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<td><strong>Filer:</strong></td>
<td>Raquel Kravitz</td>
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<td><strong>Organization:</strong></td>
<td>California Energy Commission</td>
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<td><strong>Submitter Role:</strong></td>
<td>Commission Staff</td>
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BEFORE THE

CALIFORNIA ENERGY COMMISSION

In the Matter of:


IEPR COMMISSIONER WORKSHOP

HYDROGEN AND FUEL CELL ELECTRIC VEHICLE MARKET STATUS

REMOTE VIA ZOOM

SESSION 2: FCEV MARKET STATUS

THURSDAY, JULY 2, 2020

1:30 P.M.

Reported by: Peter Petty

CALIFORNIA REPORTING, LLC
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Karen Douglas, Commissioner

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PANEL MODERATORS:

Scott Samuelsen, UC Irvine
Joan Ogden, UC Davis

PANELISTS:

Antonio Ruiz, Nikola
Lauren Skiver, Sunline Transit Agency
Jaime Levin, Center for Transport and the Environment
Brian Lindgren, Kenworth
James Kast, Toyota Motor, North America, Inc.
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Mikhael Skvarla, CA Hydrogen Coalition
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Transcribers Certificate
JULY 2, 2020

9:30 A.M.

MS. RAITT: I'm Heather Raitt, I’m the program manager for the Integrated Energy Policy Report, or IEPR for short.


Today's workshop is being held remotely, consistent with Executive Orders N-25-20 and N-29-20 and the recommendations of the California Department of Public Health to encourage physical distancing to slow the spread of COVID-19.

Please note that this meeting is being recorded. We will post a recording and written transcript on our website and you can find today's presentations posted on our website.

This session is going to have two panels, one on heavy-duty fuel cell EVs and a second on light-duty fuel cell EVs. If you were in the morning session, we used the Zoom Q&A function and we'll do that again this afternoon.

Attendees may type questions for panelists by clicking on that Q&A icon at the bottom of your screen. And before typing a question, please check to see if someone else has already posed a similar question. If so, you can click the thumbs up to vote on it and that will move it up in the queue. The questions with the most thumbs up are uploaded to the top of the list, and so we will do our best to respond to
questions, but unlikely to elevate all due to time restrictions.

I'll go over how to provide comments on today's materials. There will be an opportunity for public comments at the end of the workshop. We typically provide three minutes for public comment, but we know there's a lot of interest in this topic, and so we may limit the comment period to one minute per person to allow for greater participation. In Zoom, you can click the raise hand icon at the bottom of your screen to let us know you'd like to make a comment and you can also click it again if you change your mind and want to lower your hand.

For those on the phone not using Zoom, just press star 9 and that will raise your hand to let us know you'd like to comment. So again, if you're on the phone, it's star 9. Alternately, written comments are welcome after the workshop and they're due on July 23rd, and the notice gives you all the instructions for how to provide written comments.

And with that, I'll turn it over to Commissioner Monahan. Thank you.

COMMISSIONER MONAHAN: Great. Thanks, Heather.

And welcome, everybody, to the afternoon session of our full day on hydrogen and fuel cells. We had a really interesting discussion in the morning about hydrogen and hydrogen delivery, and this afternoon we're going to be
focusing in on the vehicle side of the equation.

I think it's no surprise to everybody transportation pollution is our number one challenge in California in terms of meeting our carbon reduction goals, and emissions have been trending up instead of down.

But California's commitment towards cleaning up our transportation system and setting a course for as much as we can zero carbon mobility remains unwavering. Just recently the Air Resources Board passed the world's first regulation requiring that trucks go zero-emission, and by 2045 any new truck sold in California has to be zero-emission. And zero-emission, there's two choices. There's batteries and fuel cells. So, batteries have made a lot of progress. The fuel cells are also making progress and I think, you know, there are some sectors, particularly in the heavy-duty and off-road space where it's not clear that batteries will actually be able to deliver.

So really looking forward to this afternoon set of conversations around heavy- and light-duty fuel cell vehicles.

And I pass the baton over to Commissioner Douglas to see if she would like to make any opening remarks as well.

COMMISSIONER DOUGLAS: Hi, good afternoon, everybody.

I'll pass on opening remarks, but I'm delighted to be here.

Thank you.
MS. RAITT: All right, thanks. This is Heather Raitt. We can go ahead and move on to our first panel, and it is being moderated by Professor Scott Samuelsen from UC Irvine.

So, go ahead.

MR. SAMUELSSEN: Thank you, Heather. Heather, thank you and good afternoon, everyone. I am Scott Samuelsen from the Advanced Power and Energy Program at the University of California Irvine, and it is my pleasure to moderate the first panel this afternoon on fuel cell electric vehicle market status with a focus on heavy-duty fuel cell vehicle which encompasses, for our discussion today, fuel cell electric buses and fuel cell electric trucks.

We're indeed very fortunate to have an outstanding panel consisting of Antonio Ruiz from Nikola, Lauren Skiver from the SunLine Transit Agency, Jaimie Levin from the Center for Transportation and the Environment, Brian Lindgren from Kenworth, and James Kast from Toyota.

Our format will follow the form that we had this morning. Namely, each panelist will provide a short overview. The Commissioners will then direct questions to members of the panel. I will moderate a question and answer session with the panelists, and we will conclude with questions that you raise using the Q&A icon, as Heather described, at the bottom of your screen.
So let's begin with a short overview from each of the panelists, beginning with Antonio Ruiz. Antonio's head of fuel cell vehicle codes and standards at Nikola Motor Company, a position he has held since 2018. He was previously a technology development manager for 14 years at the U.S. Department of Energy DOE Fuel Cell Technology Program office, managing the safety codes and standards program for that office.

