but also on our energy and environmental goals as well. Next slide, please.

17           Now I want to close with Cruise's future vision by sharing a proof  
18 point of our commitment to not only operating differently within this space but also  
19 our alignment with the Three Revolutions. And this slide is an image of the  
20 Cruise Origin. It was announced in late 2019 and it's also a fully-electric,  
21 purpose-built vehicle designed specifically for a new type of travel experience.

22           One of the goals of the Origin was to help shift how people think  
23 about transportation and to provide a new experience for people looking to move  
24 around our communities and our cities. For us this is more than a prototype,  
25 meaning that the vehicle is production ready. And while it's not on the road today,

1 we are ready to pull the trigger when the time is right.

2 Now in closing I'd be remiss if I didn't acknowledge that moving  
3 towards Three Revolutions means taking a number of things into consideration  
4 and the fact that autonomous vehicles and electric vehicles alone are not a silver  
5 bullet for all the challenges that we're facing in our transportation system. We  
6 need to make sure we keep the person in the loop and recognize that there isn't a  
7 one-size-fits-all solution to mobility.

8 We also need to make sure that people are able to use the options  
9 and meet their specific needs, and doing many of the things that Hana mentioned  
10 regarding equity and making sure that people in communities are at the table  
11 when these decisions are being made. All these things we need to do to be  
12 abundantly sure that we are building and thinking of ways to avoid those missteps  
13 of the past that were also mentioned in the previous presentation.

14 Now at Cruise we believe that we can get there by designing and  
15 implementing policies and programs that are flexible, introspective, and able to  
16 adapt to new and emerging models that were not around when these programs  
17 were first promulgated. All of these things are top of mind for us as a company.  
18 We plan to do our part and, again, believe that we have a unique role to play in  
19 helping the State meet its goals and doing something that is truly new and  
20 innovative when it comes to the transportation sector at large.

21 And with that, I will conclude my remarks and thank you all again for  
22 the opportunity to be here today. And I also look forward to the Q and A  
23 questions.

24 MR. DE ALBA: Thank you, Nadia.

25 Our next panelist is Mike Roeth. Mike has worked in the

1 commercial vehicle industry for over 35 years. He is the Executive Director of the  
2 North American Council for Freight Efficiency and is the Trucking Lead for the  
3 Rocky Mountain Institute. His recent work has included "Guidance on Electric  
4 and Hydrogen Electric Trucks and Opportunities Along the Evolution of  
5 Automation and Connectivity." Mike earned a Master's Degree in Organizational  
6 Leadership from the Indiana Institution -- or, excuse me -- the Indiana Institute of  
7 Technology.

8 Thanks for joining us, Mike.

9 MR. ROETH: Hello, everybody. And, Ben, thank you. It's an  
10 honor to be with you today.

11 And we're going to move from, you know, cars and some of the  
12 personal mobility up to big trucks. And so we at NACFE, we're the North  
13 American Council for Freight Efficiency, as Ben mentioned -- and you can go  
14 forward, Ben -- and we work in this space as truly an unbiased nonprofit. So  
15 we're helping the industry to use less fuel, move to more sustainable energy as we  
16 increase the sustainability of moving goods around the country and really across  
17 all of North America.

18 If you're interested in some of the work, everything on our website is  
19 free with no membership, so have a look if you'd like. Today -- go ahead, next  
20 slide.

21 Today I'm going to ask us to look at platooning and how automation  
22 is affecting movement of goods by tractor-trailers. And I'd like to start with the fact  
23 that these trucks are bought and utilized as tools. They're meant to help move  
24 goods and do it as cost-effective and with of course safety and logistics and timing  
25 to get the job done and to get all the goods that we want and need to the places



1 where we can use them, whether it's to our homes or offices, et cetera.

2           An interesting thing to look at is the cost per mile for these big trucks.  
3 And so here we look back at when fuel was pretty expensive, and it was up to 65  
4 cent a mile across the country to run one of these tractor-trailers. And at that  
5 point the cost of fuel was higher than the cost of the driver. You know, that's the  
6 labor and the benefits for that driver. And just easy math, most of these trucks  
7 operate at about 100,000 miles a year either within a state or across state lines.  
8 And so these dollars add up significantly.

9           Fuel prices are lower today and driver costs are up a little bit there, if  
10 you look at 2018. But the driver and the fuel make up two-thirds of the cost of  
11 operating that truck. And so if we can get those costs down and continue to work  
12 that, as well as work on the sustainability piece of this whole equation, then, you  
13 know, costs come down and it's better for everyone in moving these goods  
14 around. Next.

15           So let's specifically look at platooning. So the idea with platooning,  
16 we've studied an issue of a pretty sizable report as it was emerging in 2016, and  
17 we're updating this work as we speak now. But in this case it is along, you know,  
18 the evolution that we see could happen with different levels of automation. In this  
19 particular situation, both trucks have truck drivers, but they are linked in the  
20 acceleration and deceleration with the computer and the safety technologies.

21           So as we looked at this, and I'll get in a minute of some of our  
22 findings with our work in platooning, but we saw this stick, you know, from just  
23 early automated technologies in that sort of matrix at the bottom there, where the  
24 truck is being -- the truck driver is being aided in how they're driving the truck with  
25 things like automatic braking and lane-keeping technologies and warnings, as well

1 as even other things like automated manual shifting and so forth, all the way to  
2 what will ultimately be fully autonomous. Next.

3 And so as we looking at platooning, the key technology to enable this  
4 is the safety equipment. And what we have seen is a pretty dramatic increase in  
5 the adoption of automatic braking, lane keeping, predictive cruise control, adaptive  
6 cruise control. Those features, typically procured by fleets as safety, which then  
7 become the enabling technologies to allow this close following distance that we  
8 see in the maturity of platooning.

9 And so, you know, we do a study every year looking at adoption of  
10 85 technologies that are efficiency. And so this platooning case of all these safety  
11 technologies are now o about two-thirds of the new trucks bought by this fleet and  
12 really by the industry. So basically the technology is there to do platooning.  
13 Next.

14 But it's a pretty challenging piece, so our conclusions in this work is  
15 there is -- and that's a picture I took of two platooning trucks. And that's at about  
16 a 50-foot following distance, which is a pretty good sweet spot right now for the  
17 early implementation of platooning. It's -- you know, trucks can be safely  
18 connected much closer, but it's a level that is a good start.

19 At that gap and with some assumptions around the percent of miles  
20 you could platoon and the effect of congestion and other traveling cars and trucks  
21 on the road, if you average the fuel savings of the two trucks, it really is a solid four  
22 percent savings. And, again, as I mentioned with the high fuel costs, that's a  
23 significant number and something that the fleets are very interested in.

24 I would say, though, that there are a good bit of challenges with this.  
25 One is a public participation and the accepts of two trucks being closely followed

1 together, maybe not knowing whether or not they are enabled with these  
2 technologies. Other issues are aware -- you know, will one fleet want to platoon  
3 with another fleet even though the technology is there to allow them to do that.  
4 And so those operational challenges, interfleet operations, some of those are  
5 issues that are in the works for taking advantage of this. Next.

6           And this falls in and has come up in kind of a final few comments for  
7 me. As I mentioned, this falls into probably an evolution around automating and  
8 assisting drivers and then ultimately finding particular places where, you know, an  
9 automated truck or a self-driving truck makes a lot of sense, both from the  
10 standpoint of safety and cost, and really driver attraction or attracting drivers to the  
11 industry, which is always challenging in truck driving.

12           So Steve Viscelli is a fellow at the University of Pennsylvania and he  
13 has done some really interesting work that we have looked at and are studying  
14 ourselves along with interviewing industry players as well as fleets and  
15 manufacturers and others around many alternatives to this. So it's possible that  
16 we have exit-to-exit automation where that automated truck never does have to go  
17 through traffic lights and stopsigns and deal with city traffic. The possibility of  
18 drone operation, this -- and other autonomous opportunities where maybe the  
19 driver, you know, may not be needed in these trucks.

20           And you think about private yards where there is a lot of confusion  
21 and work just moving trailers around, putting in the docks, parking them out away  
22 from the facility, and so forth, some of those can be done with automation much  
23 more safely and at lower costs. So the future could include many if not all of  
24 these different alternatives, and it has the electric truck and alternative fuels  
25 aspect to it where potentially, you know, some of the more urban trucks are

1 electrified with a range and the air quality are more important and the longer range  
2 might have -- continue to use diesel for those long hauls where fuel cell and  
3 electric trucks will be challenging.

4           Finally, I offer on the last slide sort of a thought with respect to these  
5 costs of operation and this evolution or these different phases. And really we've  
6 added one in there in those white tractor-trailers where we are discussing an auto  
7 follower idea where there is a truck driver in the lead tractor-trailer, but the  
8 following one could be either what some call a powered trailer or a device that just  
9 basically, you know, follows that truck-driven one to gain some of the benefits.

10           And, lastly, you know as we look at the opportunity with self-driving,  
11 that truck can become a 24/7 operation truck, no longer limited by how many  
12 hours of service the truck driver can have. And at that point, you know, we really  
13 don't need a cap, we don't need a lot of the cost and a lot of the energy  
14 consumption that's needed to have a driver in the cap hoteling and sleeping at  
15 night, and on and on.

16           So with that, I appreciate being a part of this. At NACFE.org you  
17 can reach us, to me as well. Thanks for your time.

18           MR. DE ALBA: Thank you, Mike.

19           Next we have Mollie Cohen D'Agostino. She is the Policy Director  
20 for the Three Revolutions Future Mobility Program at the Institute of Transportation  
21 Studies at U.C. Davis. Mollie's work spans several sectors and includes  
22 environmental policy, community development, and transportation planning. She  
23 worked with the California League of Conservation Voters, the City of Oakland's  
24 Department of Housing and Community Development, and with the Alameda  
25 County Transportation Commission. She carries a Master's in Public Policy from

1 U.C. Berkeley. And we'll give Mollie a moment here to join us.

2 There you go. Welcome, Mollie.

3 Mollie, we can't hear you.

4 MS. COHEN D'AGOSTINO: I'm sorry. Thank you. Thank you so  
5 much for having me.

6 MR. DE ALBA: You're welcome.

7 MS. COHEN D'AGOSTINO: Okay, then. And I'll get started. So  
8 my name is Mollie Cohen D'Agostino. I'm the Policy Director for the Three  
9 Revolutions Future Mobility Program. Followed by my colleague Giovanni, so I  
10 won't go into too much detail in this first slide, but please turn to the next slide  
11 please.

12 But we know the type of three types of transportation -- and change  
13 are coming to transportation. And it can go in many different sections. We get to  
14 see that this curve that we see on this chart, we see it flattened. So we can  
15 flatten the curve with Three Revolutions through the reduction in greenhouse gas  
16 emissions that we know can happen, but that will require both the electrification  
17 revolution and a pooling revolution, a shared mobility revolution.

18 And I will just mention that in addition to these greenhouse gas  
19 emission scenarios we also have a situation where -- one of my colleagues, we  
20 briefly conducted a modeling exercise, Sterling Royer (phonetic), it was an ABM,  
21 as that describes. So I'm glad to have that fantastic reference. So this comes  
22 within contact. But her and her co-authors showed that in an automated taxi fleet  
23 only, in San Francisco, there was a significant decline in transit usage, a 50-  
24 percent decline in transit. So it goes to this order of catastrophic gas emission  
25 effect on an automated-only future, we also would see a reduction in transit and an

1 up to 18-percent increase in an amount of congestion. So certainly significant  
2 problems could be ahead if we don't make choices now.

3 So this slide will discuss what other states are doing. And so recent  
4 research done by my colleague Kelly Fleming (phonetic) showed that most states  
5 have one task preliminary policies. And we used the National Conference of  
6 State Legislatures' database to identify which policies have -- what other states  
7 have done in the way of automation policy. And it's very interesting to see what  
8 has been done, but California is the only state that addresses AVs and issues.  
9 And they -- it's sort of a small portion of SB 1014 and it includes automated  
10 vehicles for fleets, when being in trip fleet operation.

11 So we do have that policy underway, but it's an emerging policy gap,  
12 so potentially privately-owned AVs which we think could be somewhat alarming.  
13 This was mentioned by panelists and of course Giovanni, but I will just reiterate  
14 that partial automation is already showing increases in VMT. And we certainly  
15 have much work to go to create the right policy levers to change that direction.  
16 So in the next slide we'll talk about some of those policy levers.

17 So to add, you know it's hard to know which is in focus. So for --  
18 and so I'm just focusing really quickly. So I think for the CEC, for this audience, I  
19 think any vehicle electrification is the most important to underscore. And I think  
20 that we need to figure out how to support the Clean Mile Standards that CARB is  
21 leading. And the way that we can do that is by working to meet their SB 2127  
22 goals, addressing barriers for ADL electrification and charging will tend to go now,  
23 because if we begin with addressing the needs of charging for a distance fleet,  
24 especially a provider fleet, that may be an easy transition towards AVs operating in  
25 a fleet.

1                   So we think that there is a lot of opportunities there. And it's worth  
2 mentioning that the work will have -- and of course the next panel is going to  
3 speak on Intelligent Transportation, so I think what I'd like to underscore here is  
4 that the effort -- everything here, from the next panel, will relate to this effort,  
5 because the -- actually looking at the electrification effort in California applies to  
6 automated vehicles as well. So I think we need to remember that.

7                   But turning to pricing, and of course I could talk for a full eight  
8 minutes on pricing, so I won't. But I think it's important to underscore that there's  
9 many different pricing tables. And so for the CEC, I think that pricing for free  
10 access to a charging is one of the important metrics and an important opportunity.  
11 And of course there are some others. There is opportunity to reform prior  
12 legislation. But to encourage more charging hubs and more investments in  
13 charging, we need to figure out how to encourage adoption of charging for fleet.

14                   So turning quickly to data sharing, again this is a big topic so just  
15 underscore this as something that the CPUC is really leading in their AV pilot  
16 reform efforts. They have been working on trying to crack the nut on the data  
17 question, and I think the CEC should play a role in that to ensure that charging  
18 data is often in the mix.

19                   Turning to pooling, I will actually ask you to change to the next slide,  
20 to talk more about pooling because pooling is certainly last here but it is not least.  
21 There is a lot going on and a lot of questions that remain about pooling. And one  
22 of the questions posed to this panel was will pooling return or will single-occupant  
23 travel dominate after the pandemic.

24                   And I think in order to even have this conversation I think it's really  
25 important to get clear on some definition. So for research being done by Kensani

1 (phonetic), focus on how we need to get -- understand better as risks as a nation.  
2 So we can understand a fleet or AV as being secure from accidental harm, and  
3 security being safe from intentional harm.

4 And so what we do is we create these personal risk constellations  
5 we can imagine, which are groupings of safety and security risks that can be  
6 weighed against benefits to determine behavior. And so these vary by age,  
7 gender, et cetera. They are probably much more difficult than our current models  
8 can really model. To really determine behavior, we'll have to get a better sense of  
9 how to mitigate these risks.

10 So turning to the next slide, I think the goal of the state here, the role  
11 of policy is to turn this into how we can mitigate risk for leading into a pandemic.  
12 And of course risks for traveling with others, with other strangers are high right  
13 now. And so we certainly want to think through what policy solutions that could  
14 help to mitigate those risks. Is it masks. Is masks alone enough. I'm not  
15 answering that question, but I certainly think it's one that we have to ask. Or are  
16 there other solutions.

17 Indeed, there are new types of risks, new security and safety risks.  
18 And it's up to policymakers to try to identify how they can mitigate those risks. Of  
19 course electrification does reduce the broader externalities that we're describing  
20 with electric vehicles. So we certainly want to think about how we can reduce  
21 risks there.

22 And, you know, when we think about the Three Revolutions we can  
23 think about different risks and with constellations that will evolve as safety and  
24 security evolve in this state. And I think what -- doing what we have to, and of  
25 course we really follow the work that's the great work that Greenlining is doing on



1 this. We really need to think about how we can endeavor to address all risk and  
2 ensure that there is an equity of risk, so we're not encouraging or requiring risks to  
3 be endured by certain sectors of the economy.

4 So I think with that I will close, and my next slide is -- says thank you,  
5 so you can turn to that slide. So thank you so much for having me. And I do  
6 look forward to going into more detail in the next session, so.

7 MR. DE ALBA: Thank you so much, Mollie.

8 Our next speaker is Maya Ben Dror. She has over a decade of  
9 global work experience in public, private, and third sector settings focused on  
10 clean tech and sustainable transportation. Maya co-leads the World Economic  
11 Forum Global New Mobility Coalition to advance a succinct approach to shared,  
12 electric, and automated mobility for maximizing sustainability of urban transport  
13 systems. She also co-leads the forum AV Policy Framework for -- in Partnership  
14 with Israel Center for the Fourth Industrial Revolution. Maya holds a Ph.D. in  
15 Dynamic Transportation Policy and Technology Transition from Israel Institute of  
16 Technology, among several other degrees.

17 Maya, you're welcome to turn your video on and provide your  
18 presentation. Thank you.

19 DR. BEN DROR: So hi, everyone. Thank you so much,  
20 Commissioner Monahan and distinguished guests and the panelists, in particular  
21 Ben. It's a pleasure to speak to you today.

22 I did present to the World Economic Forum but also the group that  
23 Ben has just described, the Global New Mobility Coalition that was launched last  
24 year at the Sustainable Development Impact Summit. That's a group of 100 --  
25 over 150 organizations and individuals. Fifty percent are from for profit and 50

1 percent are from nonprofit, but representing organizations from across the globe,  
2 from Asia to Europe and from North America. Go onto the next slide.

3 This group has come together around a single task, which is to  
4 address climate change, and other benefits that can emerge as we address  
5 climate change. The challenge and opportunity at stake is that we probably will  
6 not be able to achieve decarbonization and mobility systems on time if we rely only  
7 on electrification. And, therefore, we are tapping into research paid by Dan  
8 Sterling at U.C. Davis and others, that by making sure about mobility, we might be  
9 able to achieve that.