Please join me in welcoming Antonio.

MR. RUIZ: Thank you, Mr. Samuelsen. I hope you can all hear me fine.

Thank you, Madam Commissioner and all the distinguished audience. I'd like to share a little bit about Nikola and hopefully put in perspective what we're envisioning in the near -- the near future.

We can go to the first slide that says hydrogen at scale.

I want to talk to you a little bit about what Nikola does, which is a bit different to what you may be used to. We are looking at deploying fuel cell trucks, along with the fueling infrastructure to support it. Now these fuel cell vehicles are Class 8 long haul vehicles with high torque and about 1,000 horsepower. Obviously being fuel cell electric vehicles, they're zero-emission at the tailpipe.

With a station, we look at fast fueling if the
vehicles have large onboard storage capacity. We envision that this will be available throughout California and throughout the country. To that extent, we see a network of stations that will be able to supply the fuel for this deployment. We look at our stations in predominantly production on side of hydrogen from renewable and clean electricity where available.

Next slide, please.

What we see in the Nikola fueling stations deployment, we see the need to fuel vehicles that have up to 80 kilograms onboard storage. We're looking at using 700 bar or 70 megapascal pressure on board. And to be entirely with diesel vehicles, we look at a fueling time between 10 to 15 minutes. Now that introduces a new fueling protocol that we are also working with industry to develop. Now this is something that we envision could be done within the near future in advance of the deployment plan for 2023.

So in our stations we also look at offering hydrogen, not just for the Class 8 vehicles, but also for light-duty passengers. So we would have a dispenser that will be able to delivery with 2601 fueling protocol for light-duty vehicles 700 bar. Also we look at having charging stations along the way, at the stations. The stations have to be capacity-wise multiple tons of hydrogen on site for these vehicles. So we look at stations at about 8 tons half a day
station, which can fuel about 150 trucks coming in. But this
has to be scalable to larger capacity, especially when you
look at a truck depot and you may have to scale it all the
way up to, like, 32 tons per day production.

Next slide, please.

As I alluded to earlier at the start, zero-emission
we're looking at producing and completely impacting how the
emissions from the vehicles all the way from (indiscernible),
so we're looking at renewable solutions where you can use
renewable power. We use electrolytic hydrogen production
basically saving water and storing it at high storage banks
onsite, and we will be deploying or delivering that fuel at
700 bar, or 300 bar, on the vehicle. Now we look at, as I
said earlier, we have to be within 10 to 15 minutes fueling
time. So we're looking at fast fueling these vehicles, and
obviously you have to maintain the cost by a delivery system.

Next slide, please.

To that, I want to point out that we have an MOU with
other well-known companies working with this realm of heavy-
duty deployment. Our colleagues at Nel and Air Liquide and
Shell are our suppliers, and they go along with Hyundai and
Toyota, our OEMs, looking at deployment vehicles within the
near future, particularly in California. That group is also
looking at developing the fueling and the hardware necessary
to meet those requirements.
On the next slide, I want to just give you an overview of some of the challenges that we are working on, which includes the fueling hardware necessary for higher flow. So if you look at the way vehicles are fueled today, those are significantly smaller storage vessels on board, where you can fill those vehicles within three to five minutes.

But when we look at higher capacity vehicles, we have to speed up the process, and along the way we have to understand some of the boundary and implications of the system itself. So we're working with our colleagues within the consortium that I just pointed out, but also internationally to develop and look at how to promote in the right fashion of such fueling procedure. Along the way, we also need to ensure the safety of the vehicle. So we learn from the work that's being done on light-duty vehicles within the regulatory framework that was put in place by the Department of Transportation through the global clinical regulations.

And the last one I want to point out was that we need to better be able to measure, develop measuring methods for fuel economy of these vehicles. Now keep in mind that these are hybridized systems, where you have battery as well as fuel cells, so it's not -- those methods are not available today, so we're working with an SME, the fuel cells, and as
committed, to develop those requirements as well.

I think that's all that I had to share for today, but
I'll be happy to answer any questions. Thank you.

MR. SAMUELSN: Thank you, Antonio.

Let's move from Class 8 fuel cell heavy-duty electric
vehicles to fuel cell electric buses with the leadership over
the years of SunLine. I'll ask Lauren Skiver. Lauren is the
chief executive officer and general manager of SunLine
Transit Agency in Thousand Palms, California, which is
serving the Coachella Valley. Lauren joined SunLine in 2013
as a CEO after 20 years of service in the transit industry
working at least three other agencies from Tampa, Florida to
Baltimore, Maryland to Wilmington, Delaware.

Please join me in welcoming Lauren.

MS. SKIVER: Thank you so much, Mr. Samuel. sen.

Thank you so much to the Commissioners and staff for
allowing me to speak.

Next slide.

SunLine is an early adopter of fuel cell technology
and we also run all battery electric buses as well. We are
centering our fleet deployment on fuel cell and have
annotated that in our ICT rollout plan, which has already
been adopted by our board, and will be filed with California
Air Resources Board shortly.

Why did we choose fuel cell? Well, it's not just the
internal knowledge and the experience that we have with fuel cell that made us make that decision for our ultimate conversion to zero-emission technology. It's also the range that we find and the productivity of our fuel cell fleet. In studying the productivity of our all-battery electric, we have assumed that we would need two buses for every one bus that we are currently running as CNG or a hydrogen fuel cell electric vehicle.

We also have determined that the way that these buses are refueled is so similar to the way that we've been refueling for over 20 years that there's not a learning curve for our organization about how to fill our buses at night using fuel cell technology. We have route flexibility with these buses. The Coachella Valley, our service area is 1120 square miles, which is a large service area for only 88 of fixed route buses. And so many of our routes are long in nature and over 300 miles in a service day.