10 The numbers that have just been noted by Mollie and by Giovanni  
11 earlier on, I would comment that this slide is actually a dynamic slide, so I will  
12 describe you could have seen it prior in a PDF format. And that from a global  
13 perspective, if we were to adopt electrification and automation, that around 2040  
14 we would be able to see how passenger miles traveled and a decrease in well-to-  
15 wheel carbon emissions even in developing countries such as China. But if we  
16 were to adopt as Three Revolutions, so if we were to add that shared mobility,  
17 shared rides into the mix, we cannot only achieve that decarbonization earlier, the  
18 reduction would be much more significant, threefold from business as usual. And  
19 we would also see a slight reduction even in developed countries in passenger  
20 miles traveled. Over to the next slide.

21 And I want to illuminate the points that were made before on safety.  
22 So of course safety first, and in order for us to achieve that safety and autonomy,  
23 the kind of vehicles do need to operate to those miles. And there are studies that  
24 are showing that shared automated vehicles, or SAVs, can actually deliver climate  
25 benefit and obviously cost reductions, even if they increase vehicle miles traveled

1 in the short term. And that's important to note, and there are a few references  
2 here to look at.

3           There are a lot of uncertainties in how we're going -- how people are  
4 going to change behavior. And obviously COVID-19 has presented opportunities,  
5 but it is important for leaders to note that mobility is a service or autonomous  
6 vehicles as a service is going to be key for us to enable that transition from single-  
7 occupancy ride and from high passenger-vehicle miles into a more sustainable  
8 commute set of choices, and as well as delivery choices. We have to recognize  
9 that autonomy happens on various modes and in various segments, long haul and  
10 shor  
11 t haul and urban mobility. And I want to note that LA for example, is now  
12 developing a framework for regulating its skies to enable drone deliveries together  
13 with the World Economic Forum. And we are also seeing companies like Japan  
14 stating that autonomy is going to be by mobility as a service to serve under  
15 populated areas that it is struggling to serve.

16           And over to the next -- over to the next slide. One very important  
17 point is that if we were to look at shared electric and autonomous mobility or what  
18 we look -- what we call SEAM, it is clearly that if we were to think of a best case for  
19 us to electrify first, that would probably be shared electric autonomous vehicles, or  
20 shared autonomous. So TNCs or pool rides that I understand are going to be  
21 articulated in the next session. These highest vehicles -- high-mileage vehicles  
22 are extremely important, and we should think about how we can tackle specific-  
23 use cases described by companies like Cruise to make sure that we are achieving  
24 the most out of our investments in the near future.

25           And it is through two dimensions that we might be able to do that.

1 So it is up to us, between public action and private action and hybrid action, so a  
2 lot of coordination and cooperation is needed. On this slide, on the bottom right-  
3 hand side you can see that some countries have already tackled that by  
4 establishing authorities that are combining few institutions and looking at various  
5 jurisdictions and already working closely with academia and the industry. And  
6 they think about long-term and autonomous policies and frameworks, moving  
7 beyond the safety elements of autonomous mobility, appearing for commercial  
8 utilization of autonomy.

9 And we also need to note that we should leverage these costs and  
10 safe instrumentation that we have either at the national level, at the regional level,  
11 and at the local and city level to be able to do that, and that it has to be context-  
12 oriented. And, therefore, a lot of insight into what constitutes a good investment  
13 in a specific city to enable the acceleration of shared autonomous vehicles that are  
14 electric is key. And there is obviously no silver bullet to adopt. It actually has to  
15 happen through these collaborative efforts. Over to the next slide, please.

16 So some of the world's design packages of policy instruments. And  
17 we've been looking at having those here. We've conducted a bit of a survey  
18 among our members to see how different regimes, different parts of the world  
19 might perceive policy instruments. And it's not surprising that actually a lot of the  
20 policy tools that are found to be impactful and conceivable are similar.

21 And a group now actually is doubling down on three specific policy  
22 areas. One is road pricing. The other one is looking at the carbon street level  
23 and how do you regulate access and provision pricing, preferential pricing to  
24 shared electric and autonomous vehicles. And the third one is looking at strategic  
25 charging and management areas in prime locations in cities to be able to serve

1 those vehicles that are operating around the clock. And where, as currently  
2 driven by humans, can't drive that much, autonomous vehicles can obviously  
3 operate at much greater efficiencies, but that heading and address that was stated  
4 earlier on, we have do have to make sure that the systems, the physical  
5 infrastructure is enabling a seamless operation that is trying to make the best out  
6 of the tools we have, the roads we have, and be more purpose-oriented to make  
7 sure that we're avoiding these unnecessary miles and maximizing the usage of  
8 each mode that we have on the ground. Over to the next slide, please.

9 COVID-19 obviously presents threats, and we've touched on the  
10 data and others have touched on that as well. I think a few points to make in  
11 relation to autonomous vehicles and the potential for shared, electric, and  
12 autonomous vehicles option, and first I would say 50. So all mobility movers are  
13 now considered vulnerable. And then because of that, we can now adopt a lot of  
14 psychological data, ICT and so on, to accelerate the transition to a smaller mobility  
15 system that would benefit autonomy and would benefit shared mobility systems as  
16 well.

17 And my time is up so I'm going to wrap up here. I don't have much  
18 more to add, but I'm looking forward to discussing with you and the panel.

19 MR. DE ALBA: Maya, thank you so much for your presentation.

20 That concludes all of our -- as the panelist presentation portion of our  
21 panel, I want to invite the dais, Commissioner Monahan and others, to ask any  
22 questions of the panelists at this time.

23 COMMISSIONER MONAHAN: Great. Thank you. Fascinating  
24 panel. And I have to say just as a woman in transportation, it's really nice to see  
25 all these women. Mike, you're like the lone guy. How often does that happen?

1 I don't know.

2 MR. ROETH: Never.

3 COMMISSIONER MONAHAN: No, never?

4 MR. ROETH: (Garbled audio.)

5 COMMISSIONER MONAHAN: Yeah, it is like where is my heart.

6 For a long time I would be the only woman. And then people would call me and  
7 say please join my panel, we need a woman. So this is wonderful.

8 And you all dealt with a lot of topics that are near and dear to my  
9 heart too, which is, you know, -- losing my headset. How do we move forward  
10 with a clean transportation system that benefits everyone. You know, I think what  
11 Mike will tell you about in terms of the opportunity for these technologies to reduce  
12 emissions from heavy-duty transportation, which I think has a lot of equity  
13 implications right there.

14 And, you know, as we think through how do we address the racism  
15 that is both historic and I would say remains pandemic in our society and creates  
16 the transportation system that we want to see, which benefits everyone and  
17 especially disadvantaged communities and communities that have trouble just  
18 accessing mobility generally.

19 So I had one question actually specific to Nadia and then a general  
20 question for the panel. But the question specific to Nadia is this was fascinating  
21 to hear that Cruise is thinking about owning the charging infrastructure, which I did  
22 not know. And that is pretty close to the model that we're seeing in China with PD  
23 which is right here in some companies where they're using their orange technology  
24 where they're going to have like their app tells drivers when to go charge. They  
25 go charge. They actually have like a food service. They have all these -- a lot of

1 their plans I think make it sort of a nice place to rest.

2 And I'm curious if you could share your thoughts about what that  
3 charging system would look like for Cruise.

4 DR. ANDERSON: Yeah, absolutely. It's a good question and I  
5 would say that it's still very evolving because we're only in the testing stage right  
6 now. So our charging system currently is that we have -- that we own the  
7 chargers and we operate them in order to support the vehicles that are out in  
8 testing on the road. They -- while getting charged, they're offered maintenance  
9 and doing all the facilities and checks that we have to go working on the vehicles  
10 as well before they go out.

11 I think in a model where we are scaled, there will be more sites  
12 around where we own and operate the stations in order to support the vehicles  
13 that we have out on the road. I think there's tons of opportunity there for us to  
14 explore ways that we can, you know, better integrate with the grid, that we can  
15 support the vehicles that we have out there, that we also can see if there are any  
16 other ways that we could align with some of the programs that both the  
17 Commission are thinking and others are operating.

18 COMMISSIONER MONAHAN: Great to hear. And at some point if  
19 we could follow up and do a tour, you know I'd love to see it firsthand. So when  
20 there is -- going to see.

21 DR. ANDERSON: Absolutely, we'd love to have you.

22 COMMISSIONER MONAHAN: So my question for the group is this  
23 question about equity. And you all have touched on it in different ways. I was  
24 curious, Maya, when you were talking about how you're looking at this as a big  
25 opportunity to advance equity and to advance mobility. And yet we've heard

1 some horror stories too around how these technologies would make it more  
2 difficult to create an equitable transportation system.

3           So I wonder if you all have -- you have given us some general  
4 guidance on equity, but if you have specific guidance for what we can do in the  
5 state of California, I guess in addition to what Hana pointed out in terms of making  
6 sure that we are integrating, you know, hearing what community needs are and  
7 responding to those needs so it's not -- it is definitely bubbled up from the  
8 community rather than being imposed on the community. But are there other  
9 ways we could think about using our policy lever to advance equitable  
10 transportation solutions?

11           DR. BEN DROR: I'm happy to chime in with a couple of examples.  
12 So we're seeing -- what I noticed in my data was the case of Japan where they  
13 have low populations and it's just under served. There are no mobility services in  
14 areas in Japan just because the public mobility system had been privatized in the  
15 seventies and there was just not enough to operate. And one of the things that  
16 they have done is we looked at what was served, how can these people be served  
17 best. And they thought about technology that would help to address some of the  
18 challenges as well.

19           So, for example, this street where people can just push a button and  
20 then a vehicle would know where they need to go. So, you know, these -- a lot of  
21 service, a lot of field work and a lot of testing and experimentation. And I think a  
22 few panelists here are familiar with how do you experience or letting more of the  
23 public's experience serve the solution.

24           But I would also note that obviously we all agree, right, that  
25 automation on its own would probably not be beneficial for equity and we do need



1 to make sure that when automation hits the ground it be commercialized, this  
2 actually is capable of serving as many at a low cost. And for that to happen, we  
3 need to make sure the economics are there. And this is why I think turning into  
4 what these operators, these autonomous vehicles, or the autonomous companies  
5 such as Cruise and Zoox and others that are looking, and Waymo and others that  
6 are looking at assured operation mobility, what is it that would make it possible for  
7 them to start with sharing and not start with serving individuals. And that  
8 economics relates to these needs, such as operating the fleet, having access to  
9 prime location within cities, having a charging infrastructure that makes sense to  
10 them that would enable them to maximize the benefits of each vehicle that they  
11 operate, and there needs to be a lot of coordination in order for us to be able to  
12 serve that need. And obviously there are other perspectives or other approaches  
13 to more sustainable and equitable -- and urban development can be very useful.

14 MS. CREGER: I can jump in here. So I think specific to California,  
15 the mobility equitable framework has really helped to influence the design and  
16 development of the Innovative Clean Mobility Pilot coming out of CARB, mainly  
17 clean mobility options in disadvantaged communities and the Sustainable  
18 Transportation Equitable Pilot. And so these are all community-driven mobility  
19 solutions, where residents are actively cocreating and deciding which mobility  
20 options meet their needs.

21 I know the Energy Commission is also exploring and funding some of  
22 these kinds of pilots, and I have seen a lot more of this. But I think we have to  
23 even think beyond the pilots themselves. And we need those marginalized folks  
24 to be deeply involved in shaping, you know, what those equitable guidelines  
25 should look like.

1                   And I think of course there's endless different policy interventions.  
2 You know, there's road pricing, making sure services are acceptable, retraining  
3 programs, and whatnot. But there is never going to be a one-size-fits-all solution,  
4 and it will look very different at each community. And so personally, like I'm less  
5 concerned about the specifics of the policy interventions and I'm more interested  
6 in the process of how we get there and how marginalized folks are involved in self-  
7 determination of their communities in deciding what those appropriate policy  
8 interventions are.

9                   And so our framework has also been used and adapted to help  
10 determine what are those most equitable, most appropriate policy interventions,  
11 specifically on the topic of community-driven congestion pricing policies in San  
12 Francisco and Portland. And we're now also adapting it to the context of zero  
13 emissions.

14                   MR. ROETH: You know one quick thought from a freight  
15 perspective. You know it wasn't so long ago that the packages came home with  
16 the person. So we were with a car and they went shopping and they brought  
17 home the packages. Now no longer can we look at freight as this separate thing  
18 in our communities and in the subdivisions and, you know, in downtowns. I mean  
19 it is ecommerce. And even COVID, you have so many people having meals  
20 delivered, food delivered. So now those packages or those smaller -- smaller  
21 good movement are now very much like people movement, and so we have to  
22 consider both of them when we look at all these technologies and policies and  
23 practices because it's very much -- very similar.

24                   COMMISSIONER MONAHAN: Dan, do you have any questions for  
25 the panel?

1                   PROF. SPERLING: Yes. I always have questions.

2                   You know, first of all, I want to reinforce what Hana just said and  
3 Maya about especially the idea of how do we develop these innovative services in  
4 a way that really do serve communities and especially just -- I mean all  
5 communities, but especially disadvantaged communities. And we're launching all  
6 these pilot projects. And some of them are with a lot of input, some of them with  
7 less input. But even more crucially we don't -- haven't created the permanent  
8 funding streams and the permanent policies to actually make them reality and  
9 scale up and stick around. And I think there is a role for the Energy Commission  
10 as well as CARB and others to really get focused on that part of it. So that's really  
11 a top priority.

12                   I have a little question for Mike and a bigger question for Nadia.

13                   So, Mike, you said the platooning would save four percent energy.  
14 So I just wanted to understand that better. So was that for two trucks platooned,  
15 one is 50 feet behind and that's the savings for the second one or is that averaged  
16 for the two? What is that four-percent number?

17                   MR. ROETH: Yeah. That's a straightforward question. I  
18 appreciate that. So we reviewed dozens, I think we have 40 different tests that  
19 were provided to us both by manufacturers, by fleets and other things for these  
20 two-truck platooning. Some were on empty freeways or empty test tracks, I  
21 should say, where it's just the two trucks running. And others were, you know,  
22 more in traffic.

23                   So basically what happens is, is when these two trucks are alone at  
24 highway speeds, the following truck can save pretty consistently around 10  
25 percent and the front truck around 4, 4 and a half percent. So if you combine

1 those two savings and the amount of fuel being burned by both of them, it's about  
2 a seven-percent savings. But in no way can you platoon every mile. There's  
3 going to be miles where each truck is going to be separate. And then ultimately  
4 there's going to be times where either construction, weather, general congestion  
5 cause that platoon to break up. So we did some analysis and work to look at,  
6 okay, well, how much of that seven percent in that perfect case of two trucks alone  
7 at highway speed, how much of that goes away. And of course it's very -- you  
8 know, it changes much, but around a four-percent average between the two  
9 trucks.

10 And then you know the second follow-on question often is, is, well, if  
11 the front truck is saving less than the back truck, then why would I ever want to be  
12 in front, and how will two fleets figure that out. And when we asked the CFOs of  
13 these carriers, they all said, hey, we'll figure that out. We know which truck's  
14 behind for how many miles, one truck's for how many miles, and we'll figure out  
15 the monetary movement of money from one fleet to another per truck, and they  
16 didn't see that as a real problem.

17 PROF. SPERLING: And a little bit of follow-up on that. If those are  
18 battery-electric or fuel-cell-electric trucks, would that number change?

19 I mean I understand there are some problems with diesel engines  
20 getting enough air, like in the second truck, and then platooning and so.

21 MR. ROETH: Yeah. If you get too close, then, you know, there is  
22 not enough cooling air for the following truck, so you have that right. You know,  
23 really it's basically the same. We're talking about energy, and so whether it's  
24 electric or whether it's diesel, that savings is going to be there.

25 When we look at an electric truck, you know the more efficient

1 electric trucks or the more miles you can go ends up being a range enhancer even  
2 more so than a cost savings because of the fuel savings, so that's why these  
3 electric trucks need to be as efficient as possible because every efficiency gain will  
4 get more miles of range, which is really important.

5 PROF. SPERLING: Yeah. You know I would just comment that  
6 we really need to get our act together in the policy world to figure out how we're  
7 going to deal with truck platooning. It's not an obvious -- and then so my other  
8 question is just for Nadia.

9 So you said you're going to roll out, produce these Cruise Origins  
10 vehicles which, by the way, are I think the ideal Three Revolution vehicles, I love  
11 them, but you said when the time is ripe. Can you define for us what the means?  
12 What conditions have to exist before GM would actually make a major -- would pull  
13 the trigger and scale up?

14 DR. ANDERSON: Yeah, absolutely. So there are a number of  
15 things under consideration. What I didn't share and if you haven't read the press  
16 releases or any of the things online is that the Origin is a vehicle. Campfire's  
17 (phonetic) on the inside to redesign the total inside where there is not a steering  
18 wheel, there aren't any pedals, and that there are rows where people can sit, a  
19 little bit of modularity inside of the vehicle.

20 So one big hurdle is the fact that it's not legal to have cars without  
21 steering wheels and pedals out on the road, like they're capped at a certain limit.  
22 And so getting -- like making the environment to continue to evolve and being able  
23 to think about moving toward that way.

24 I think the other piece is that we are still in the testing phase, so we  
25 haven't gotten to the phase where we are fully deploying the vehicle. The

1 regulatory environment is also still evolving. And because those things need to  
2 get into place before the vehicle like an Origin can get out on the road, because it  
3 is so novel and new.

4 PROF. SPERLING: Not fully satisfying, but thank you.

5 COMMISSIONER MONAHAN: Are these vehicles being tested,  
6 Nadia? Where are they being tested? I know San Francisco but where else?