We also, as you may know if you've ever been out here to the desert, have very challenging terrain and extreme climate that we operate in, and so fuel cell has really been the vehicle that we are centering our fleet deployments around.

Next slide, please.

So this is, just shows you a little bit about the combination of our fleet. One of the points I want to move
forward to all fleet operators, whether you're a public
transit agency or a private fleet operator, we believe that
the future is going to require mixed propulsion fleet and
maybe even mixed manufacturer fleet. As you can see on the
right, we have multiple bus providers and fuel cell and drive
systems. That does not create an issue for our maintenance
personnel and our technology technicians. We pull those
buses out every day, and so the days of a fleet of the exact
same truck or bus out on the yard may be a thing of the past
as we move into the zero-emission world.

I did want to mention that COVID-19 has affected all
of us, and deeply, but I want to bring a word of optimism.
And during COVID-19, SunLine was awarded VW mitigation funds,
1.2 million in order to convert five CNG buses, replace --
being replaced fuel cell, and we were just notified that we
won an EPA TAG award for five fuel cell buses. And so our
zero-emission project is moving stronger than ever. We are
technology agnostic. We do run four all-battery electric BYD
buses, but again, those buses are very specific to a job.
They do an express route where they can be opportunity
charged during the day and midday between trips, and we find
that that is really the job that they're best suited for.

Next slide.

So I want to talk a little bit about our hydrogen
production. One of the things I want to bring forward about
hydrogen fuel cell or any kind of fleet operator, fueling is the most important aspect. And so you can have all the vehicles in the world available to buy, but if fueling and fueling infrastructure is difficult, it's going to be an impediment to the deployment of zero-emission technology, whether it's all battery electric of fuel cell electric.

SunLine was the benefit of a CARB award for a new hydrogen station. We've been running and producing hydrogen for more than 20 years, but on a much smaller scale. These are photos of our 900-kilogram per day electrolyzer. This was a Nel/Proton project. We had a great working relationship with them with Kiewit as the construction arm. We are already producing 900 kilograms per day and are working on our public station which I'll talk about in just a moment.

Next slide.

So this is our next round of projects. So we don't sit back with anything. We are looking to buy property across the street from us. We will be putting a solar farm and we have already raised the funds for that first phase.

The second will be a solar-to-hydrogen electricity storage so that we can gain all this California sun, store it, and produce our hydrogen at night and during the day when we need it.

Phase 3 will be to upgrading our public fueling
station which is already in place. It just needs some
compression upgrades.

And Phase 4 is to put a hydrogen and renewable
electricity truck plaza on this property so that trucks
coming in to the L.A. basin from points west or east can fuel
at our facility before they get into the congestion of the
L.A. area.

Next slide.

That's the last slide. Thank you very much.

MR. SAMUELSN: Thank you, Lauren.

We'll transition now to a mix of fuel cell electric
buses and fuel cell heavy-duty trucks with Jaimie Levin.

Jaimie is director of the West Coast operations for the
Center for Transportation and the Environment, a position
that he has held since 2013 after 15 years of service with
the Alameda Contra Costa Transit District as director of
environmental technology.

Please join me in welcoming Jaimie.

MR. LEVIN: Hey, thanks Scott.

Good afternoon, everybody, from sunny Berkeley.

Next slide, please.

So CTE is a 501(c)(3). We're engaged in a number of
really significant hydrogen fuel cell projects, including
Class 6 UPS trucks, Class 8 Drayage trucks with Kenworth,
marine cargo top loader fuel cell lifts with Hyster-Yale,
both 40- and 60-foot transit buses being deployed commercially, and then heavy-duty and light-duty hydrogen fueling stations.

Next slide, please.

So what this is all about is operational efficiency. And we have to be able to appeal to the end user, the end user here being the fleet operators, whether it’s a transit or trucks. And so we subscribe to the KISS principle -- Keep It Simple Stupid, and there are five key performance aspects of this. Three key performance objectives -- range, passenger capacity payload, and multiple duty cycles, being able to operate your vehicles on a one-to-one basis.

But there's two key fiscal objectives. One is the affordability of the vehicles and that really means bringing the cost, the CapEx, of the vehicles down, and that is happening with volume. And the second one is OpEx. Fleet operators are looking at fuel efficiency and lower costs of fuel purchases to be able to operate their vehicles.

Next slide, please.

So Lauren touched on this. Essentially, we see four really key advantages to fuel cell. One is proven range. Secondly is significant reduction in vehicle weight, and that is continuing to drop in order to increase freight payload and to increase passengers. Fuel cells continue to be more power dense and capable. Then the speed of fueling that's
throughput being able to get your vehicles through the
fueling period and out on the street. Just keep in mind that
for transit as an example, you have to marry passenger
schedules, vehicle schedules, and driver schedules. And so
you don't want to add a fourth dimension of complexity on the
refueling, and that's where hydrogen has great advantages,
ultimately leading to one-to-one replacement.

Lauren touched on the impact of climate. And one of
the advantages with fuel cell, especially in cold weather
climates, not so much here in California, but is the ability
to utilize exhaust heat from the fuel cell to operate at
correct temperatures without turning on electric heaters
which draw down energy.

   Next slide, please.

So here's the challenge with fuel cells at startup
because of cost and the effort and really unfamiliar aspect
of hydrogen. There's always a steep high bar to climb over
but with scale, you actually can achieve significant cost
savings and efficiencies.