7 DR. ANDERSON: So the Origin is not being tested. What's on the  
8 road now are the Chevy Bolts. And so those are being tested in San Francisco.

9 COMMISSIONER MONAHAN: Ah, so the Origin is a concept, it  
10 hasn't actually gone on the road to be -- am I getting that right?

11 DR. ANDERSON: It's a little bit more than that. So the terminology  
12 is a little tricky. So people, when they say concept or prototype, it's like a pie in  
13 the sky via its design. It's not ready for production, like the parts, the equipment,  
14 the engineers haven't totally like figured out how to kind of totally put it together.  
15 But with the Origin, all those things are complete, so it's more than a prototype, but  
16 it's not actually rolling off the production line just yet. It's ready to, meaning that  
17 we have the knowhow to be able to do it. We have all the parts and equipment to  
18 be able to do it. It's just not being produced currently or accurately.

19 COMMISSIONER MONAHAN: Great. Thank you.

20 So I'm ready to turn over to Ben for questions, unless, Ben, do you  
21 have any other questions before the next sessions?

22 PROF. SPERLING: I'm fine.

23 COMMISSIONER MONAHAN: Okay, good. All right. Looking  
24 forward to the discussion.

25 MR. DE ALBA: Thank you, Commissioner Monahan and Dr.

1 Sperling. Really appreciate those questions.

2           So just a remainder for the panel. We're scheduled to wrap this up  
3 at about 12:10. So we have got about 20 minutes or so for a couple questions.  
4 We have addressed a lot already, but I am going to ask the COVID question,  
5 because I think that's something we haven't quite touched on and elaborated. So  
6 I will throw this out to the whole panel. Feel free to jump in.

7           Is there a concern about automation as a service in light of new  
8 attitudes towards physical distancing. How might COVID-19 affect traveler  
9 interest comfort in automated ridesharing in the long term?

10           MS. CREGER: So I mean I definitely agree we have to think about  
11 ridesharing in a context of public health safety. And I will let someone else handle  
12 that part. But I really do want to use it as an opportunity to stand on all these  
13 points earlier about we have to think about ridesharing in the context of personal  
14 security for vulnerable populations.

15           And while I fully agree, yes, we have to lean more towards shared  
16 trips, we really have to acknowledge that this comes along with inherent safety  
17 inequities. And so in the context of vehicle sharing, it's so different for women,  
18 people of color, children, immigrants, and, you know, all these other groups who  
19 are constantly targeted and harassed on transit and in shared rides. I myself  
20 have been in really uncomfortable situations in shared rides.

21           And also I mean with today, you know, in the increase in the rates of  
22 the tax, we really can't ignore this. And not everyone is going to feel comfortable  
23 sharing an AV with total strangers especially without that third-party driver.

24           And, you know, I've heard countless horror stories, but the reality is  
25 that only certain groups experience them, and it's often not folks who are

1 developing the talking or developing the policies or the research scope. And so if  
2 we want to see that kind of massive shift into AV sharing, we can't just talk about  
3 the modeling in terms of, you know, efficiency and sustainability. And we have to  
4 design shared vehicles in a way that everyone feels safe, to increase acceptability.

5 And so I have an example and an idea for Nadia. I would love to  
6 see designated vehicles and seats that are female only at night. Like that would  
7 instantly increase like my, you know, ability to ride them.

8 But my last point, I'll drop out kick, is that we have to think about  
9 what safety enforcement looks like in this automated future, because we know that  
10 Uber and Lyft have had huge issues with addressing sexual harassment in their  
11 services. And also, I mean today with the spotlight on police terror, how can we  
12 develop forms of AV safety enforcement that moves away from policing and  
13 instead towards these community-based violence-prevention models. I definitely  
14 do not have all the answers to reconciling these safety inequities, and my  
15 recommendation to figure out those equitable solutions is to really start these  
16 conversations with engaging those most vulnerable folks.

17 DR. BEN DROR: And I would like to jump in and maybe fill up on  
18 the other hand had said and I think that we have an opportunity here actually to  
19 look at shared rides or high-occupancy vehicles more holistically. So the issues  
20 that are experimented by as women and by various groups in the population in  
21 shared rides are also applicable to a broader set or the traditional set of shared  
22 rides, which is transit. So there is an opportunity for these various agents, various  
23 operators, the more traditional shared mobility operators and the new shared  
24 mobility operators to come together and help construct sensitive guidelines and, if  
25 needed, and even technologies in tabbing, if needed, or on app or whatnot to



1 make sure that we're actually operating right. And of course enforcement will be  
2 very much needed. Then I would say we are presenting the opportunity to break  
3 down these barriers.

4           And because we have seen these break down already, we have  
5 seen buses in Wuhan take groceries and essential goods to places. And we have  
6 seen the other way around, we've seen the usage of shared mobility to be able to  
7 kind of compensate for public transit that could not operate at night because there  
8 was just too little demand and transporting people in Florida from hospitals back to  
9 their homes. So there is that great opportunity to look more holistically at the  
10 problems of equity and at the problem of shared mobility.

11           But to your question on safety and whether that is going to be a  
12 hurdle or not, I think it's too soon to say. I think it's great that teleworking is an  
13 option for some, but only for some, and I think it should be addressed. And we  
14 have seen some places in the world where it's appropriate, where it's possible.  
15 We see these new technologies emerge. We see DB doing a few changes to  
16 require drivers to implement some in-vehicle features to be able to protect their  
17 riders. And we see in-app features that are requiring drivers to Zoom themselves,  
18 clean the vehicle, and to show that they're actually wearing a mask.

19           And in this, we see the government coming up with an mask that is  
20 implementing all across to make sure that if somebody was exposed it's  
21 communicating to others. And we see by giving companies -- share mobility  
22 drivers coordinating with authorities and to detect or to communicate to people that  
23 might have been exposed, you know, and share that information. So there is that  
24 great opportunity to break down all of these barriers of exchanges of public-private  
25 divide and also some other silos that we have created in a twentieth century

1 mobility system and move onwards and try to solve these issues together, but it is  
2 in silos. That's just my support here.

3 DR. ANDERSON: I can jump in on that --

4 MS. COHEN D'AGOSTINO: One --

5 DR. ANDERSON: -- as well and talk a little bit about not only what  
6 was it Hana and Maya said when it comes to how you're interacting with and  
7 making sure that all the voices are at the table but also thinking about how you  
8 design it for the most vulnerable in our population. I have two that fall into that  
9 category of being in that double minority of sorts and thinking about like what my  
10 views and the belief in my community are, and that is done right and kind of -- and  
11 think about, you know, shared rides and vehicle electrification. In a way, that is  
12 more like inclusive and is able to sort of chip away at and the issues that we are  
13 facing as a society today.

14 I think the other side of that is that the outbreak of COVID-19 and  
15 this new time, for lack of a better word, that America specifically is in the middle of  
16 when it comes to the disparities and situations that many people face, gives us a  
17 big opportunity to do things differently and also gives us the faith to be able to do  
18 things differently. When speaking specifically like self-driving cars and electric  
19 vehicles, based on the outbreak of COVID, what we have seen like anecdotally is  
20 people are looking to see if it's a way for a solution. We talk about delivery,  
21 contactless delivery, and being able to like redeploy police in a different way that  
22 may not have been what was initially conceived, but because you're in this new  
23 environment you now have to think about those things.

24 What I've learned from my time in tech is that people in tech like to  
25 solve hard problems. So now you're thinking about COVID and reducing the

1 spread and mitigating its impact, especially on those communities that are now  
2 being shown in the data to be most vulnerable, it's an opportunity for new ideas to  
3 be traded.

4           We've seen in public transit new cleaning processes and systems  
5 that are being put in place. We're seeing people with their own vehicles thinking  
6 about ways to be able to clean and innovate. And it also goes across society to  
7 like grocery stores and any type of public interaction. And so I can imagine the  
8 AV industry thinking about this in a very similar way, figuring out what is needed in  
9 order to make this a safe experience not only when it comes to the public health  
10 concerns but also to the racial aspect that we had out there, people experiencing  
11 racism in different ways. I think for us it is something to focus on and then being  
12 able to think about it in a very measured and intentional way in order to make sure  
13 that we are able and in a position to do it right.

14           MS. COHEN D'AGOSTINO: Really good points from all the  
15 panelists. And I just want to add, though, to what everyone said, but I think I'll  
16 add, you know, I think of course those concerns about sharing are going to linger  
17 as a result of the pandemic. And I think that those concerns are going to vary  
18 based on lots of criteria, right. Lots of people walking around feel vulnerable  
19 around others as a group. And those concerns are only made more visible in  
20 recent months.

21           I think that we need to think about what that means for automation  
22 because, you know, the CPUC raised this concern during the question about how  
23 to expand the AV pilot, right. They thought that we needed an adult in the room.  
24 And there was a lot of discussion that that was -- that there are some solutions  
25 that can be -- that can solve that problem, right. There can be a remote operator,

1 there can be large windows. There can be -- you know, there can be systems in  
2 place that can group individuals by preference, right. If you prefer to drive -- to  
3 ride only with other females, can that be something that operators could include.

4 I think from a policy perspective I don't think that it's up to the  
5 regulators to necessarily make those kinds of decisions about what types of  
6 services are going to be offered, but there could be incentives that could push  
7 them in the right direction and ensure that large fleets do have these types of  
8 options. And that makes people feel more safe and secure.

9 You know this research, there is some research from my colleagues  
10 at U.C. Davis that looked at vehicle designs, looked at how we could design  
11 vehicles to encourage sharing and make people feel more safe and more  
12 comfortable. I think that is a really important pursuit. Angela Sanguenetti and  
13 Kent Roni (phonetics) where it talks about that research in design school, and they  
14 really envisioned a new type of vehicle. And it doesn't look so different from some  
15 of that we had there, but I think we need to think about policy levels that may push  
16 the whole industry in this direction, because there may be some good actors,  
17 some good company about these issues, but there also could be some companies  
18 that aren't thinking about these needs and need to push in that direction.

19 And the last thing I will say on this topic is I think that in addition to  
20 users of automated vehicles you have to think about users outside of the vehicles.  
21 This is not exactly COVID related, but I think it's important to follow on. Because  
22 in addition to people inside the vehicle you will have nonusers, bicycles, and  
23 pedestrians, and folks in other vehicles that also have additional security and  
24 safety risks, and we think need to consider those while we're having this  
25 discussion as well, because as autonomous vehicles mature those -- those

1 nonusers, excuse me, are often need -- needing voice. And so I think those  
2 interactions with -- interactions with shared and nonshared autonomous vehicles  
3 will need consideration too. So I think that is the point that I'd like to add to this  
4 conversation.

5 MR. DE ALBA: Thank you for all of those thoughtful responses.  
6 I'm going to ask one more question and then I'll allow all the panelists to have  
7 about 30 seconds in final thought before we conclude.

8 So with that, we heard some discussion about the transit sector and  
9 the impacts of automation on trans operations particularly in California. So I think  
10 it's important that we have a short conversation about that. How do we as  
11 policymakers at the state and others at the local and regional level make sure that  
12 automation isn't a threat to the transit sector, especially at a time where we've  
13 seen ridership decline? How do we use automation to boost and enhance public  
14 transit?

15 And maybe -- it looks like Mollie's reconnecting, so, Maya, maybe  
16 you can share some thoughts on the international perspective, and then we can  
17 dive in want others.

18 DR. BEN DROR: Sure. I was actually considering that exercise in  
19 some parts of the world are actually buses, autonomous buses, are the first to be  
20 tested. So there are actually autonomous buses in a dedicated lanes operating  
21 for quite some time now from Singapore that is also picking up passengers to  
22 enable them to experience the model. So we have autonomous buses operating  
23 all over. And the promise for that concept of VRT to ART is interesting. And we  
24 should be looking at how can we create a bus system or a transit system that  
25 operates to a degree where possible, and a lot of the design of cities in the U.S. is

1 grid-based, so we can have people transition between modes more often, but then  
2 have autonomous transit systems operating more efficiently and online.

3 And obviously on-demand is extremely important but quite difficult to  
4 implement because of that point of vulnerable road users and because of that  
5 point of wanting to make more space for people to move and less space for  
6 motorized vehicles. So there is a bit of a tension there that I would also to -- also  
7 particularly some of these potential benefits for transit systems if automation  
8 actually sees light.

9 I don't know if I've covered that, but that's just one perspective to  
10 think of.

11 MS. CREGER: Yeah, and just to follow up on that, and we also just  
12 need a huge investment to improve the quality and the service of mass transit to  
13 make sure that it actually stays competitive with other forms of mobility. You have  
14 to make it a good option for people.

15 And, you know, I don't think we should give up so quickly on the idea  
16 that government can't be innovative. You look around the world at what other  
17 governments are doing and it's absolutely possible. And if, you know,  
18 government did invest in autonomous features in public transit, I think they'd  
19 actually be better positioned to ensure equitable access, you know, pricing  
20 models, sustainability, to guarantee fair labor standards, and just transition  
21 programs for displaced drivers.

22 And I think to be honest, yeah, government and transit agencies  
23 don't innovate and don't keep up with other mobility services, then they're at risk  
24 of, you know, going the way that the taxi did.

25 MS. COHEN D'AGOSTINO: Yeah. I think, again, I agree so much

1 with what was just said, but I just want to underscore that the transit operators are  
2 really in trouble. And, you know, I'm really speaking on behalf of myself but also  
3 this is something that I've heard Dan say several times -- and of course, Dan,  
4 you're the architect of the Three Revolutions and Patty of course as well, so I know  
5 you all know this and know this topic really well, but I think what's important to  
6 recognize here when we talk about the transit impact of autonomous vehicles and  
7 that transit impact is large because of course that's a huge discussion, but we're  
8 talking about the risk of how automation will affect transit.

9           We know that it's a lot about costs. And the service -- when the  
10 shared automated service really comes online, it will be cost-competitive with  
11 transit and that will be another blow to transit operation and really reduce ridership  
12 again. So we need to really think about how we can reform transit from being,  
13 you know, -- it's quoted so difficult, but the transit currently is taking from where  
14 you're not to where you're not going, right. So how do you make transit more on  
15 demand, to be more responsive. And whether that includes automation or not, I  
16 think is really -- it remains to be seen and it remains to be needed.

17           What we do know is that many operators will probably transition  
18 toward an adult in the room. And where we do see those automated shuttles, you  
19 do have operators onboard, right. So we're not in a position where we're  
20 comfortable with allowing a many-seater vehicle having no adult in the room. And  
21 that may -- that may linger so that safety -- the savings, the cost savings  
22 associated with removing the driver may not actually be there. The question is  
23 then can that driver provide other -- other services and other -- and to meet other  
24 needs for providers. And that's a discussion that we've had for many years.  
25 How can the driver in theory be transitioned to remove some of their driving hats,

1 maybe not all depending on the safety of the situation, to then provide other  
2 services, whatever that may be.

3 I'm not suggesting that they become hair stylists or -- you know, but  
4 they may be able to deliver some type of services to people onboard. So I think  
5 we need to think creatively about how to transition transit operation to deliver  
6 some service in an automated way.

7 DR. ANDERSON: And just to also like close out I guess on the last  
8 panelist to talk on transit. I think that an important and a big question is also we're  
9 thinking about the balance between it, going to the focus of specifically like self-  
10 driving cars and interaction with transit. I think there is an opportunity for self-  
11 driving cars to be a complement. And by a complement not only meaning miles  
12 to connect people to transit systems as they're continuing to be built out, but also  
13 being able to design an experience for people based on their unique needs. A lot  
14 of times the transit and bus schedules are designed for the majority of the  
15 population, that they need to get from somewhere based on, you know, peak rush  
16 hour times, the traditional 9:00 to 5:00 schedule.

17 I think we're looking at self-driving cars as an opportunity to think  
18 about the ways that they can help those who may not be on that same schedule  
19 and may be a little bit more rigid and the time to be able to get from where they  
20 need to go to where they need to be. And that they can work hand in hand. And  
21 it doesn't need to be a zero sum game when you think about self-driving cars out  
22 in the road. With transit, I definitely appreciate the situation that transit is in  
23 currently because of the COVID outbreak and also thinking about the ways that,  
24 you know, it can be more in collaboration or done in tandem with some of those  
25 innovative technologies that are coming there and, again, making sure that the



1 person is in the loop and that people, that self-determination piece is there, that  
2 you're not only saying to certain people that you have to rely on transit as your  
3 only way of getting around, but then here are three options that you can choose  
4 from, depending on what's happening in your day in your life that allows you to be  
5 able to maintain the level of mobility that you need and that you desire at that  
6 period of time. So I think it's definitely a big conversation definitely ongoing. And  
7 I think by doing this and having conversations where people can talk about how  
8 those things can interact and exist in the same larger system is a way that we get  
9 there.

10 MR. DE ALBA: All right. Thank you so much. So, unfortunately,  
11 we don't have any more time for questions. But I am going to give all of you 30  
12 seconds to have some closing thoughts. I'm going to go in the order in which you  
13 all give your presentations earlier. So, Hana, you're first.

14 MS. CREGER: I just want to close out by connecting, you know,  
15 this equity conversation to these research conversations because there's so much  
16 excellent research now coming about equity implications and so many amazing  
17 researchers who, you know, I follow your work and I very much respect you all.

18 But I think, you know, as we're seeing all the funding going to equity  
19 research, we need really clear guidelines on how to keep accountable to meeting  
20 those equity outcomes.

21 And so I just want to make a quick plug for a document that  
22 Greenlining is developing and that we'd love feedback on from researchers to  
23 collect a range of best practices, equity resources, and recommendations for  
24 these researchers who are conducting equity work. And this isn't just specific to  
25 academia. This could be applied to the private sector conducting their own

1 research and other NGOs as well. I just wanted to make that plug and connection  
2 because we can't really, you know, foster these kinds of conversations about  
3 building equity in from the beginning including research.

4 MR. DE ALBA: Thank you.

5 Nadia.

6 DR. ANDERSON: Yeah. I want to close out by putting for a double  
7 clicking on the importance of having these types of dialogues and conversations  
8 but also figuring out ways that we can collaborate and work together. I think we  
9 all have diverse perspectives that we bring not only to our day jobs but based on  
10 our experiences and what our passions and interests are. And I think we all are  
11 working to resolve some things that are really, really hard and challenging that are  
12 out there. I think we should all look at this as an opportunity to be able to fix  
13 some of the things that we know is wrong not only with our systems but how we  
14 think about and approach problems, and then also giving ourselves a little bit of  
15 grace to work with some of those things that may be a little bit more thornier and  
16 challenging, but also working towards a goal and keeping ourselves accountable  
17 for the desire and the vision and the future that we all say that we want to see so  
18 badly.

19 And also just to thank you for allowing us to be here and like join the  
20 conversation and contribute and share our thoughts. I'm looking forward to  
21 keeping this going in any way, shape, or form.

22 MR. DE ALBA: Go ahead, Mike.

23 MR. ROETH: So you know I was asked to join on highway trucks  
24 and platooning. And, you know, I think it's important to consider all of our options  
25 around electric and hydrogen fuel cell, possibly, that are in other forms as well as

1 automation. But having spent the hour talking really about urban, you know I just  
2 think it's really important to think about freight and think about the package  
3 delivery, the good delivery in our cities, with parking challenges, with a lot of what  
4 we've talked about here. So just bringing freight into those urban mobility  
5 transportation discussions, whether it's automation, electric, or even shared.

6 I mean someone mentioned, you know, you're using buses to move  
7 goods or potentially trucks to move people, or something of that nature, or light  
8 rail. So there's a shared aspect of goods and people that I think should be really  
9 important in a lot of these conversations in cities and states around the country.

10 MR. DE ALBA: We'll do Mollie and Maya.

11 MS. COHEN D'AGOSTINO: Yeah. Well, I think to close out, once  
12 again I'll thank Dan, Giovanni, and Patty for all of their work in this space. I think  
13 this is a really fantastic conversation and all of the panelists have really learned a  
14 lot from you, so thank you.

15 I'll just reiterate what has been said. There is a large body of  
16 research pointing to some concerns related to AV travel, right. And we want the  
17 Commission to recognize those, those concerns. And we want to ensure that we  
18 can do our best to mitigate pressures for increased vehicle miles and increased  
19 auto emissions associated with the coming tide of automation, and I think we can  
20 do that.

21 So we've got the policy and mechanisms to do it with. We've got SB  
22 1014, the Clean Mile Standard, that's going to be discussed in the next -- in the  
23 next session. And I think that -- the CEC can work to develop charging  
24 infrastructure and meet their SB 2127 goals and really target those on high-  
25 mileage vehicles like public EVs. And then of course there is a number of other

1 policies that are already on the books that offer us tools to help meet the needs of  
2 AV travel, including SB 375. We need to work to encourage regional -- empower  
3 regions and cities to plan to mitigate risk associated with AV travel, as well as  
4 other policies. So I will close there, but thank you again for having me. And I  
5 think let's continue this conversation.

6 DR. BEN DROR: Thank you so much, as well, for having me. So  
7 many great final remarks here. I'll just maybe highlight two things. And one is  
8 that we are presented with an opportunity to actually realize that mobility systems  
9 for moving both people and goods, or things, is without. So perhaps we should  
10 give up that twentieth century between modes and think about the opportunity of  
11 putting the externalities of private cars and other externalities of a mobility system  
12 in the way we think about how we price, how we create access, and so on. And  
13 that's where government can play a huge role.

14 And the second point is that each one of us is going to experience  
15 different needs of mobility throughout our lives. It's not just that different people  
16 have different needs. Throughout their lives they would have different needs.  
17 So we have to be, you know, wearing different lens as we think about that, as well  
18 as mobility systems, and be flexible and make sure that all of these various  
19 options are available for everyone and that can only happen if there is actually a  
20 robust financing or business case for each of these models. It's not or this or that.  
21 If you want, you have to make sure that all of these are complementary and  
22 operable from a business perspective. And that calls for a lot more conversations  
23 like this one, maybe having a bit more clear in a conversation as well.

24 Thank you so much.

25 MR. DE ALBA: That concludes our panel. Thank you, all. I really

1 appreciate your time and the thoughtful discussion we had today.

2 I will turn it over to Heather.

3 MS. RAITT: Thank you, Ben.

4 And thank you, panelists, for sharing your time and expertise.

5 That's just so helpful and interesting.

6 So it is time to move on to public comments. And I will just remind  
7 folks to please limit to one person per organization, and we'll have time, three  
8 minutes per person. And if you're on Zoom online, just go ahead and press the  
9 raised hand icon to let us know that you'd like to comment. If you change your  
10 mind, you can press that icon again and it will take your hand down.

11 And if you're on the phone, you can press star 9 to raise your hand.

12 And with that, I will introduce RoseMary Avalos from the Public  
13 Advisor's Office at the Energy Commission to go ahead and help us with that  
14 public comment period.

15 Thank you.

16 MS. AVALOS: Thank you, Heather.

17 Our first call with attendees using the raised hand features on Zoom,  
18 please state your name and affiliation and spell your first and last name. Also, do  
19 not use the speaker phone feature because we may not be able to hear you  
20 clearly.

21 Robert Perry, your line is open and you may need to unmute on your  
22 end.

23 MR. PERRY: Hi. My name is Robert Perry. R-o-b-e-r-t P-e-r-r-y.  
24 I'm the Principal Consultant for a firm called Synergistic Solutions, which is a policy  
25 consultancy firm.

1           And I just want to thank the panelists. This has been a fantastic  
2 conversation. And I would just like to comment on some of the socio-political  
3 aspects of what we're trying to achieve. And I think the panel kind of touched on  
4 a lot of these different aspects when they're talking about security and prioritization  
5 and things like that.

6           And I really think that what we're dealing with is we have to kind of  
7 acknowledge what the current ideal is. And in this country, the ideal is absolute  
8 autonomy through personal car ownership. I think there is an expectation that  
9 you have your car, you can get in it whenever you want, go wherever you want,  
10 and the only constraining factors are fuel and congestion. And we have to  
11 develop a system that can deliver on most of the expectations towards that ideal  
12 while giving an alternative lifestyle that is acceptable and maybe even preferable.

13           And I think there are a couple of things that have to be accomplished  
14 in order to do that. One, I think we need a unified platform on which all the apps  
15 for these various transit and transportation services are located. I think people  
16 have to be able to go to a portal and access all the wide menu of things and based  
17 on their preferences be given various services that will get them from point A to  
18 point B. I think a prerequisite to that is there's going to have to be a major  
19 advance in information infrastructure. I think the telecommunications companies  
20 have to be brought to task to make significant improvements so that there is  
21 seamless integration as far as communication, as people go from one  
22 transportation mode to another.

23           And, third, I think there needs to be a prioritization system that  
24 accurately assess the person's need to get to their end destination. I think COVID  
25 has given us a window as to what truly essential is, what truly essential is, and that

1 system would give a higher prioritization to a sanitation worker who needs to get to  
2 work, to get on their truck to pick up the trash than to the CEO of a company who  
3 is basically operating mostly online and doesn't really have to physically get  
4 anywhere, provided that he has that interconnection.

5 And I think that, finally, we need to explore, people are going to have  
6 to develop user profiles on their preferences and that we might engage the dating  
7 services and the compatibility processes to match riders better so that there are  
8 not any, you know, altercations. Anyway, thank you.

9 MS. AVALOS: Thank you, Mr. Perry.

10 And a reminder, dial star 9 to raise your hand and star 6 to mute if  
11 you are on the phone.

12 Are there any other comments? Please raise your hand.

13 Okay, we have David Park. You're line is unmuted, and please spell  
14 your first and last name, and your affiliation. David Park.

15 MR. PARK: Hi. This is David Park. Last name spelled P-a-r-k. I  
16 am with the California Fuel Cell Partnership and I'm the Industry Liaison.

17 Just two very brief observations to offer to the panel and to  
18 Commissioner Monahan. Thank you very much for having this really valuable  
19 session. It was very interesting. CARB had a pathway to a carbon-neutral  
20 society webinar yesterday and a big, dominating topic on that was energy storage  
21 and the whole hydrogen and the energy storage. And I would just like to point out  
22 that as society moves towards electric drive transportation, this provides dual  
23 benefit in that hydrogen can be used directly in the transportation mode and can  
24 also be useful in grid stability.

25 And then, secondly, on the equity side we're seeing now fuel cell

1 electric vehicles on the light-duty side launch around 2015. And we're seeing  
2 those vehicles returning from their original owners or lessors and being put back  
3 into the market at a significant cost reduction. And when it gets to high-density  
4 housing, accessibility at centralized hydrogen refueling is somewhat more  
5 convenient than installing land-based electricity for large populations of electric  
6 vehicle users.

7           And then, finally, on the light-duty, heavy-duty medium side, on the  
8 scaling side, we note that all of these vehicle classes have a synergistic effect on  
9 each other in that as the light-duty market scales, it reduces the cost of fuel cell  
10 power plants that can then be installed at cost effectively into the heavy-duty  
11 sector. And then as the heavy -- medium and heavy-duty sector scale their vastly  
12 larger consumers of hydrogen per vehicle, and so then we see economies of scale  
13 on the fuel costs, the hydrogen fuel cost side. So we do see a total market  
14 picture on that.

15           Thanks for listening to my comments.

16           MS. AVALOS: Thank you, Mr. Park.

17           Seeing there are no raised hands, this concludes public comment. I  
18 turn to Commissioner Monahan.

19           COMMISSIONER MONAHAN: Well, thanks, everybody, for  
20 participating. I really appreciate this morning's panel. A really fascinating  
21 discussion with lots of great thought.

22           I encourage folks to return for the afternoon session which is on  
23 Electrifying Transportation Network Companies. So we'll have, I'm sure, a really  
24 great panel discussion there too. So I hope you can join. Thanks, everybody.

25           (Session 2 ends at 12:22 p.m. Session 3 begins at 2:00 p.m.:)



1 MS. RAITT: Okay. It's two o'clock. We'll go ahead and get  
2 started. People will be joining us. Good afternoon. Welcome to the IEPR  
3 Workshop on Zero Emission Vehicle Resilience and the Three Revolutions in  
4 Transportation, Part 3 of 3.

5 I'm Heather Raitt, the Program Manager for the Integrated Energy  
6 Policy Report, or IEPR, for short. Today's workshop is being held remotely,  
7 consistent with Executive Orders N2520 and N2920, and the recommendations  
8 from the California Department of Public Health, encouraging physical distancing  
9 to slow the spread of COVID-19.

10 This meeting is being recorded. We'll post a recording and a written  
11 transcript on our website.

12 Also, today's presentations have been posted, including a couple  
13 from this morning. If you looked for those and couldn't find them, they should be  
14 there now.

15 If you were on the prior sessions, we will continue using the Q and A  
16 function in Zoom, including being able to vote on questions posed by others. So  
17 attendees may type questions for panelists by clicking on the Q and A icon. And  
18 before typing a question, please just go ahead and check and see if someone else  
19 has already posted a similar question. And, if so, you can click thumbs up to vote  
20 on it, and that will move the question up in the queue.

21 We'll reserve about five minutes at the end of the panel for attendee  
22 Q and A. And so given the time restrictions, we likely won't be able to elevate all  
23 questions at the end.

24 And I will quickly go over how to provide comments on the material in  
25 today's workshop. There will be an opportunity for public comments at the end of

1 this session. Please note that we will not have time for the panelists to answer  
2 questions during the public comment period.

3 For those of you on Zoom online, click the raised hand icon to let us  
4 know you'd like to make a comment. And if you're on the phone, press star 9 to  
5 raise your hand. Alternatively, written comments after the workshop are  
6 welcome. And they are due on August 6th. And the notice gives you all the  
7 information on how to do that.

8 With that, I will turn it over to Commissioner Monahan.

9 COMMISSIONER MONAHAN: Great. Thanks, Heather.

10 I'm looking forward to this part for many reasons. One is of course  
11 the conversation on how do we electrify transportation network companies and  
12 make sure that they contribute to the clean transportation future that we need in  
13 California but also because a number of colleagues and friends are on this panel,  
14 strangely. So I look forward to hearing their thoughts as we deepen this  
15 discussion about how do we electrify transportation network companies. And,  
16 you know, from the CEC's perspective we're very invested in building out the  
17 infrastructure needed for -- or supporting the build out of the infrastructure needed  
18 for zero emission vehicles and I'm especially curious about how do we -- how do  
19 we make sure that our investments also support the electrification of transportation  
20 network companies in a way that's equitable and really helps with drivers of these  
21 vehicles lower their bills and drivers who drive electric vehicles.

22 So with that, I'm going to ask any of the other members of the virtual  
23 dais, and hope that Professor Dan Sperling is here. And I'm not sure about other  
24 Commissioners.

25 PROF. SPERLING: Well, then I'll just jump right in. Thanks, Patty,

1 Commissioner Monahan.

2           You know, let me just make some prefatory comments about this  
3 session. First of all, the truth, the reality is that the TNCs, the ride-hail  
4 companies, really only provide about one to two percent of the passenger miles  
5 traveled. So by themselves they're really not important in terms of greenhouse  
6 gases and energy use. But there are three very -- there are three reasons why  
7 this is a really important topic.

8           Number one, what we're doing here by coming up with a strategy  
9 and policy for electrifying the TNCs is that we're creating a model for the rest of the  
10 world. Lots of countries, lots of states are watching us in how we manage and  
11 handle this and are likely to imitate us.

12           Number two is it's a great marketing strategy for EVs, whether  
13 they're battery EVs or hydrogen EVs. And that means we have lots of people that  
14 are in those vehicles. There's lots of exposure. It's just great marketing.

15           And number three is it sends a signal to auto makers as they start  
16 thinking about both getting into the business and being a mobility service, but  
17 especially in terms of automated vehicles that they think about, that they get the  
18 signal we are really emphasizing that they be electric. Some already have gotten  
19 the message, like we heard in the earlier session with General Motors, but send  
20 that message that as automated vehicles come in, whenever that happens, they  
21 are coming in, there's no doubt they're coming in in a more slower, less hyped way  
22 than we had thought but still coming in this whole regulatory process. And any  
23 other processes we develop to support the electrified TNCs is really critical in that  
24 way.

25           Thank you.

1 COMMISSIONER MONAHAN: Great. Thanks, Dan.

2 So I want to emphasize something Dan said actually around the fact  
3 that this is a way to expose a lot of potential EV owners to the technology. And,  
4 you know, when we talk about the three big barriers to electrifying transportation,  
5 which is to call them costs, consumer awareness, and convenience, then  
6 electrifying TNCs actually gives you the consumer awareness side, where lots of  
7 individuals can get exposed to the technology. But also it helps to drive down  
8 costs because basically the more miles we drive electric, the more miles per year  
9 that a vehicle is driven, basically the more savings that you get in fuel cost  
10 savings, and it drives down the lifecycle of costs of your ownership. So the  
11 sooner you can get that savings, the easier it is drive down costs.

12 So there's lots of interesting synergies with potential synergies that  
13 could be realized with the electrification of TNCs, so I'm really curious to talk about  
14 that but also to recognize that right now it's not happening. And there is a way, as  
15 far as the big part of the reason it's not happening is because of the convenience,  
16 the last seed, where it's inconvenient to refuel or recharge your vehicle. And so  
17 we have to work on all three of those simultaneously.

18 With that, Heather, do you want to do the introductions or shall I for  
19 the moderator?

20 MS. RAITT: Oh, either way.

21 COMMISSIONER MONAHAN: Why don't you do it.

22 MS. RAITT: Okay, good.

23 COMMISSIONER MONAHAN: I'll nominate you.

24 MS. RAITT: Thank you, Commissioner.

25 So we'll go ahead and have the panel on Electrifying TNCs. And it's

1 moderated by Shobna Sahni from the California Air Resources Board. And  
2 Shobna is the manager for Advanced Clean Car Regulation Section of the ARB.

3 So go ahead, Shobna. Thank you.

4 MS. SAHNI: All right. Well, good afternoon, everyone. As they  
5 said, I'm the Manager of the Advanced Clean Car Regulation Section. And my  
6 section is charged with coming up with the Clean Mile Standards, so my team is  
7 working on that.

8 And the Clean Mile Standard, I just wanted to start off this panel  
9 discussion with a brief background on Senate Bill 1014. So let's go ahead and go  
10 to the next slide.

11 SB 1014, or the Clean Mile Standard, requires CARB to adopt GHG  
12 reduction targets for TNCs and CPUC to implement the program, given that it  
13 already manages the operating permits for these companies in California. So the  
14 California Public Utilities Commission and CARB have been working together to  
15 come up with the standards.

16 After the bill was passed, staff collected triple-level data from the  
17 fleet to establish the 2018 base year emissions and released a white paper. Our  
18 next step here is to propose a regulation to the Board in December of this year.  
19 Next slide, please.

20 The Clean Mile Standard Program will included two compliance  
21 targets, a greenhouse gas reduction target, and the metric of grams CO2 for  
22 passenger miles traveled, and an electrification target in electric vehicle miles  
23 traveled. The key goals for this program are really to promote zero-emission  
24 vehicles and to reduce the vehicle miles traveled.

25 Because larger studies of our state in particular are heavily impacted

1 by ever increasing congestion and vehicle emissions, reducing vehicle miles  
2 traveled would serve to mitigate these issues that impact public health and quality  
3 of life. Next slide, please.

4 A new regulation will support CARB's mission as well as adapt the  
5 new mobility landscape. This is our first light-duty fleet regulation. This  
6 regulation would encourage TNC fleets to provide clean mobility options, including  
7 pooling, zero-emission vehicles, connections to transit, and active transportation,  
8 all while reducing VMT. Next slide -- next slide, please.