   You see this image of AC Transit's fueling station.
   This was built some years ago. It supplied and supported
10 to 12 buses. We recently upgraded this station. It's a
footprint of 45 feet by 56 feet. It competes with bus
parking. As you can see, this is during the day when the
buses are not all there, but at night it fills up completely.
Under a recent test three weeks ago, AC Transit processed 30 buses through each with an average fill of 24 kilograms and in the process did that in 6 hours and 40 minutes. We know we can do this same time period with 60 buses at this station and with added two dispensers, 120.

Next slide, please.

So, there are five key issues that have to be dealt with infrastructure, that's one of the biggest challenges. Price is number one, hydrogen's too expensive. The footprint, the real estate on the property is critical. R is for renewables, resiliency to be able to address natural disasters, and redundancy to ensure 100 percent uptime. Scalability and speed of fueling, we touched on that already. And entry level startup, that high bar to cross at the beginning.

Next slide, please.

Last year, Patty Monahan spoke at the International Zero-Emission Bus Conference, ran this survey with 500 people, mostly from transit. And you can see here there was almost on parity with battery and fuel cell what they see in ten years. Last year, a year ago it would have been 5 percent assumed fuel cell.

And last slide, please.

Recently, we submitted 18 letters from transit agencies authorities in California to the Energy Commission,
emphasizing the importance of hydrogen to meet our zero-
emission goals.

And thank you very much for the time.

MR. SAMUELS: Very good. Thank you, Jaimie.

And the last two presentations we'll focus on the
application of fuel cell technology to Class 8 heavy-duty
trucks, beginning with Kenworth and Brian Lindgren. Brian is
a director of research development at Kenworth Truck Company.
While he has served as director for nearly three years, he
has been with Kenworth over 40 years in managing the research
and development program for Kenworth for nearly over nine
years.

Please join me in welcoming Brian. Brian.

MR. LINDGREN: Thank you, Scott. And thank you to
the Commission for the opportunity to share our perspective
today.

I'll try to keep my comments very brief so we can
allow more time for Q&A. So I'll just give a quick
introduction to who Kenworth is and then an idea of the
projects we're currently working on.

Next slide, please.

So just in terms of who are we, Kenworth Truck
Company's been in the business since 1923 when founders Harry
Kent and Edgar Worthington bought the assets of the Gersix
Motor Truck Company. And since then we've built over 1.2
million trucks, and last year alone we built over 60,000 trucks. And we support these trucks with over 400 dealership locations across U.S. and Canada. We also have a factory in Mexico where we build for Central and South America. We have a factory in Australia where we build for the Australia and New Zealand markets. Kenworth is part of parent company PACCAR, which also owns Peterbilt, as well as DAF Trucks in Europe and Leyland Trucks in the U.K.

Last slide, please. Here we go.

So we've been working on a number of projects here. As you can see the green truck in the upper left is a fuel cell electric truck. It's a -- it happens to use a Ballard fuel cell. The one next to it in blue with the markings on it is a CNG range extended electric truck, uses the same power train as the Ballard fuel cell truck, but it gets its energy from a different source. And both of these trucks are in commercial operation in Southern California. The green one has about 5,000 miles on it so far. The blue one about 9,000.

And then below that are the next generation iterations of each of those. The lower left corner shows our -- what we are calling Ocean. It's a ZANZEFF grant project that we are working with the Toyota folks on. Ten trucks there, we've got I think six of them operating now. Those use Toyota fuel cells and a very similar electric power...
train to the ones up above.

And then the one in the middle on the bottom is another CNG range extended electric truck. It uses a near zero-emission natural gas engine, so it uses the same electric power train. And then the one on the right is happens to be a battery electric one that we're just starting into the design phase on now.

So you can see by looking through this that Kenworth is a little bit agnostic as to where the power comes from, and I think that there will be a number of solutions as we move toward zero-emission trucking, and not any one is going to capture all of the market. I think there's a place for battery electric, I think there's a place for natural gas, and I think there's a place for hydrogen certainly.

Hydrogen looks like it is going to be the winner for longer haul, as Lauren and Jaimie have already covered, and as I've covered in previous workshops. That it -- hydrogen has a big benefit compared to battery electric in terms of range and refuel recharge time. And I think so, and as well as for payload. So until we see an order of magnitude change in battery technology to improve energy density as well as costs on batteries, I don't see battery electric as being the solution for longer haul. So therefore, we're working strongly on the hydrogen programs.

So that's just a brief overview for Kenworth, and I
will hand it back to Scott from here. Thank you.

MR. SAMUELS: Very good. Thank you, Brian.

Our fifth of five presentations is from James Kast of Toyota. James is the fuel cell business analyst in the Electrified Vehicle and Technologies office at Toyota Motor North America. He joined Toyota in 2017 after serving two years as a science and technology policy fellow at the U.S. Department of Energy.

Please join me in welcoming James. Hello, James.

MR. KAST: Hello, Professor Samuelsen, and thank you for the introduction. And thank you, Commissioners and staff for the opportunity today.

So you see here, this is actually my only slide. So I'll really try to use this to tell the story of hydrogen and fuel cells within Toyota and how we got ourselves into the heavy-duty space in the first place.

So I think it really starts actually in the top middle, where you see the Toyota Mirai. You see six of those vehicles on the back of the truck and, of course, this is really where it all began 25 plus years ago with our initial development of both hybrid and fuel cell technology.

So this vehicle represents really Toyota's dedication to the technology and to all technologies to help bring cleaner vehicles to the road. But we are looking for ways to bring this beyond that space. And I think there was a huge
need for how you would decarbonize and clean up, you know, 
other sectors of transportation as well, certainly heavy-duty 
being a big piece of that, especially at the ports. 

So we took this upon ourselves to see how we could 
leverage an existing development within two Toyota Mirai by 
disassembling them, taking as many pieces as we possibly can, 
and in some kind of almost Frankenstein experiment created 
the first truck there on the bottom, the blue truck, we call 
it the Alpha Truck, which we unveiled in 2017 to essentially 
prove out that we could scale light-duty technology to a 
heavy-duty platform in a full Class 8 fuel cell truck. So we 
did exactly that. We created a 200-mile range zero-emission 
truck that was able to actually tow and meet the needs of 
diesel operators today. 

So then we took the learnings of the first truck and 
moved to the next generation, the top right there in the Beta 
Truck, the red truck there you see. So even after just one 
year of extra development, we were able to reduce not only 
the weight reduction as well, we were able to add a sleeper 
cab, we added to 300 miles of range while still meeting many 
of the performance needs that diesel operators expect. 

So these were kind of our first initial proof of 
concept vehicles that led us to the program that Brian 
actually alluded to. You see on the left there is actually 
one of those Ocean Trucks he spoke of. So now we're
currently in strong development with the Kenworth Truck Company, a respected truck company within certainly the U.S. market and others globally, for how we can bring ten of these trucks to market and actually start supporting vehicle operations within four key operators, mainly UPS, of course, the most noted of them.

But taking all this experience from light-duty, going to heavy-duty, and helping clean up the ports does definitely require a fuel side as well. So we've been working with Air Liquide on two of the current stations that we have today in the ground, supporting initial demonstrations, and collaboration with Shell to have the next three heavy-duty design stations all with over one ton per day of capacity. And all those are actually quite far along in development which will be online by early point of next year.

Now Toyota's not just stopping at only heavy duty and one application, but we're looking for ways to explore many other applications for our fuel cell technology to decarbonize other sectors throughout the global markets. So you've seen announcements from forklifts to buses, medium-duty trucks, even stationary power and also marine applications, all with fuel cell power train, based on the exact same modularity that is developed for the Toyota Mirai.

So the last piece I'll leave you with is really just how much heavy-duty and light-duty need each other in a
synergistic manner. So the scale of light-duty is actually quite large compared to other sectors. And by leveraging the scale of light-duty, you can help bring down the cost of the actual technology and what goes into all these different kinds of vehicles. But to help bring down the cost of the fuel, you need this high demand to make the investments in the fuel side, and that's where heavy duty and other applications come in since they demand so much more fuel compared to a typical retail light-duty customer.

So with investments in both light light, heavy duty, and other areas, you can really start to bring them all together in a synergistic way to enable what we consider the hydrogen society where you have a cost effective zero-emission solution for all.

Thank you very much.

MR. SAMUELS: Thank you, James.

This concludes the presentations, and I invite Commissioners Monahan and Douglas to ask questions, and hand the virtual microphone over to Commissioner Monahan to take that step.

COMMISSIONER MONAHAN: Thanks, Scott. Yeah, and I think all the panelists can put their videos back on for this part.

So I have a question for James, I think, is most appropriate. You know, this morning we heard from hydrogen,
you know, fuel, folks that are producing the fuel or
dispensing the fuel and, you know, we heard a lot of exciting
announcements about how fuel cell, you know, the hydrogen
actually is being produced not just for the sake of vehicles,
but potentially there's a wider array of ways that we could
use that low carbon hydrogen to help us with meeting our
carbon reduction goals in multiple sectors.

And I'm curious about what you were saying about how
we need scale and light duty in order to bring heavy duty
along. And this idea that, well, hydrogen is going to be
produced for a wide variety of -- like, let's say the
hydrogen issue gets solved, it's lying and waiting there.
Let's say that there's enough demand from multiple sectors
who are trying to decarbonize for the hydrogen.

How much would you still need that light-duty scale,
and, you know, can we do both heavy and light duty
simultaneously? And I say that because, you know, heavy duty
is our challenge in terms of, you know, we don't have a lot
of alternatives right now in the heavy-duty space and we
really need fuel cells to deliver and on heavy duties, I
think, in order to meet our carbon reduction goals for
transportation.

MR. KAST: Uh-huh. You know, it's a very good
question. And I think, really to your point where the fuel
can be used for so many different applications, that's really
what helps unlock the investments in the hydrogen supply
chair, which you alluded to itself and I think was a big
topic of the discussion earlier today. And what we're saying
is the same is also true on the vehicle side. So you kind of
even heard from Brian, you know, the scale of the trucks they
make is, you know, 60,000 or so per year. It tends to be
somewhere around there. It could be a lot more or less.
But, you know, that scale is only so much, and you could do
that on other applications.

But at the end of the day, how many light-duty
vehicles are produced and sold every day? This is a huge
number. It's an order of magnitude different. And once you
get to the cost of manufacturing, you get to these economies
of scale, you can just reach them so much more quickly on the
light duty side where we're already going to be producing,
you know, 30,000 vehicles per year, starting as early as next
year for our next generation Mirai. And that's not something
that we could achieve, you know, in those volumes with any
other application today around the world.

So leveraging that scale is what helps give you all
the components itself, not just the fuel cells pack, but
everything else that goes into the vehicle can help bring
down that cost, and much more quickly than just focusing on
one or a few of the other applications.

COMMISSIONER MONAHAN: What we're seeing, I mean,
right now in China we're seeing a lot of interest in buses and trucks for fuel cells. And I'm, I mean, I'm curious because the number of buses in China is so large, whether that could potentially bring down costs for buses here in the United States. And I don't know if anybody on this panel -- oh, Jaimie, Jaimie can answer every question about --

MR. LEVIN: Yeah. Well, for sure.

COMMISSIONER MONAHAN: What do you think, Jaimie?