9 As you will see from the panel discussion today, I think we all agree  
10 that the technology and the rationale already exists to electrify the TNC fleet. The  
11 question is really how to overcome the barriers and what role can the public and  
12 private companies play to expedite this transition. And how do we do that while  
13 incorporating equity and low-income -- low-income needs.

14 So with that, I don't want to take too much time on background here,  
15 as we have a great panel discussion. We have a very diverse panel. And  
16 looking at -- looking at the electrification of ride-hail fleets, process wise, each  
17 panelist has about five minutes to present their key takeaways on electrification.  
18 And then we'll go into questions and discussion after that.

19 Our first panelist is Rohan Puri, Founder and CEO of Stable Auto.  
20 He is a former M.I.T. media lab scientist who is working on the next generation of  
21 charging infrastructure for fleets. At Stable Auto they believe that charging  
22 infrastructure is a critical and under served area, necessary to make electric and  
23 autonomous vehicles a reality. And that as EVs penetrate the ride-hail fleet,  
24 charging infrastructure needs to accommodate the large number of drivers.

25 So with that, I will hand it over to Rohan.

1 MR. PURI: Thank you so much, Shobna.

2 It's an honor to be here, and we're excited to really share a new idea  
3 that we have here at Stable: How infrastructure can be more efficiently deployed  
4 in a way that is more planned, and shared across commercial fleets like the TNCs  
5 demand. So I'm going start with -- the next slidee, please.

6 I'm going to start with some stats that you've probably already seen a  
7 couple times, but although electric vehicles account for one percent -- or rideshare  
8 vehicles account for one point of the GHG emissions, that is really noted.  
9 Electrifying one just taxi saves as much carbon dioxide as electrifying three  
10 vehicles. And we've already seen some of those stats from our colleagues over  
11 at U.C. Davis, less than half a percent of California's EVs are in rideshare across  
12 the three cities that were sampled, but they're already pulling 23 percent of the  
13 energy at DC fast charges today.

14 Now what's interesting about the dynamic in the United States is that  
15 we have already installed a large amount of infrastructure to serve the general  
16 public. And we have put them at predominantly at home, work, and retail  
17 locations. And while that's fantastic, and offers amenities for patrons of those  
18 locations or workers in those locations, it actually creates a weird sort of  
19 disincentive for the fleets, the commercial fleets to be charging there as well  
20 because that charging infrastructure wasn't really designed to accommodate TNC  
21 demand. And I'll show you a little bit more about what that means, but we'll go to  
22 the next slide here.

23 The problem with public charging infrastructure is it simply won't  
24 scale to the needs of the fleets. We've already seen some pockets of additional  
25 congestion at a couple of public charging locations at retail centers here in

1 California. And two of the major considerations that commercial fleets are looking  
2 for, especially in the TNC demand goes along to what Commissioner Monahan  
3 pointed out and to the long convenience. These sites are typically poorly located,  
4 so they're predominantly near residential, work, or retail locations, which again is  
5 great for the general public, but has the disadvantage of increasing vehicle miles  
6 traveled for TNC fleets if they're off the beaten path of where they typically might  
7 operate.

8           The second problem with these sites is there is no guaranty of  
9 availability. You might be stuck queuing behind either other fleet vehicles or the  
10 general public, and that creates congestion problems for the public as well.

11           Now the public has these sites as public amenities. You want out  
12 make sure that the TNC fleets are accommodating those needs as well. So at  
13 Stable we're taking a different approach in thinking about this. And when you  
14 typically think about commercial fleet charging you're thinking slightly differently.  
15 Next slide.

16           I love showing this picture. This is a new DC charging facility in  
17 Shenchen, China which shows the scale of a commercial fleet charging operation.  
18 In Shenchen, 99 percent plus of the taxi fleet is already electric today. And to  
19 handle it with a huge array of DC fast chargers, these are ranging anywhere from  
20 40 kilowatt plus in a massive facility right outside the city. And while this works  
21 great, it actually ends up being quite inefficient from a CAPEX perspective, from  
22 an understanding of where the infrastructure needs to -- how much infrastructure  
23 needs to be put in place, and even from a vehicles miles traveled and utilization  
24 perspective. And I'll show you some of the models that illustrate why. Next slide.

25           So here we're going to play a little video that's going to show some of



1 the simulations that Stable works on to help illustrate this problem. You might  
2 have seen this in the earlier sessions. Similar idea here, really trying to  
3 understand how fleets are going to use infrastructure today.

4           If we were to do the same strategy as implemented in Shenchen,  
5 where we have a couple of bigger, centralized hubs littered around the city, using  
6 this case, San Francisco's pickup and dropoff data for TNCs and how they model  
7 how they might charge at centralized locations, in this case three locations in San  
8 Francisco, it turns out we would need over 1,250 DC fast chargers to  
9 accommodate the same pickup and dropoff data that you have as of today.

10           But if you're very clever about where you put those chargers and in  
11 what locations and in much smaller quantities, it turns out you only need around  
12 300 chargers to accommodate the same pick up and dropoff. This is the power of  
13 using modeling tools to really understand how to minimize the number of chargers  
14 to serve the largest number of vehicles possible. And that's the motivation at the  
15 end of the day here, right. If you have to deploy over a thousand chargers to  
16 serve these fleets and get them on the road, serving the public, that's going to take  
17 much longer, it's going to cost a lot more. We can be a lot more efficient. It's all  
18 about doing less -- doing more with less. Next slide.

19           So a couple of the goals for the deployment of infrastructure in this  
20 space. It's all about faster deployment and deploying a minimum number of  
21 chargers dramatically just with a simple agent-based model and some complex  
22 considerations around traffic, real estate pricing, electrical -- you can actually  
23 minimize the number of chargers being deployed in the city. You can be much  
24 more efficient about it, but realize around sharing infrastructure, what if the  
25 common set of infrastructure could be shared across fleets. Many fleets have the

1 same requirements in terms of amenities, locations, the types of activities they  
2 perform per day, guaranteed availability. How can we build an infrastructure that  
3 accommodates them and reduces congestion at public charging sites?

4           There are some barriers, of course. We don't want to overwhelm  
5 the public chargers. We want to have shared access for all sorts of vehicle fleets.  
6 And we want to decrease the infrastructure costs and increase the deployment  
7 speed, which means we need easier access to information and a simplified  
8 deployment process. So it really is about efficiency here. And with a lot of  
9 planning and some clever sharing, we can be really, really careful with how we  
10 deploy our next generation infrastructure to support these fleets.

11           Thank you so much.

12           MS. SAHNI: Great. Thanks, Rohan.

13           So we'll go to our next panel member, who Jeremy McCool. He is  
14 the founder and CEO of HEVO Power, which is looking at wireless charging for  
15 electric vehicles. He's always been a tinker and an entrepreneur who started this  
16 venture in 2011. "HEVO" stands for Hybrid and Electric Vehicle Optimization, is  
17 developing a wireless charging standard for electric vehicles, and having no cords  
18 or plugs could definitely hasten the electric vehicle revolution.

19           With that I will hand it off to Jeremy.

20           MR. MCCOOL: Okay. Thank you for that.

21           We're going to do a little bit different with HEVO there, as we do  
22 everything differently. First I'm going to start off with a very quick demo of  
23 wireless charging. I'm actually in my mother's garage in New Mexico. So this is  
24 where I am for COVID. I'm typically a Brooklynite, in New York, but the world has  
25 changed things.

1           So let me go ahead and start by introducing you to the Resident E8.  
2     And we have our electric vehicle here, the Nissan Leaf. This system is set up.  
3     As you can see, we have a power pad here on the ground. And that power pad is  
4     able to be set like you see it here or it can be embedded into the street like a  
5     manhole cover.

6           The other thing about this system is that it is built for a UL  
7     certification, it's already been UL certified. So it's been chemically tested thus far.  
8     It's been also driver tested. It's 4500 psi rating gives it about the same strength  
9     as concrete. Obviously it's been submersed and tested in water and also firehose  
10    tested.

11           As you can see there, we've got this nice grid mesh panel on the top  
12    for nonslippage. It's also ADA compliant. And we have this bezel that goes  
13    around the outer perimeter for side-impact prevention from street sweepers and  
14    snow ploughs. And so this system is quite literally able to go into any kind of  
15    environment and for any type of use, industrial, private, public, whatever it may be.

16           As you can see, we've got a conduit connected to this tower. And  
17    this tower provides us with the wireless charging. Our system here is set up for a  
18    Level 2 charger. So this total setup here in my mom's garage is giving us the  
19    ability for about 7.2 kilowatts. So we got us interface, 50-amp, 240-volt system  
20    here. However, this charger is actually able to do 8 kilowatts, so it's a Level 2  
21    flash charger, I guess is a good way to look at it.

22           The couple of critical things inside this tower. This provides you  
23    with the wireless charging system inside of it. It comes complete with a gateway  
24    device, an LTB, 3G, 4G, GPS, wifi, ethernet connections. Also, it has a certified  
25    revenue grade energy meter, so we're able to account watt by watt of what is

1 actually being supplied to the user while the vehicle is charging.

2           And, finally, this is the world's first dual charger. So this not only  
3 wirelessly charges the vehicle, but right here there is a connector for you to be  
4 able to add to the system, a Level 2 plugin charger, and you can holster it here  
5 onto the tower or onto the wall. So this can go either on the wall or on the tower,  
6 as you see it.

7           Here on the vehicle side we have got what is normally a motor and  
8 all the onboard charging systems. So you've got the DC connector for plugin, the  
9 AC connector for plug in. It goes through all these conversations and then it  
10 comes out to the appropriate voltage and DC that the battery requires.

11           Different from our system is, is that all this, mostly a lot of this  
12 equipment is unnecessary for wireless charging. Our battery adaptor sits nested  
13 in, and you can kind of barely see it, there is a black enclosure right here. And  
14 that's sitting there nested between the front bumper and the manifold. And that's  
15 connected to the CAN bus, the battery management system. And we supply DC  
16 power directly to the battery, which helps us with inefficiencies and also with the  
17 longevity of the battery itself.

18           And, finally, on the bottom of this vehicle you will see that we have  
19 this -- you can sort of see that wireless receiver there. So it's about a half an inch  
20 below the grade of the vehicle. And this vehicle site assemble and equipment  
21 can be mounted onto virtually any type of vehicle.

22           I'm going to do one thing for you, because a lot of people want to  
23 know how do you charge wireless charging, let me show you. Okay. So I'm  
24 going to -- oh, I can't share. That means I can't show you. There is no sharing  
25 given to me on this side.

1                   But going back to this point, we have about a minute left, I think the  
2 primary driver that we are supporting here, to state the least, is there is a  
3 handsfree way to -- development of wireless -- or I say EV charging across the  
4 state. But, more importantly, is that it also is enabler to other technologies like  
5 autonomous electric vehicles. It removes the TNC problems with people  
6 forgetting to charge. And so we are all in this thing, ready to be able to provide  
7 those kinds of products and abilities.

8                   So I'm going to go ahead and stop there because I'm right about a  
9 minute or less permitting, and hand over the rest of my time to the next person.

10                  MS. SAHNI: Thank you, Jeremy. That was very interesting, I have  
11 to say. Very good presentation.

12                  We'll go ahead and move on to our next panelist, which is Don Anair  
13 from the Union of Concerned Scientists. Don is a Research and Deputy Director  
14 for the Clean Vehicles Program, working on state and national transportation, air  
15 quality, and global warming policy. He is an engineer with expertise on fuels and  
16 transportation technology, covering both light- and heavy-duty vehicles.

17                  With that, I will hand it over to Don.

18                  MR. ANAIR: Great. Thanks, Shobna. Glad to be here and talking  
19 about this topic today.

20                  I wanted to just cover some of the findings from a recent analysis  
21 that UCS did, looking at the climate impacts of ride-hail today, which really  
22 highlights electrification as a key strategy. I will also end with just a few  
23 observations. So the next slide, please.

24                  So the analysis that we realized gathered data from California and  
25 other cities, looking at what the emissions from a typical ride-hail trip are today and

1 how those compare to both different strategies within ride-hail as well as other  
2 modes of transportation.

3 In the first column you will see certain emissions from a typical  
4 private vehicle trip. And in the second column shows a nonpooled ride-hail trip.  
5 And you will see that it's about 50 percent more emissions than a private trip.  
6 And really there are two key factors here. One is the efficiency of the vehicles,  
7 which for ride-hail vehicles tend to be more efficient than the average passenger  
8 vehicle, which is good news. But the big factor here is the miles. The miles that  
9 these vehicles are traveling without any passengers in between pickup and dropoff  
10 of passengers. For about every three miles driven with a passenger there's  
11 another two miles driven without. And that leads to the significant additional  
12 emissions shown there in the hashed part of the bar.

13 When you factor in cooling, we assume in this analysis two  
14 passengers pooling rides, that significantly offsets that disadvantage. And you  
15 will see on the right-hand side examples where electrification has a really  
16 significant impact reducing emissions almost 70 percent, compared to a private  
17 vehicle trip. The next slidee, please.

18 So comparing ride-hail to private car trips doesn't completely paint  
19 the complete picture because, as we know, not everyone is taking private vehicle  
20 trips as an alternative. Many passengers using ride-hail would have taken other  
21 modes. And this work from U.C. Davis presented here from survey results show  
22 what types of trips are being displaced currently with ride-hail trips both for  
23 passengers that are in pooled rides and passengers that are not in pooled rides.  
24 And so those highlighted in the reddish, pinkish color are modes that are typically  
25 lower carbon than car trips and transit, while walking, biking, and even trips that

1 wouldn't have been taken without ride-hail being available. So the next slide,  
2 please.

3 So using some of that displaced emissions data, we took the step of  
4 analyzing what would the emissions be compared to the types of trips that are  
5 being displaced by ride-hail today. And what we found was an estimated 70  
6 percent higher emissions from a ride-hail trip compared to the typical types of trips  
7 that ride-hail is replacing.

8 And then the green bar there is a hypothetical scenario looking at if  
9 the vehicles were electrified and half of those were pooled what would the benefit  
10 be from ride-hail trips.

11 So that summarizes really in a very top level some of the analyses  
12 that we've done and highlights the fact that both ride-hail trips today are higher  
13 emission and also the role electrification can play in reducing those emissions.

14 Of course it's more complicated than that. Ride-hail is a small  
15 percentage of overall trips, but in certain urban areas it can be very significant, up  
16 to 13 percent in San Francisco based on some data from a couple years ago,  
17 contributing to congestion.

18 So what is the role of ride-hail in a sustainable transportation  
19 system? And I think there are four key points I just want to finish off with.

20 One is a rapid transition to electrification is necessary to reduce ride-  
21 hail emissions. And policies like the Clean Mile Standard or a standard that  
22 accelerates electrification in the nearterm are important. But it's equally critical  
23 that companies are taking on the responsibility for the transition and that means  
24 making both commitments as well as the investment necessary to make the  
25 transition and not passing those costs and responsibilities on to the drivers

1 themselves.

2           Secondly, I think it's crucial that ride-hail complements rather than  
3 competes with public transit, biking, and walking for that to be a sustainable  
4 transportation mode. And that means we need to invest in mass transit, micro  
5 transit, walking, biking. Those have to be options for households so that ride-hail  
6 is a small portion of their trips.

7           Third, is that ride-hail and transportation on the surface must be  
8 higher occupancy. That's challenging now in a pandemic where ridesharing isn't  
9 allowed. But in the future we need to address that.

10           And then, finally, I would just say transportation as a service and  
11 ride-hail itself, in order to be a sustainable strategy and a growing part of  
12 California's economy, the jobs that are created in this industry need to be  
13 sustainable. And, as we've seen, ride-hail driver association is advocating for  
14 changes in working conditions, companies opposing policies like AB 5, this is a  
15 challenging dynamic and to really ensure a sustainable transportation system, we  
16 need to address those broader labels -- labor and transportation system impacts.

17           Thank you.

18           MS. SAHNI: Thank you, Don.

19           Move on to our next panelist, who is Emily Warren, from  
20 Nelson/Nygaard. She is a former executive from Lyft and is a shared mobility  
21 pioneer with a wealth of experience in transportation policy and technology  
22 regulation. She developed innovative policy frameworks and builds consensus to  
23 advance safe, equitable, and sustainability mobility outcome. We're happy to get  
24 her perspective in this discussion.

25           With that, I will hand it over to Emily.



1 MS. WARREN: Thanks so much. It's great to be here. And I will  
2 just also mention I had the opportunity to join Lyft on its first day of operation in  
3 2012 and had a lot of different roles, ranging from engagement with the driver  
4 community in the earliest days and ultimately creating and leading the  
5 Transportation Policy Team addressing issues of sustainability, electrification, and  
6 partnerships with public transportation agencies.

7 After leaving the company in 2017, I continued to stay closely  
8 focused on those issues. And now at Nelson/Nygaard, which is a national  
9 transportation planning and consulting firm, I work primarily with cities and state  
10 transportation departments as well as public transit agencies that are focused on  
11 policy development related to emerging mobility.

12 So dating back to my time at Lyft, I have always been very optimistic  
13 about the role that TNCs can play in accelerating electrification of vehicle miles  
14 traveled. So I want to share a little bit about my understanding of the dynamics of  
15 TNC driver participation and use that to help illustrate the reasons for my optimism  
16 as well as my understanding of where the barriers and opportunities lie for really  
17 realizing that potential.

18 So like any online market place, there is a wide spectrum of levels of  
19 participation among TNC drivers. Sometimes it's easy to just, you know, think  
20 about TNC drivers as if they're all interchangeable with one another. But actually  
21 the ways that different segments of the driver community participate in those  
22 platforms is really different.

23 So for our purposes, I want to simplify it and put folks into two  
24 buckets. There are really a long tail of casual drivers. Let's say this is 80-plus  
25 percent of all the drivers on TNC platforms, who drive very few hours per week,

1 and tend, in many cases, to have a relatively short tenure on these platforms.  
2 They may not be doing it for years at a time. So it's intuitive to realize that for that  
3 segment it's probably pretty unlikely that many of them would make a vehicle  
4 purchase decision on the basis of their participation as a TNC driver. You know,  
5 they're not deeply committed to it. It's not a huge part of their lives.

6           However, it is the case that at Lyft a substantial contingent of these  
7 drivers might be willing to rent a vehicle on a short-term basis to drive on those  
8 platforms, because they may not have a qualifying vehicle of their own. They  
9 might want to use something that's more efficient, and then their own vehicle.  
10 And, you know, they don't want to make that longterm commitment to get a  
11 different type of car than the one that they already have. But they will be sensitive  
12 to the costs of whatever that vehicle solution is.

13           There is another bucket of drivers that are full-time drivers that are  
14 less than 20 percent of drivers on the platform but of course contribute very  
15 disproportionately to the total number of vehicle miles traveled, generated by the  
16 platform. They drive very heavily on a more than full-time basis and are much  
17 more consistent over a long period of time.

18           So it's probably logical for you to jump to the conclusion that these  
19 drivers might be a lot more likely to choose a vehicle to purchase based on the  
20 fact they're a TNC driver. And I think that's true, based on my understanding of  
21 the research. But cost is still a really huge issue for these drivers. These drivers  
22 generally have low household incomes and low personal savings. They're in  
23 pretty precarious financial circumstances and they're much more likely to purchase  
24 vehicles on the secondary market than to purchase new vehicles, so they need  
25 low-cost vehicles.

1           And so you could probably start to think about how this affects the  
2 likelihood that they would choose an EV. High upfront capital outlay to purchase  
3 a vehicle is a big problem for these drivers. And the lack of availability of long-  
4 range affordable EVs on the secondary market is a big perform for them as well.

5           They are, however, very attuned to operating costs for their driving  
6 activity and to fuel efficiency because they really realize how much that affects the  
7 money they make at the end of the day, and that could make EVs very attractive to  
8 them, if we could find a way to defray the upfront cost. And so, you know, I think  
9 it's also important to keep in mind that many of these drivers, just like some of the  
10 casual drivers, are inclined to participate in short-term rental programs provided by  
11 the TNC platforms like the Lyft Express Drive Program, for example. And that is  
12 because many of these drivers own cars may not be in good enough condition or  
13 new enough to drive on these platforms. But those drivers may have problems  
14 with as to home charging.

15           So I think that, you know, as others have mentioned, it is very  
16 important to focus on how we can solve these problems to take advantage of the  
17 potential for these drivers because they -- the vehicles that they're driving,  
18 particularly among the heavy, full-time driver population are doing a much, much  
19 heavier duty cycle and much greater mileage than a typical personally-owned  
20 vehicle, so it can offer really outsized benefits in terms of emissions reduction if  
21 they can be electrified.

22           And, as Don said, I would second the notion that the DMT that they  
23 do generate is highly concentrated in urban areas, where it has an outsized impact  
24 on local air quality as well as on the displacement of other sustainable modes that  
25 may be more common in those urban areas than they are in other parts of the

1 state.

2                   So I think the key challenges for policymakers are really about  
3 thinking about how we can adapt the incentive structures for purchase incentives  
4 we have so that they are really easy to retain by low-income drivers who are  
5 sensitive to upfront point-of-sale costs, even if that means adapting the redemption  
6 processes for things like ZZRP. And then also making sure that those incentive  
7 programs actually work for fleets, so that drivers who are renting vehicles on a  
8 short-term basis can take advantage of them by having their rental costs reduced,  
9 even if the vehicles themselves were purchased and owned by fleet rather than an  
10 individual.

11                   And of course we want TNCs to be motivated to promote these  
12 options to their drivers. And I'm encouraged by commitments like Lyft's that are  
13 voluntary but also think that the Clean Mile Standard is really necessary to help  
14 ensure that those incentives are fully aligned so that TNCs promote those options  
15 as wholesomely and as fully as they can to drivers, because they have such a  
16 powerful channel of communication and intermediating the driver's vehicle  
17 selection process when it comes to those short-term rental vehicles.

18                   From an infrastructure perspective, you know I have -- it's not  
19 something which I have as much expertise as other speakers on this call, but I  
20 would second the notion that it's critical that the siting of that infrastructure be  
21 done such that it is ubiquitously present in the areas where the vast majority of  
22 ride activity occurs and not along things like the freeway corridors, where the vast  
23 majority of fast charging facilities are currently located. That's just really not  
24 particularly useful from a Lyft driving perspective, especially if drivers want out  
25 utilize that while they are out in the middle of their driving shifts.

1 And I think I will leave it at that.

2 MS. SAHNI: Thank you, Emily.

3 And we'll go on to our next panelist here, is Jon Walker. He is a  
4 Sustainability Policy Manager for Lyft. Lyft of course is a large ridesharing  
5 company based on in California. He has also worked as Lyft's transportation  
6 policy manager and collaborated often with cities in the form of transportation  
7 partnerships. He has also coauthored, "Peak Car Ownership, The Market  
8 Opportunity of Electric Automated Mobility Services."

9 So with that, I will give it to Jon.

10 MR. WALKER: Great. Thank you, Shobna.

11 So, first of all, thank you for having me on the panel. It's great to  
12 see a lot of familiar faces. Even when we're kind of quarantined, it's fun to get the  
13 band back together virtually like this, so appreciate it.

14 And I think most of you have seen the big news out of Lyft is that we  
15 have made a commitment to a hundred percent electrification by 2030. And that  
16 was no small undertaking internally and it's going to be no small undertaking  
17 externally. So today I wanted to talk about why we did this that, why does that  
18 matter to us, and then I want to talk about the how. And then I'll close with what  
19 are the barriers. Why is less than one percent of the TNC fleet electric today  
20 when more than that is electric in the general fleet. And my co-panelists hit on a  
21 lot of those key areas. But next slide, please.

22 Okay. So why Lyft EVs. Why do we at Lyft care about  
23 electrification. Next slide.

24 So money. I mean money talks and money is super important.  
25 And something that is really important is driver pay. I think we can all agree we

1 want driver partners to get paid as well as possible. And a study just came out  
2 from Cornell and found medium earnings about \$23.25 per hour, which is pretty  
3 good. And that equates to about \$50,000 per year, which is close to the median  
4 in Seattle where the study was done, for about 53,000. So I think contrary to  
5 some belief, the numbers out of Cornell using real data from a very respected  
6 source show that rideshare drivers are well paid.

7           And their number one expense, though, even within that \$23 per  
8 hour, that's after expenses, their number one expense in that study is gasoline.  
9 And so we are very interested in removing that expense from drivers so they can  
10 make even more money.

11           And so what we're doing, and I'll talk a little bit more about this, and  
12 Emily talked about the rental program, our nearest-term leverage point is working  
13 with rental car companies on a rental product to bridge some of the capital cost  
14 barriers and the technology and education barriers.

15           And in that program right now we are renting electric vehicles in  
16 Seattle, Atlanta, and we did our biggest in Denver late last year. And we have  
17 partnered with Electrify America, EVgo, to provide unlimited fast charging on those  
18 networks. So Lyft has quite a bit of skin in the game to make the economics even  
19 sweeter for drivers, for paying for the fuel for our EV renters. And so the next  
20 slide, please.

21           And then I won't spend too much time on this because I think Don  
22 has made the case, and if you read Alan Jenn's paper out of U.C. Davis, one way,  
23 you know, we can say TNCs emit more carbon. Another way to say it is every  
24 time we electrify a TNC vehicle, that's more bang for our buck. And U.C. Davis  
25 found that electrifying a Lyft vehicle curbs three times more pollution than a

1 personal car because of the high mileage and the usage of the TNC.

2           So when we think about public funding or incentive programs, this is  
3 a pretty good place to put it. And also considering that some of the stats that  
4 show half of drivers come from low-income Zip codes, our data shows two-thirds  
5 of drivers identify with minority groups. So this is a phenomenal way to get clean  
6 vehicles into the hands of folks that aren't traditionally the main buyers right now.  
7 Next slide, please.

8           So how are we going to do this. You know, the commitment we  
9 didn't make lightly and we didn't do it without figuring out how we were going to do  
10 it. So next slide, please.

11           So Emily teed me up perfectly. We think about the driver partners in  
12 essentially two big buckets. There's a bucket of folks that are driving a lot, and  
13 that's actually very, very small. According to the Cornell study, less than seven  
14 percent of all drivers are driving 40 or more hours. So the vast, vast majority of  
15 drivers on the Lyft platform are doing this very part time and very temporarily.  
16 And so -- and we already made this point too, but it's very challenging for them to  
17 switch their vehicle -- switch their vehicle for this short-term thing. So with that,  
18 we need battery costs to come down in a robust used car market, but the nearterm  
19 opportunity is this rental model, where we've already proved that if drivers can get  
20 an incentive to choose an EV, which they have gotten in Colorado, and  
21 Massachusetts just modified their state tax credit so that drivers can access it in  
22 fleet capacity, the EVs will follow.

23           So we are -- you know, we would love to bring quite a few electric  
24 vehicles to California. We need to align the incentive programs, though, with the  
25 business model of TNCs. And I'm not saying 20 percent of programs at Lyft. I

1 don't think anyone's saying that. What we're saying is let's point the incentive  
2 programs at TNC drivers because, for a number of reasons, they are not switching  
3 over to electric.

4           And then just to wrap up, I know I'm over time, if you go to the next  
5 slide and I'll just wrap up. One more, please. So what do we need to do. We  
6 need to aim incentives at drivers. It's very different than consumer drivers. And  
7 then, secondarily, we need to defray costs of the fast-charge network, so it's great  
8 to see my fellow panelists about that. Then, third, I would love to talk about how  
9 can we get low-income folks the electrical upgrades that they need at their home  
10 to the charging that a lot of folks take for granted when they go buy a Tesla, they  
11 put it in. So I'd love to talk about a program where lower-income folks get the  
12 electrical upgrade so that they can participate in the overnight charging.

13           MS. SAHNI: Great. Thank you, John.

14           Before we go to questions, we're going to go back to Jeremy. I  
15 know he had, he wanted to share, finish, I guess finish his presentation. So we'll  
16 go back to Jeremy.

17           MR. MCCOOL: Thank you for that. I'm going to share my screen,  
18 and thank you for that permission to do that as well.

19           So I just wanted to show everybody how this actually works and that  
20 this isn't just a technology in a hardware sense. It's a technology in a full  
21 complete sense as a platform. Here we've got a station. It's available. We  
22 know it's available because it's green. This is the name of the location. It's  
23 wireless. And you so you go and see it at 7.2.

24           So I'm going to tap that charge button. And from here it tells you  
25 which station you need to go to. Anyone who has had to charge an electric



1 vehicle in public knows that often finding them is very hard. Now to do that with  
2 wireless charging where it's not as easily seen as plugin charging. And you start  
3 them up into a program. But, as you see here, I have a parking zone. I'm going  
4 to pull up while I've got you guys on my screen and show you how this works and  
5 how this software works to help people be able to enable that there in the right  
6 location. So it's pretty easy. I just align the vehicle already and I hit Start  
7 Charge. And now we are charging.

8           Some of the critical things that we showcase that are really important  
9 we believe to the customer and certainly has to do with efficiencies is actually  
10 efficiency. So, as you can see here, we're charging about 6.2 to 7 kilowatts, or  
11 so. I'm going to tap on this card here, and it shows us how many miles we've  
12 gained dynamically. It shows us what our running total is in terms of cost. But it  
13 also shows as you the end-to-end efficiency. And we're measuring that from the  
14 outlet always to the battery, which, by the way, nobody does. Not to mention, that  
15 we have the stated charge in the middle of the screen as well, so you can see  
16 what the charge of your vehicle is or a fleet can see what the charge of their  
17 vehicles are remotely and be able to do that anywhere in the world without having  
18 any issues.

19           One last thing about our end-to-end efficiency, typically plugin  
20 charging at level 2 is somewhere around 80 to 85 percent efficiency. So we're  
21 actually somewhere around three to five percent more efficient than most typical  
22 plugin charging.

23           I'm going to go ahead and end it there, and hopefully take on some  
24 other Q and A.

25           And thank you again for that time.

1 MS. SAHNI: Thank you, Jeremy.

2 And I guess now it's time to go back to the dais for some questions.

3 COMMISSIONER MONAHAN: Thanks, Shobna.

4 I encourage actually everybody who's on the panel, if you could put  
5 your video and come back. Great.

6 Well, it really is nice to see so many familiar faces. So I do have a  
7 few questions. I'm sure Dan does as well. And then if you want to take it off, if  
8 Dan wants to go first.

9 PROF. SPERLING: No, you go --

10 COMMISSIONER MONAHAN: I'm happy going second.

11 PROF. SPERLING: You're the one. You're the one,  
12 Commissioner Monahan.

13 COMMISSIONER MONAHAN: I'm the one who gets to go first.

14 Well, I guess I have a question for different folks. I'm curious,  
15 Jeremy, on the wireless charging, just what -- are there car companies that you're  
16 working with on integrating the technology to make it seamless so you don't have  
17 to do a retrofit and --

18 MR. MCCOOL: We are. Sorry.

19 COMMISSIONER MONAHAN: And if it takes that, that would be  
20 great. And whether this is -- whether you think there is a difference between light  
21 duty and heavy duty in terms of the utility of the technology and the barriers in  
22 terms of -- I know that it's not as fast or at least historically that's what we hear, is  
23 that it's not as fast as the wired charging, what's the loss for -- what's the downside  
24 of wireless charging in terms of speed of charging.

25 MR. MCCOOL: Got it. So really great questions. And I'll start

1 with saying one thing about the cost of our system is that this is a dual level 2  
2 charger, so you get plugin and wireless as and option with it. In our costs for our  
3 system are under \$3,000. Compare that to level 2 chargers in the market that are  
4 also dual chargers where all sues, industrial sues, curbside uses, and those costs  
5 are going to typically go for 2,- to \$10,000, so we're on the lower tier of the actual  
6 costs. And that includes the after-market costs required for the vehicle. The  
7 vehicle equipment is only \$250. And that makes us very attractive, especially for  
8 fleets, but also for consumers.

9           And we talk about disadvantaged communities. One of the primary  
10 things that are going to be there is that you have to be innovative around the  
11 business model. And our business model is that nobody buys this equipment.  
12 We actually provide it as a service in the total service contract for a customer. So  
13 instead of them having to buy the equipment upfront and then pay for the  
14 installation and then go find a network carrier for their internet and then also go  
15 figure out a contract agreement with the utility, all that gets covered within one  
16 single price for a month basis on their contract. And of course the contract link  
17 then determines what their price is going to be. And that immediately removes all  
18 the extra hurdles that typically do come with electric vehicle ownership and electric  
19 vehicle charging. So back to that point that was brought up earlier.

20           But the other point about are we working with auto makers. Many.  
21 We actually have over a half a dozen auto makers, major global auto makers, and  
22 some auto makers hanging out in Silicon Valley, I can't say who. But we have  
23 several that we have relationships with. And initially this will be an after-market  
24 retrofit type of market. But by 2024, 2025, we will have the wireless charging  
25 systems on vehicles automatically from the line.

1           But let's not mistake something here. By having an after-market  
2 retrofit system, we're giving jobs and opportunity to those local mechanic shops  
3 and dealerships who are hurting for revenues. And it gives them the opportunity  
4 to take part in the electrification of mobility, but then also to take part in the  
5 wireless electrification of mobility. And, you know, everybody could use a buck  
6 right now. So we can help out with that.

7           Did I answer your questions in total, Commissioner?

8           COMMISSIONER-MONAHAN: Yes, I think so.

9           MR. MCCOOL: If I haven't, --

10          COMMISSIONER MONAHAN: I --

11          MR. MCCOOL: There was one more question, you had a question  
12 about the charging rates. So our --

13          COMMISSIONER MONAHAN: Yes.

14          MR. MCCOOL: -- efficiencies are typically like three to five percent  
15 more than level 2 plugin charging. So we measure inefficiency from the outlet to  
16 the battery. And then we show that to the customer while they are charging, so  
17 they can see it. They don't have to guess it. Nobody in the world does that, or  
18 really any production in the world on top of that. You don't get that with your  
19 phone, you don't get that with your computer, you don't get it with refrigerator.  
20 But we give it to you.

21          But -- so to answer the other point, we had the building of fast  
22 charge. We built systems with 30 kilowatts. This is our introductory production.  
23 But, you know, democratizing electric vehicle charging means it needs to be in the  
24 right cost component and all these other things, so we have the level 2s right for  
25 our production. An American made product, by the way, in case that matters.

1           COMMISSIONER MONAHAN: It does, especially if it's a California-  
2 made production, we really care about it.

3           MR. MCCOOL: It's in Austin, Texas, but we're coming up to  
4 California. We are a Californian company already.

5           COMMISSIONER MONAHAN: Well, my next question I think is  
6 more for Jon, but other panelists may have an opinion on this. So we heard this  
7 morning from Cruise auto and how they're planning to build charging stations as  
8 well as -- in addition to their autonomous vehicle fleet. And there's a big question  
9 about who pays for the infrastructure -- well, multiple questions on the  
10 infrastructure side. Where do you put it, how do you price the electric speed  
11 correctly. And, you know, we are trying to make investments as a state in  
12 charging infrastructure, publicly-available charging infrastructure, and there are  
13 definitely intersections with drivers of TNCs in the public sphere. But I'm curious  
14 about, you know, for widescale deployment, what is the role of Lyft and other  
15 TNCs in actually providing infrastructure. That's one question.

16           The second question I have is around the -- and as Jon knows quite  
17 well, you know, the grid impacts of charging at the -- at peak times are bad and  
18 going to be expensive. You ideally want to capitalize on times when we have  
19 over generation of renewable work or curtailing renewables in the middle of the  
20 day. That's the optimal cost for TNCs, to be able to plug in and charge. I was  
21 just thinking about whether Lyft and other companies are -- are considering  
22 vehicles for integration issues in their strategies to elf transportation.