MR. LEVIN: Well, we're already seeing the benefit of what's happening in China by reducing the cost of fuel cells. So we're seeing fuel cell costs dramatically drop. Our early buses, I mean, we built beginning fuel cell buses for 3.2 million apiece, down to 2½ million recently, now under 1.2. And we feel there's no question we can reach price parity with battery electric and reaching our zero-emission goals.

But the Chinese have played a huge role in ramping up volumes. And this is all about volumes in terms of CapEx. And I would just comment based on what James was saying, the one advantage on the fuel side that you have with buses or fleets is you have a very nice mix of supply and demand. You can pull those together. You're not waiting for individual consumers. But ultimately, to get the fuel price down, we need the volumes that light-duty will bring to the table. So these are complementary technology applications that we need. We need to see both play out.
COMMISSIONER MONAHAN: Great. Thank you.

Commissioner Douglas, do you have any questions?

COMMISSIONER DOUGLAS: Just one. I was curious, you know, what have your experiences been getting hydrogen fuel? Do you tend to source the fuel locally? How is it, what percentage of, you know, renewable fuel are you able to source? Is that a significant challenge? How does the fueling side look in the heavy-duty space?

MR. LEVIN: Okay. I can

MR. SAMUELS: Go ahead.

MR. LEVIN: I can start out, at least.

The projects we've worked on is sourcing primarily liquid fuel from different directions because there's limited supply. We have a project down in Southern California that draws liquid supply from Northern California. And a project in Northern California that's drawing supply from Southern California. There have been some projects with electrolysis. Lauren can speak and will speak on her great project at SunLine, but we don't have the supply that we would like to see.

We've not had shortages in the fleet application, as I believe it's been experienced in the light duty, but we're looking forward to the projects like Air Liquide's project and other suppliers stepping up as the technology expands.

MS. SKIVER: I would just add that the cost for a
kilogram of hydrogen is in the transmission. That's where the big influx in cost comes from. And that's why production and infrastructure, the hydrogen community creating smaller scale, smaller cost production sites is really important in stations, because, you know, we can produce a kilogram of hydrogen right now using grid power for $8 a kilogram. If we buy it from Colton and have it transmitted, it's over $30 a kilogram. So that gives you the where the cost is from. The cost isn't the molecule, it's moving it.

COMMISSIONER DOUGLAS: But just as a follow-up question on that, you know. With today’s economics and so on, you know, what’s the optimal size of one of the small, of the smaller more distributed project? Is that the project you guys are moving forward with basically?

MS. SKIVER: Our project won't be small.

COMMISSIONER DOUGLAS: Oh, okay.

MS. SKIVER: Do you mean, what is -- I think that if we could get a hydrogen production starter set that would create in a renewable way, possibly down the road, you know, 300 kilograms per day, 300 to 500, then we're talking that fleet operators could start to do deployments that aren't too small, like SunLine had at the beginning with five buses because we could only make 200 kilograms per day, but could do something that generates more of a deployment strategy, and these need to be scalable like our station is. And I
think that most of the hydrogen infrastructure producers now are making scalable solutions. But you need to have a starter set that could easily be added on to as your fleet deployments grow for this to really take off. Because on the vehicle side, for buses anyway, the commercialization, the productivity and reliability is there. It's the infrastructure that needs to catch up.

COMMISSIONER DOUGLAS: Yeah --

MR. LEVIN: Commissioner Douglas, we, we just --

COMMISSIONER DOUGLAS: -- let me ask just one follow up, and then I'd love to hear it.

MR. LEVIN: Oh. Go --

COMMISSIONER DOUGLAS: The only other follow up is, you know, when you look at the transportation costs, like how close to your, you know, fleet should the production be? Is it a big deal if it has to be moved five miles? Is it, you know, how close is best for you?

MS. SKIVER: Well, I'm only going to speak for transit. In your backyard is best. It's called a deadhead mile, and fleet operators would say the same thing. For every mile you have to travel, there's a cost associated.

COMMISSIONER DOUGLAS: Sorry, please. Who else was answering? Jaimie.

MR. LEVIN: Yeah. I was going to say we built, we recently built the Orange County station for $5 million to
support 50 buses --

MS. SKIVER: Though, if we can get transmission, you know. Just because I run so many vehicles.

Go ahead, Jaimie.

MR. LEVIN: Hello? Oh, okay. Yeah, so we built that at around $100,000 per CapEx per bus to support that size system. That compares actually very favorably to the costs that are required for charging infrastructure at facilities. But the cost of the fuel is still ranging for liquid delivery between 7, 7½ dollars, and $8 per kilogram. And clearly, if we had supplies that were closer at hand, that cost would drop significantly.

As Lauren said, transportation is a big part of that cost. Because of SB-1505, a third of that hydrogen has to be renewable, and ultimately we see renewable supplies as the goal that we have to all achieve. So there is a cheaper cost on the CapEx and we're seeing more benefits as more stations get built.

COMMISSIONER DOUGLAS: Super. Thank you.

COMMISSIONER MONAHAN: So before I sign off and let the, have the panel discussion, I just want to acknowledge SunLine's leadership in this. I mean, I actually could acknowledge Jaimie Levin's leadership as well. There's a lot of leaders in this, on this grid. But, you know, this vision of, you know, being, leaning in to a new technology and then
this longer term vision of capitalizing on renewable energy
to power the vehicles, provide a public station -- I just
want to say, like, that's the kind of vision that is really
inspirational to learn more about. So just thank you for
sharing that story.

All right. Now we can go -- Scott, we'll turn it
over to you for the panel discussion.

MR. SAMUESEN: All right. Thank you. And thank you
Commissioner Monahan and Commissioner Douglas.

We'll take about 20 minutes now where I'll moderate a
discussion from the panel. And then, remember, we'll
conclude with a Q&A where you'll have a chance to raise your
questions and use that icon at the bottom Q&A in order to
provide us with a question that you have.