23           MR. WALKER: Yeah. Thanks, Commissioner Monahan. Both  
24 excellent questions. So on the first one, we haven't necessarily ruled out loading  
25 and operating infrastructure. But the fact of it is Lyft's real estate footprint is tiny.

1 And even if we put chargers at every piece of real estate that we rented, there  
2 wouldn't be enough to satisfy the demand of a widespread electrical grid. So our  
3 strategy right now is to partner with the EVgos, the Elf America's, the charge  
4 points of the world to that. We literally have deals with those companies. And  
5 that's a lot of skin in the game for us. So we have negotiated deals with them.

6 And then we are paying the sometimes very high fast charging costs  
7 for the drivers on the rental program to basically subsidize that for now.

8 So I think as we go forward, what we're interested in from public  
9 entities is to make the cost lower for these -- for the charging providers, make the  
10 permitting process faster. You know, you could -- we would defer to EA or EVgo  
11 on exactly what, but it needs to be less expensive and easier to put in the fast  
12 charging infrastructure.

13 And then, as I mentioned, I think we need to make it easier to get to  
14 240, because to your second question, a combination of fast charging and then  
15 overnight charging would be best for the grid. And then our early data is showing  
16 that the fast charging is happening kind of mid-day, which is fantastic. That's our  
17 early data out of Denver. It's kind of inverse of the duck curve. So it's a theory  
18 that we've had all along that TNC electrification would be complementary to the  
19 duck curve, is proving to be true. And then if you add overnight charging to it,  
20 then you're going to be off -- then you're doing even better.

21 And we have plans to add into our app grid functionality. That's  
22 probably a few years away, but we could have signals go straight to drivers  
23 through the app and the software, we can turn it on, we turn it off, and we're -- you  
24 know, we're in the final talks with some power providers in California, who really  
25 care about this, and talked about a pilot program where we could actually look at

1 charging and then start to think how we optimize that.

2 COMMISSIONER MONAHAN: And, Jon, am I getting it right that  
3 are you investing in the charging infrastructure with these charging providers or  
4 are you just having -- like can you elaborate on who is actually paying for the  
5 charger?

6 MR. WALKER: So I guess it depends -- I mean at the end of the  
7 day what we care about is costs to deliver a kilowatt hour. And I would say right  
8 now that cost is split between us, the charging companies, and then whatever  
9 city/state and utility rebates they have, so the three of us are splitting that cost.  
10 We are putting quite a bit of money into that program, though. And we believe the  
11 charging companies are giving us a fair rate and then cities and states are adding  
12 to that, but it's not sustainable longterm. You can't have fast charging that costs  
13 as much as gasoline or you kill the entire point, you know, you kill the whole value  
14 prompt. So we really need to get that down from that 30, 40, 50 cents a kilowatt  
15 hour down into the tenish to make it really powerful.

16 MR. PURI: Commissioner Monahan, if I might add on top of that  
17 question to give a little more context. I think Jon makes a great point, it all comes  
18 down to economic viability. We're talking about that in a bunch of different  
19 categories, from the perspective of the fleets, from a perspective of the general  
20 public, and from the perspective of drivers. But we also have to consider the  
21 charging infrastructure providers. And what it comes down is actually utilization,  
22 right.

23 Fleets want their fleet utilization to be as high as possible and  
24 charging providers want their charging utilization to be as high as possible. But if  
25 you think about those two things, they kind of counter one another. If the vehicle

1 is driving a lot, it's probably not charging very much. And so how do you actually  
2 bridge the needs of both and then build an infrastructure plan that makes the most  
3 sense. And for some fleets, they're forced to build their own, as we saw with  
4 Cruise earlier today. But I would argue there is not a huge difference in the  
5 charging needs of Lyft, Uber, Waymo, and Cruise. As time goes on, their needs  
6 will converge. They're going to need the same things. They need chargers near  
7 where their fleets are active. They need amenities for their drivers, where one  
8 day they're going to be driverless, right, they're going to be thinking about vehicle  
9 cleaning and maintenance. So it's all going to kind of converge on the same sorts  
10 of needs across these fleets.

11 And so it's really about how do we maximize the utilization of that  
12 charging infrastructure by doing things like sharing and putting them in the right  
13 areas that will lead to the better cost parameters for drivers themselves, right. It's  
14 easier to justify a lower cost of energy if those charging assets are actually used.  
15 And right now in the general public, you see fast charging utilization, it's quite low,  
16 so that is why the prices have to be so much higher.

17 COMMISSIONER MONAHAN: Yeah. No argument here. I mean  
18 it is -- we're trying to figure out what's the right level of investment by government,  
19 to be able to eventually stimulate the market enough that we will not need  
20 government funds, supplemental funds anymore, the market will be self-financing.  
21 And you may always need utility investments that are very focused on ensuring  
22 that all ratepayers are benefitting, but beyond that we need to move to a place of a  
23 self-sustaining market. And that's the question we're wrestling with pretty  
24 intensely right now because we can't incentive -- we can't give incentives forever.

25 And in this one place with TNCs, you know we are really -- I'm



1 struggling with like how do we support this market. How do we make sure that  
2 are investments benefit the driver of the vehicle in the short term. In the long term  
3 this needs to transition, right, to a place where I see a strong role for TNCs in the  
4 charging network because you can optimize, as you said, Jon's app. You can  
5 say, all right, you're going to drive this amount of miles and you're going to pick up  
6 this driver and then you're going to go charge your vehicle. And once you move  
7 maybe many, many years down the road, the system has to be the way it works.

8           So it seems like the transportation network company has to play a  
9 big role in this charging network. And so it's good to hear that you're starting to  
10 develop those relationships with the providers to do that.

11           Dan, how about -- I'm hogging the questions -- why don't you jump  
12 in.

13           PROF. SPERLING: You did a great job. I loved your questions.

14           You know, this was a fascinating session. I really enjoyed it. A lot  
15 of different perspectives. And I struggle with how to frame what are the  
16 challenges and strategies to address them. And so, kind of listening, I broke it up  
17 into three groups. One is the charging infrastructure, the other is the purchase  
18 incentives for the EVs, and the other is the role of the companies, the TNC  
19 companies themselves and the role they play.

20           And so if I start with the charging, so I'm going to ask the panelists to  
21 follow up on some of these ideas, help at least me think through them and I think  
22 hopefully that's useful to the Commission. You know with charging, so far we've  
23 done two things that are not very helpful for TNCs. We've put the charger, the  
24 fast chargers mostly on the freeways because we've had the model that the fast  
25 chargers are for innercity travel, but that's not, as was pointed out here, that's not

1 really what's needed for the TNCs. And they need it in the urban area.

2           The other thing we have not done well is we haven't been sensitive  
3 to low-income owners and drivers. And Jon really pointed this out well. And  
4 most of these drivers are relatively low income. And so how do we -- and so  
5 those are the two big challenges. You've got to shift some of this infrastructure.  
6 You know it goes back to optimizing. How do we shift it more to the urban areas.  
7 And how do we make it more available to low-income drivers that are going to be  
8 using it.

9           And I would point out kind of a slight different viewpoint than the  
10 Commission has or at least Commissioner Monahan about this idea of a self-  
11 sustaining market. It's hard to see that chargers, whether level 2 or fast chargers,  
12 are going to be self-sustaining on their own, at least in terms of selling the  
13 electrons. So all of it is like Jon Walker was pointing out, you know, the TNCs  
14 pay a little bit, the local governments pay a little bit, employers pay a little bit, and  
15 utilities pay a little bit. And I think that's going to have to be the model going  
16 forward because you just can't make money from selling electrons to vehicles. So  
17 we need to figure that out.

18           We did make a change and maybe this is worth following up. With  
19 the Low Carbon Fuel Standard, a year or two ago we changed it so that there are  
20 additional credits for fast chargers. We did it for hydrogen stations and fast  
21 chargers and it's having an effect with the hydrogen stations, but I haven't heard  
22 anyone taking advantage of it for fast chargers. And maybe we ought to be  
23 looking into that, you know, and maybe we need to change that a little. I'd be  
24 interested if anyone has any insight of that.

25           And then on the purchases, somehow we need -- what we've done

1 wrong again is none of vehicle incentives are tied to utilization of the vehicles, the  
2 VMT. And, as that was pointed out, you know, including by my colleague Alan  
3 Jenn, these vehicles are using much more energy and reducing much -- you know,  
4 in per-passenger mile are really an important part of the solution.

5           And so, for instance, maybe CARB should be adjusting its CVRP.  
6 Maybe the incentive -- so there's an incentive program going to be built out of the  
7 LCFS program to give rebates back to EV buyers. You know maybe that ought to  
8 be modified also to incentivize EVs for TNCs.

9           And the last one is the company perspective. And I think actually  
10 what CARB is doing goes a long ways to solving that and is in someway creating  
11 the conditions for the TNCs to incentivize their drivers -- I guess incentivize the  
12 companies to incentivize their drivers to get EVs. And of course what Lyft has  
13 done, you know and I had some discussions with them before they made their  
14 announcement, is to make sure that they not only, for their own goodwill do this,  
15 but that there is a regulatory and an incentive structure that supports them in  
16 shifting to EVs and doing all the little things that are needed to make that happen.

17           So I'd be interested in taking any of these three any further than I did,  
18 you know, the charging, purchase incentives, and the role of companies.

19           COMMISSIONER MONAHAN: Did I also hear regulation?

20           PROF. SPERLING: What's that?

21           COMMISSIONER MONAHAN: Well, you also talked about  
22 regulatory. I mean I don't know if it's a driver. It's a city credit, right, under the  
23 fast -- there has also been talk about modifying the ZEV mandate so that if -- for a  
24 TNC to demonstrate that it was doing a lot more emiles than you would expect,  
25 you'd get some kind of credit for that, like extra miles driven on an electric vehicle

1 shared in a fleet.

2 PROF. SPERLING: Yeah. And that can be done in separate  
3 ways. It can be done through the ZEV mandate itself. It can be done through  
4 the incentive programs. And it actually can be done through the vehicle  
5 greenhouse gas performance standards, the CAFE Standards. It may be -- I'm  
6 glad you mentioned that because as we go towards the next round, that's  
7 something that we could do as well.

8 You know we do have to assure there has to be some kind of way of  
9 confirming validating accountability that the vehicles actually are being used. You  
10 know maybe Jon Walker can comment on how that might happen. Because  
11 that's true for a lot of these things that we're talking about, all of these incentive  
12 programs.

13 MR. WALKER: Yeah. I think you're both hitting on the exact right  
14 points, that incentive programs need to be designed for high-mileage fleet vehicles  
15 if we want to start to making the transition. And they're not designed for that right  
16 now. They're designed for consumers buying Teslas, right. So we need to start  
17 thinking about how we modify CVRP, how we modify the DLCSM Program or how  
18 we spin up new programs within that umbrella to give incentives, again, to the  
19 drivers on TNC platforms. That's what has to happen so that the cost to the driver  
20 is less than the cost of a gas car.

21 And then on charging, we need the charging to be -- I'm sort of in the  
22 middle, like in between Patty and Dan on this one, I think we could get to a stable  
23 place if once all the hardware is installed. So if there are subsidiaries for  
24 hardware and installation, then the electrons become a pretty good business and  
25 EVSC companies are doing maintenance and other things. But it's just that initial

1 upfront cost of fast charging that kills us and then it's also the initial upfront cost,  
2 frankly, to go to a 220 in a garage or an apartment complex that a person with not  
3 a lot of capital or credit, they don't have \$500 for an electrician to come put in 220,  
4 so how can we get 220 to those people.

5           Lyft will pay for the fast charging. Lyft will buy the L2 cable. We  
6 just need the electrical -- we just need the sockets to plug it into and we can do it.

7           MR. ANAIR: I guess I could take a stab at this. Dan, you had laid  
8 out a lot of good starting marks for the conversation, so I appreciate that.

9           You know I think on the purchase incentive piece, it's -- you know, I  
10 think Lyft's example in Denver is one where some changes to incentive structures  
11 has led to some deployment of EVs there. So I think there's an opportunity in the  
12 near term in California to think about ways to do that. I think there has been  
13 some hesitancy to make some sweeping changes to CVRP or existing programs.  
14 You know those are already over subscribed. And I think while there is certainly a  
15 rationale for higher-mileage vehicles, I think there is also a rationale for that  
16 program to be having a broad impact on the vehicle market as a whole.

17           So I think there is a balance there, but I think there is an opportunity  
18 and especially in the near term before standards are in place, like the Clean Mile  
19 Standard, to get some pilot programs going in California both on the -- so, for  
20 example, the leasing model I think is one that is interesting. It's a way to be able  
21 to avoid that upfront cost for drivers, an upfront commitment, and rather do a  
22 short-term leasing program.

23           I think if there are going to be some programs incentivizing that  
24 leasing structure, I think it's important to look at ways to put some protections in for  
25 drivers in those leasing programs. I think if we look to some other industry

1 examples, Dray's Trucking (phonetic) comes to mind for me, you know, there are  
2 concerns about leasing models because how they have been done in the past and  
3 how individuals and drivers have been on the hook. So I think there's  
4 opportunities to put some protections in place to make sure that that doesn't  
5 happen and make sure that the model is a good one going forward, so encourage  
6 us out think about that as we think about potentially supporting that.

7           Basically the other point I would make overall is we're looking at the  
8 transition in an industry over several years. Right now we have on the vehicle  
9 side costs are higher than a gasoline vehicle. That's been changing. It's been  
10 getting better, it will continue to do so. At some point, and I think in this case it's  
11 an industry where there are consumers out there paying for wrap. There is a way  
12 to pay for a transition to electrification.

13           And while right now I think it's appropriate for incentives, I don't think  
14 that a long-term incentive program to elf ride-hail is appropriate. At some point,  
15 as Patty said -- Commissioner Monahan, apologies -- that this does need to be a  
16 sustainable market. And if that means ride-hail trips cost a little bit more to make  
17 sure that they're lower emission, I think that's an okay outcome.

18           Let's see, on charging infrastructure, you know, on the flipside of the  
19 leasing model is here is an opportunity for electrifying vehicles in lower-income  
20 households. And we've been, as a state, have been trying to do that. There are  
21 programs providing greater incentives for lower-income individuals. I think maybe  
22 on top of that households who are doing higher mileage, maybe there is an  
23 opportunity there to support home charging access.

24           We know that for situations where people don't own their homes,  
25 there's barriers, for apartment buildings. That broader issue needs to be solved,

1 and maybe this is an opportunity to actually accelerate some of those changes.  
2 So I think it's a challenge but it's also an opportunity for making some positive  
3 impacts, or something.

4 MS. SAHNI: Yeah, this is Shobna. And I know I pointed this out  
5 too that there different kind of types of TNC drivers, so I think I would be careful as  
6 well just to design a program just for them because it is different in the short term  
7 versus long term. And it's different for kind of two different, you know, distribution  
8 of drivers. That's probably the best way to put it.

9 And so I think it's hard to design a program specific for them as far  
10 as incentives, but definitely adopt our incentive programs as they are now to make  
11 sure that we capture some of those high-mileage fleets, so I think that's definitely  
12 doable. Now he have been working internally to figure out how we could do that.

13 MS. WARREN: I have one quick comment just in response to that.  
14 I think, yes, there is enormous variety in the way that drivers participate, but I don't  
15 think that that's a reason why it would be inappropriate to develop a mechanism to  
16 allow fleet-owned vehicles that are being rented out to drivers, whether they mean  
17 part-time drivers or full time drivers, to allow that mechanism to be created. I  
18 think the short-term leasing model is one that is currently being utilized by drivers  
19 across that spectrum. And, frankly, that could be utilized by other types of fleets  
20 as well. I mean it doesn't have to be exclusive to TNCs. So I see a lot of utility in  
21 the creation of that kind of mechanism from an incentive perspective.

22 MR. WALKER: Yeah. Plus just one final point on that is we have  
23 been -- like I said, we have been in talks with a lot of folks like about a mechanism  
24 to do it. And I think the mechanism that would work is to have the incentive flow  
25 right to the driver, so the driver goes into the rental car company. The gas car is

1 \$200. The unsubsidized EV is \$280. So that doesn't make sense. But maybe  
2 they have a coupon or a voucher to get that cost of renting the EV down. Now  
3 that money is going straight into the pocket of a driver. And it's enabling the  
4 driver to make a choice about clean vehicles and it's enabling the vehicle -- the  
5 rental car companies to offer electric vehicles where they would lose money  
6 without an incentive. And then again on top of like what we will raise to the table  
7 is the charging cost, the driver acquisition, et cetera, et cetera, all the super  
8 powers of the TNC to increase electrification if the economics work for these car  
9 rental companies.

10 PROF. SPERLING: I think I would be remiss if I didn't include one  
11 other little idea here that many of you probably already know what I'm going to  
12 say. I see Don smiling already. And that is developing a fee bay that is tailored  
13 to, you know, more intensively-used vehicles like TNC cars and provide an extra  
14 incentive that way. And that way it Meets Commissioner Monahan's desire for a  
15 self-sustaining model with no government taxpayer money.

16 But I think -- you know all of this is a great discussion because we  
17 really haven't in the policy world, the regulatory world, we've not really put much  
18 effort in tailoring these incentive programs and regulatory programs to TNCs and  
19 the electrification of TNCs. So I think that's one of the take-home messages at  
20 least for me from this panel.

21 COMMISSIONER MONAHAN: Great. So I think we can now turn  
22 it over to you, Shobna, for the rest of the Q and A, the rest of the session actually,  
23 and I will go off video for now.

24 MS. SAHNI: Okay. I know one of the questions that we had that  
25 we were starting to talk about a little bit, but what opportunities are there to



1 enhance mobility for disadvantaged communities? I wanted to throw that  
2 question out there and see if any of the panel members wanted to address that.