I'm going to begin with a topic of interest to the
commissioners, I believe, which has to do with the impact, if
any, of COVID on the development and deployment of fuel cell
heavy-duty vehicle technology. And I'd like to look to two
of you to respond.

First, from a fuel cell electric bus perspective,
Lauren would you provide a response to that question?

MS. SKIVER: I would say that I'm going to bring a
message of optimism. There is a lot of negativity in the
world right now for all of us, but, you know, SunLine is
looking at this as a way to redesign our network. We were
planning on doing it anyway. And actually our projects or our station project, we have a few construction projects going on right now -- we're seeing those actually move along faster than pre-COVID times.

So I think that our program, our fuel cell program, our zero-emission ICT plan will not stop. We are actually more actively working on putting in for grants. The world has slowed down a bit where we can actually take time to look at other opportunities. We are going to need that solar grid funded, and so we're driving that project by putting in for grants.

So I would say that there are impacts to revenue generation through fares and through ridership, but I don't think this is going to be something that we experience forever and I think transit agencies are becoming more optimistic about using this time to redevelop and bring new services that the public really wants. We have to stop selling what people aren't buying and start bringing services that people want ride.

MR. SAMUELSSEN: You suggest we might even be from the sites.

MS. SKIVER: That's right.

MR. SAMUELSSEN: James, would you respond with regard to fuel cell heavy-duty Class 8 vehicles?

MR. KAST: Of course. And certainly, you know, the
times today have certainly caused everybody to reprioritize, and I'm very pleased to share that within Toyota, fuel cells and everything about hydrogen has actually remained more of a priority than before because it is such a future technology and growth. So anything from the Mirai to all these other applications have actually been accelerated, even given the current situation, because we just see how much it's going to be needed in the near term and in the long term.

MR. SAMUELSSEN: Let me move to a major question addressing the market and address the, this question to Brian, Antonio, and James.

Other than fuel cell electric buses where the market is beginning to embrace the technology, as Jaimie just alluded to with the Orange County Transit Authority, we know the longstanding record of SunLine. But for trucks, in what locations are you envisioning heavy-duty fuel cell electric vehicles competing in the initial years?

Brian, would you be so kind as the first to respond?

MR. LINDGREN: Sure. I'll be happy to start that one out.

Yeah, as we look at it, at the broad variety of heavy-duty trucking applications, we really see tractors that run 200 to 500 miles a day as being the target opportunity, initially anyway, for fuel cell trucks. Shorter runs like under a hundred miles a day, that can probably be done with a
battery electric. If you're going to run from Los Angeles to New York City, that's probably going to stay diesel for a while because it'll be a while to build out the infrastructure.

But the payload advantages and refueling time advantages of hydrogen compared to battery, I think, is where we see the big advantage. Right now, it still is a bit more expensive than diesel. So it's going to require some incentives to the end user to move from diesel to hydrogen. Over time, I think we can overcome that, but again, like some of the others have said, it really comes down to volume, and until we get the volume up into the thousands or tens of thousands, then we're probably not going to see parity with diesel for a while.

But again, the application tractors in 200- to 500-mile-a-day applications is where we see the sweet spot.

Mr. Samuelsen: Thank you, Brian.

Antonio, hoping you're still with us. Would you be so kind as to respond to that question on the locations that you're seeing to enable the initial market?

Mr. Ruiz: Yes. I hope you can hear me okay. I'm actually sitting in a plane. I apologize for the noise in the background.

We envision the long haul application will be deployed to (indiscernible) North America and even Canada.
And to that extent, we see the need for (indiscernible) stations that could be in the course of 700 range of stations needed. So our initial deployment obviously will be launched within the priority space like California and have a great momentum globally. And then we see that moving slowly where other parts of the country. But California is the initial target.

MR. SAMUELS: Thank you, Antonio. We heard you very well.

James, would you conclude by responding to this question?

MR. KAST: Of course. And rather than repeat kind of the benefits on the vehicle side, I'd actually like to share the infrastructure perspective because I think it's something sometimes is overlooked.

And when you really think about how to support a fleet, even if those vehicles only need 100 hundred miles of range, you still need to be able to charge them all in the amount of time, their uptime. So in any kind of application where they need to have a high uptime, where you have a very large fleet, the actual throughput of your fueling may become the depending factor, not necessarily just the vehicle itself. So that's where hydrogen really provides a lot of good advantages for that fast fueling. You get more vehicles fueling in a shorter amount of time, and it also just scales
much better and easier. And I think that gets exactly to Jaimie's point, where charging one truck versus fueling one truck, you know, hydrogen is not so good. But anything more than, you know, 20 to 50 vehicles, all of a sudden hydrogen starts to look like a very good investment.

MR. SAMUELS: Thank you, James.

Let me move to a question I'd like to address to Jaimie and Lauren and Brian, which, if you would speak to the hurdles that you are facing in the rollout of fuel cell electric heavy-duty vehicle technology with these different, you know, perspectives of the bus technology and then of the Class 8 technology.

Jaimie, would you be so kind as to begin?

MR. LEVIN: Yes, Scott.

So I think the biggest challenge that we face right now is infrastructure. In my presentation, I laid out five key issues that fleet operators have to address if they're going to, both technically and from an affordability standpoint, move forward with the technology.

We're seeing capital costs come down. The vehicle performance is doing exceedingly well, but there's still a marginal cost difference there that makes it difficult for public transit operators to make that jump. That is why California has been extremely important in leadership and being able to not only pass the regulations, but to fund the
programs that we have today.