3 MR. WALKER: And I'm happy to take a quick look at that. So I  
4 think that naturally what Lyft does is provide earnings opportunities to folks, a lot of  
5 folks from communities of color and disadvantaged communities. And it's  
6 something of a unique thing where almost everybody can participate. And, you  
7 know, the data coming out of  
8 Cornell says it's a pretty good side job, which it is a side job for almost 90-some  
9 percent of the drivers.

10 So I think electrifying the TNC fleet naturally accomplishes that. It's  
11 -- our drivers happen to be the folks that you're talking about. And so any way we  
12 can do that achieves a goal of a low-income program. And, again, not to be a  
13 broken record, but the most near-term thing we can do is the fleet vehicles. And  
14 then we also need to start building the long-term ability of consumers, of drivers to  
15 switch from their gas car to an electric vehicle, even if they are driving four hours  
16 on the Lyft platform. So right now they won't do that, they won't change their car,  
17 but in 2028 maybe -- you know, we have to have it so it's a no-brainer that they  
18 can switch to electric.

19 MS. SAHNI: I think one of the biggest barriers probably to that is  
20 infrastructure for those drivers. You know, we kind of covered it a little bit more  
21 on how to -- that there is providing infrastructure where they live and providing  
22 infrastructure where they're driving, are two different things. And so, you know,  
23 any thoughts on that as well?

24 MR. ANAIR: Well, on the broader question of, you know, how can  
25 TNCs and TNC electrification enhance mobility for communities, I think one of the

1 potential maybe indirect impacts here is to the extent that companies like Jon was  
2 saying are working with charging companies to expand the DC fast charging  
3 network, so I think that that is potentially a side benefit, as long as those chargers  
4 are public, obviously, and conveniently located in communities. So I think that's  
5 an indirect benefit.

6 I think more directly there are risks here too. The communities -- for  
7 sustainable community transportation, we need to have lots of mobility options, as  
8 I mentioned in the presentation, and I think ride-hail is a piece of that. And some  
9 of the challenges we see are local decisions about the transportation that is in the  
10 communities. And if we're making decisions about cutting transit funding, for  
11 example, and replacing that with ride-hail, that can be extremely challenging. On  
12 the other hand, there can be an important complementary role of ride-hail to  
13 provide greater mobility in communities as long as it's affordable. And I think  
14 that's one of the big challenges here, is ensuring that. You know ride-hail itself is  
15 not an affordable -- transit is a more affordable option than ride-hail. You can't  
16 just replace transit with ride-hail in ensuring that there are affordable mobility  
17 options.

18 I guess the last thing I would say is I think just as the ARB's Clean  
19 Mobilities Options Program is an example where the community-driven solutions  
20 for mobility is really at the center of how are these tools going to be most useful to  
21 a community, and I think there need to be community-centered solutions. So I  
22 think to the extent that regulators and companies are working with communities in  
23 figuring out what the solutions there that they want is the critical piece of that.

24 MS. WARREN: I'm happy to comment on that question as well with  
25 respect to the role of TNCs in providing mobility to disadvantaged communities. I

1 don't want to stray too far off of our main topic here, about electrification, but I think  
2 most of the answers to that question is actually not about electrification. It's about  
3 the role of TNCs as a passenger-carrying transportation mode. And in that  
4 regard, I think that -- you know I work extensively with public transit agencies  
5 these days and I'm very often part of planning processes in which those transit  
6 agencies are grappling with the exact kinds of questions that Don was mentioning.  
7 But I think that the agencies are facing a question of given limited resources, how  
8 to best allocate those resources for the provision of service such that they provide  
9 the highest level of service level possible across the broadest scope of coverage  
10 that they can for communities. And given that there are variations in population  
11 density in different areas, there are some areas that are really viable for providing  
12 high-frequency public transit service. And there are other areas that are not.  
13 And in the areas that are viable, they would like to provide the highest frequency of  
14 service possible.

15           What I think the introduction of on-demand transportation options as  
16 a new kind of form of complement to traditional fixed-route public transportation  
17 operations can provide is the ability to offer a high service level in areas that are  
18 not viable to the provision of fixed-route service that can expand the geographic  
19 coverage of the agency while allowing it to focus most of its own operations along  
20 the fixed routes where there really is a lot of demand and offer a better service  
21 level there.

22           So I think it's developing a portfolio of service-delivery mechanisms,  
23 some of which are on-demand, some of which are fixed-route, to hopefully raise  
24 the bar for the entire system and to serve those outlying areas that traditionally  
25 would have had no service or would have very poor service to do it in a more

1 financially sustainable way at a higher service level, like -- I guess we can leave it  
2 at that and get back to electrification.

3 MS. SAHNI: Okay. Okay, Jeremy, I know you had your hand up,  
4 so I'll let you.

5 MR. MCCOOL: Okay. Thank you for that. My air bus just died on  
6 me, so I'm going to have to switch over to my speaker. And you're able to hear  
7 me okay; is that correct?

8 MS. SAHNI: Yeah, we can hear you just fine.

9 MR. MCCOOL: Okay, great. Thanks.

10 So I'd like to have a couple questions towards Jon. So obviously  
11 you guys have a lot of things that you're working on to try to incentivize the  
12 program for your communities that are already driving. I wonder, though, that in  
13 the projects that you guys already have to date, are you seeing any issues where  
14 people around the plugin charging apparatus and those kinds of issues popping up  
15 like they were for the Car2Go Program that was in San Diego, so that's one part of  
16 that question.

17 And then the other part of that question is trying to get at the point  
18 where it sounds like you're going that lift is going to play a part in the cost cycle of  
19 the EV charging equipment, and I understand that part, is there an opportunity  
20 there where Lyft wouldn't want to play a part in any of that payment and also  
21 provide that level of EV charging to just a company to roll out for your to your  
22 drivers so that it's completely off of your table?

23 MR. WALKER: Yeah. So to the first question, no, we don't have  
24 the same problem Car2Go had. Car2Go kind of I don't know if someone from  
25 Car2Go wants to argue with me. But they kind of just put those EVs out there in

1 San Diego and nobody people didn't think the vehicle turned on because it was so  
2 quiet. So that --

3 MR. MCCOOL: Yeah.

4 MR. WALKER: We do a special electric vehicle onboarding for folks  
5 that have it, where we show them how to operate the vehicle, how to charge, we  
6 give them the Way2Go app, we give them the Electrify America app. So, no, we  
7 don't have any problems with that aspect of it.

8 What we have a problem with is that a lot of our -- a lot of the driver  
9 partners don't have home charging. And, again, they're doing this temporarily or  
10 very part time. And so to go and make an electrical upgrade is very hard for  
11 them. So you're using the 50-amp, which is great. We would -- if every one of  
12 our drivers had a 50-amp setup, we'd be able to deploy a lot of electrical vehicles  
13 because we could give them the 240 plug or we could work with you and do the  
14 wireless plug. And really the barriers around that electrical upgrade, so I think  
15 that's something that I would love to see the Energy Commission think about, is  
16 how -- when somebody asks for a 240 and it's prohibitive because of their income  
17 or where they are, how does the Energy Commission or CARB or the PUC allow  
18 that person to put in 240 and how it -- I think Norway calls it a right. It's a right to  
19 charge in Norway with a component 240. And we're not Norway, we're not  
20 Norway, but maybe we do it for high-mileage drivers.

21 MR. MCCOOL: Yeah, and they do it in Amsterdam too. Yeah,  
22 that's my understanding.

23 And one final question for you guys. Do you guys foresee  
24 autonomy taking a hard position in your future or over the next 10 years as well?

25 MR. WALKER: Yeah. Totally. We've been -- yeah, we've got a

1 lot of public materials out there but, yes, we --

2 MR. MCCOOL: Of course.

3 MR. WALKER: -- we are transitioning to an electric autonomous  
4 fleet, and the exact dates we don't know, but we've got a team working on  
5 autonomous. My team is working on electrification. And that is definitely the  
6 goal to create the Dan Sperling Three Revolutions that we're all well aware of.

7 MR. MCCOOL: So I would point the question back to the  
8 Commission and to the side and, really to Jon's point, the need for the charging  
9 stations and the infrastructure is really the gating function here, right? And being  
10 that most of the drivers are going probably, especially where I'm guessing Lyft  
11 predominantly is, is going to be in an urban environment, the real challenge comes  
12 to can we get that kind of cabling and power to those locations much easier. And  
13 the reality is I don't really believe that there is a need for an EV driver on the  
14 ridesharing side, ride-hail side to have to phone a station. That's crazy.

15 In my view and in HEVO's view, it would be better articulated that  
16 there is station positioned that gives that opportunity for them to charge at, and  
17 they just pay their simple monthly fee or their daily fee that hopefully is comparable  
18 or less than what they're paying for gasoline, and what other incentivization is  
19 required at that point? Because now it's just the management fees for EV  
20 charging, one vehicle charging at one time and another one at another time. And  
21 it's purely scheduling at that point.

22 MR. WALKER: The issue -- so in an autonomous world where, you  
23 know, Waymo or Via, or whomever has got the recruits, and they can move the  
24 cars around to the different chargers, I think that makes a ton of sense. But for  
25 now we have a problem where when we look at a heat map of drivers, it's going to

1 be totally different in three months. And so we've got to hit the puck -- pass,  
2 perhaps skate to where the puck is going, right. So how do we allow as TNC  
3 drivers turn over very frequently, how do we allow them to have access to  
4 dedicated charging. So it's a very challenging problem.

5 And I was just pointing out the one piece of it is the electrical  
6 upgrade, that if I'm driving on the platform for summer, I'm not going to spend  
7 \$500 to upgrade my garage, but maybe if there is a program, yeah.

8 And then to your point also, Jeremy, we don't think that that drivers  
9 need to buy a station dealer. Either they utilize an EVgo or an Electrify America,  
10 or Lyft provides the L2 or you provide the wireless L2, that is an asset that could  
11 transfer between drivers. It's just the electrical upgrade that is kind of the sub  
12 cost.

13 MR. MCCOOL: Agreed. and I would -- my final piece on this, and  
14 I will now put myself back on mute is really that the driver, they shouldn't be forced  
15 into that function, and you guys are going to have more drivers coming in from the  
16 urban areas because of job loss rates that are happening in places like New York  
17 City. And those people don't have garages, you know. So in thinking really to  
18 the unfortunate situation that we're in right now, we've got to think that it's going  
19 to be years of advancing these kinds of opportunities because they're going to  
20 have the ability to make money, it certainly shouldn't get stagnated because there  
21 is not enough realty for somebody to charge because they don't have a garage.  
22 That's nuts.

23 I'm putting myself back on mute. Thank you for the time. Thank  
24 you to Jon too.

25 MS. RAITT: So thank you, everybody. This is Heather Raitt. I

1 need to stop the conversation. It's a good conversation, but I do need to reserve  
2 just a couple minutes to take some questions from the attendees. And so Jon  
3 Bobadilla has -- is going to be moderating for that. So, Jon, if you could go ahead  
4 and ask a question from the attendees.

5 MR. BOBADILLA: All right. This question is from Carrie Sisto: It's  
6 clear that TNCs are not spending money to install charging stations. Jon just  
7 mentioned Lyft is partnering with EVSPs. Has it considered working with the  
8 utilities directly or CCAs?

9 MR. WALKER: So, yes and yes. I mean we have great  
10 relationships with a lot of utilities and CCAs. And we've got -- I don't want to let  
11 the cat out of the bag, but -- an exciting announcement with a CCA coming up.  
12 And so, yes.

13 And I would argue that -- I mean it depends on how you think about  
14 ownership. I would say we are putting quite a bit of money in to building out the  
15 fast charge network. Elf America and EVgo are going to be building out additional  
16 charge stations based on the predicted demand of Lyft. Therefore, Lyft -- and Lyft  
17 subsidizing the fuel cost, Lyft is contributing to the growth of the fast charge  
18 company.

19 MR. BOBADILLA: Thank you very much, Jon.

20 Heather, how are we on time?

21 MS. RAITT: I'd say you could do just one more and then we should  
22 move on to public comment.

23 MR. BOBADILLA: Okay. Excuse me. Technical difficulties.

24 MS. RAITT: Or we can just go on to the public comment.

25 MR. BOBADILLA: Yes, please. Public comment.



1 MS. RAITT: Okay, fair enough.

2 Well, listen, thank you so much to our panelists and to Shobna for  
3 that discussion.

4 So moving onto public comment, RoseMary Avalos from the Public  
5 Advisor's Office is here to help us with it.

6 But, basically, just to let folks know, please just one person per  
7 organization to comment. We have -- we'll do three minutes per person. And if  
8 you're on the phone, just press star 9. That will raise your hand to let us know  
9 you'd like to comment. And if you're online, just -- you can press that raise hand  
10 icon and that will let us know.

11 Okay, so, RoseMary, go ahead. Thanks.

12 MS. AVALOS: Thank you, Heather.

13 I'm first going to call on the attendees on the phone. I will read the  
14 last three digits of your phone number to let you know it is your turn to comment.  
15 Please state your name and affiliation and spell your first and last name. And,  
16 also, do not use the speaker phone feature because we may be able to hear you  
17 clearly.

18 The person on the phone with the last three numbers of 029, go  
19 ahead and unmute yourself.

20 MR. PARK: Yes. Thank you. This is David Park, D-a-v-i-d P-a-r-  
21 k. I'm with the California Fuel Cell Partnership and I'm the Industry Liaison.

22 Thank you, Commissioner Monahan, Professor Sperling, this has  
23 been a great session. I very much appreciate it.

24 I was hoping to hear some discussion on hydrogen fuel cell electric  
25 vehicles and how they might fit into the TNC model. I think that there are places

1 where they would excel in the TNC marketplace in that the fueling time is similar to  
2 a gasoline experience and the range is also similar to gasoline experience without  
3 very much modification in driver behavior.

4 Also as the vehicles move into an autonomous type design, the  
5 power demand on the vehicle power plant will be greatly enhanced by having the  
6 power density that hydrogen fuel cell vehicles offer. Thanks very much.

7 MS. AVALOS: Thank you.

8 And now I'll move on to Zoom attendees. Again, please state your  
9 name and affiliation and spell your first and last name. And also do not use the  
10 speaker phone feature.

11 Justin Luke, your line is open. You may need to unmute on your  
12 end.

13 MR. LUKE: Hi, everyone. My name is Justin Luke, J-u-s-t-i-n L-u-  
14 k-e. I'm a Ph.D. student at Stanford conducting research on electric vehicle fleets  
15 and autonomous electric vehicle fleets and optimizing charging stations for their  
16 operation. So I have two very related questions on this topic.

17 Firstly, when I'm planning for charging infrastructure and siting, at  
18 least my research has shown that it's very dependent on if it's for an autonomous  
19 TNC fleet versus like human operated, you know, and the driving patterns and  
20 capabilities are very different. So how much goes into the planning of charging  
21 stations when considering that self-driving or autonomous driving technology is still  
22 uncertain how it roll out in the next 10 years or so? So that's my first question.

23 And the second one that's related is for -- again for the planning of  
24 charging stations, how do the stakeholders work with utilities or even the California  
25 Energy Commission in determining suitable electricity retail rates and demand

1 charges are appropriate for TNC electric fleet operation while also supporting grid  
2 needs and renewables penetration? Thank you.

3 MS. AVALOS: Thank you. And a remainder for those on the  
4 phone, dial star 9 to raise your hand and star 6 to mute and unmute the phone  
5 line.

6 And now we'll go on to the next commenter, Rosaline Jeffries.  
7 Please spell your first and last name, and your affiliation. Your line is unmuted.

8 MS. JEFFRIES: Thank you. My name is Rosaline Jeffries. I'm an  
9 analyst with AMPLY Power. We provide charging as a service and help  
10 commercial and publicly transition to electrification.

11 I have a question -- first of all, thank you to the CEC for organizing  
12 this panel and thank you to all the speakers. I have a question directed at Jon  
13 Walker at Lyft.

14 I was wondering if you could speak a bit more on Lyft's plans to  
15 adding grid continuity to its app. I think you kind of -- you mentioned it earlier  
16 when talking about grid impacts on charging. And if you could please elaborate,  
17 that would be greatly appreciated. Thank you.

18 MS. AVALOS: Thank you, Ms. Jeffries.

19 This is the period for public comment, and so are there any other  
20 public comments? Please raise your hand.

21 Okay, seeing that there are no raised hands, I will turn to  
22 Commissioner Monahan.

23 COMMISSIONER MONAHAN: Well, great. Thanks, everybody.  
24 A really interesting panel, appreciate your perspectives in helping Dan and me to  
25 think about how do we support this transition to electrification of transportation

1 network companies. And how do we integrate the Three Revolutions. The thing  
2 about Three Revolutions of transportation, shared electric autonomous mobility to  
3 make sure that we're part of the same sense for the good of -- our coordinating is  
4 for the good of the health of our residents.

5 So thanks, everybody. We're having a week's break and then the  
6 week after we're going to be holding a workshop on Near Zero Emission  
7 Technologies and Fuel. So thanks. I hope you have a good rest of your  
8 evening.

9 And thanks, Dan, for being on the virtual dias with me.

10 PROF. SPERLING: Thank you.

11 (Whereupon, the Workshop was concluded at 3:41 o'clock p.m.)

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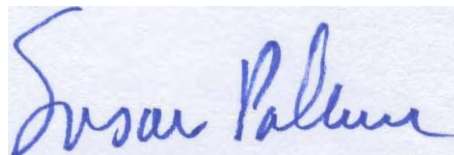
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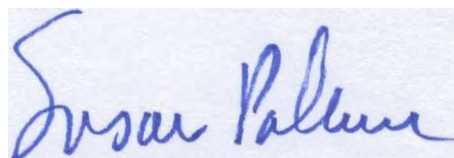
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