But infrastructure is really key. If you go to someone like AC Transit, which now has 21 fuel cell buses, their board's moved forward to buy another 20, they have capacity of up over close to 100 buses that they could fill within their current fueling structure. The cost of fuel is the big challenge for them. And that’s why we need investments still from California and from the Energy Commission specifically to support infrastructure development and fuel supply.

MS. SKIVER: I would just add that, you know, on our CNG fleet, if something goes down with our internal station, we can find it. If something goes down with our hydrogen production plant, we're not finding that. And so, I think it goes to Jaimie's point where reliability on the fueling infrastructure side and more choices for it, instead of buying a tube truck at $30 a kilogram and waiting for it to get delivered, you can't do that when the buses need to roll out. Or whether, it wouldn’t matter what your business is, you’ve got to roll out the next day. It's what our business is all about. It's time and rubber on the road.

So I think infrastructure as well is what I would highlight. I would also highlight internal champions and internal knowledge, having folks within the organization that's embraced the technology and want to learn about it is
extremely important. It's part of SunLine's pivotal success, is we have internal folks who understand our fueling and our bus side, how those vehicles work, and close relationship with our manufacturers.

MR. SAMUELSSEN: Lauren, (indiscernible, unstable Internet connection) which are now (indiscernible) kilograms a day, do you have a Plan B to back that up of trucking it in, or have you found you've reached the reliability and resiliency for that strategy that you are now comfortable in supporting your operations?

MS. SKIVER: Supporting our operation daily, but we're already driving a resiliency project and looking what's being developed by manufacturers right now for a portable refueler. You know, our new project across the street -- we're already actually planning on the next module of our electrolyzer because we just won 10 more buses, which will take us to 27, plus 2 on the way, that's 29, and our station will be tapped out after another award.

So I think that that's one thing we're working on now. We have a steam methane reformer that was going to be our backup, but she had to be decommissioned. She was just beyond her useful life. So we're busy looking for our resiliency factor right now, since buying fuel and having it trucked out to the desert is not where we want to be in the future.
MR. SAMUELSEN: Thank you.

MR. LEVIN: Scott, if there's a chance, I'd like to make a comment or two on resiliency. But I'll let the next speaker you ask the question of first.

MR. SAMUELSEN: Thank you, Jaimie. Let's do that. Brian, would you be so kind as to respond to --

MR. LINDGREN: Sure. You'd talked about hurdles, and there's been a lot of good development on city buses running on hydrogen, and Lauren has talked about that, Jaimie's talked about that, too.

Moving to heavy trucks, heavy trucks are not buses. Where buses weigh about 45,000 pounds and typically go 25 to 45 miles an hour, heavy trucks are typically 80,000 pounds or more and need to be able to climb long grades of three to five miles in the L.A. basin at 60 miles an hour, and be able to compete with trucks that have 450 to 500 horsepower in their diesel engine. So we need to -- one of the challenges is making sure that we have enough power on board that we can put it to the ground in a sustained manner, so that you don't end up depleting what little battery you have on the truck before you get to the bottom of the grade just by going freeway speeds, and then have to crawl up the hill at only what you can put out by reduced power, if you have kind of a range extender arrangement, like we do on our first truck.

So that's one of the hurdles. One of the others, of
course, is building to scale. This is an emerging market for electric vehicles in the heavy-duty category. So there currently aren't component suppliers who have the bits and pieces that we need to put it all together. Things like break air compressors, and refrigerant compressors for the air conditioning system and to chill the batteries or whatever. Power steering, those kinds of things, we don't have those in high volume today, so we're having to kind of create new products to meet those needs. And then that kind of permeates through the entire truck.

MR. SAMUELS: Very good. Appreciate that, Brian. Jaimie, let's go to resiliency. What'd you want to share?

MR. LEVIN: Yeah, I have to mention this. So as we move toward zero-emission transportation, especially here in California, resiliency issues are very big. And here are three advantages, or two primary advantages to fuel cell electric transportation, and specifically as it relates to transit.

We, in the transit industry -- often, first responders look at transit vehicles as a means of moving people after an earthquake, for instance, from one region to another. And so you need vehicles with range, zero-emission vehicles that can cover that range to go, let's say, from the Bay Area up to Sacramento with people from hospitals or
senior centers.

But the other key advantage is exportable power. On a 40-foot fuel cell electric bus that SunLine's operating Orange County AC Transit, there is 600 kilowatt hours of usable energy on that vehicle. On the articulated fuel cell bus we're building for agency in Illinois, there's over a megawatt hour of energy. So you can image in the future that hospitals, senior centers, emergency operation centers have switch gears, and these buses pull up to those switch gears, plug in, and export their power. And oh, by the way, it only takes 6 to 10, maybe 15 minutes max to refuel those vehicles, either with a portable fueler or a swap with another bus. That is an important value of fuel cell vehicles in this state, for sure, in many states dealing with natural disasters.

MR. SAMUELSEN: So appreciate you making that observation, that point. Jaimie, thank you.

Let me go to policy. And let me divide policy into two aspects. One would be policy that is actually facilitating the deployment and development. The other is policy that’s perhaps hindering the development and deployment of fuel cell heavy-duty vehicle technology.

I’m going to ask this, actually, of all of you. Antonio, are you in a position where you can go first?

We cannot hear you at this moment. Let’s hold on.
that.

Lauren, would you take the --

MR. RUIZ: Okay. Sorry.

MR. SAMUELSSEN: Oh, here we go.

MR. RUIZ: Can you hear me now?

MR. SAMUELSSEN: Yes. Uh-huh. Please join.

MR. RUIZ: Yeah. Yes. Some of the -- some of the challenges, actually we were -- we were very fortunate to start on with the light-duty vehicles into the landscape for their regulatory requirement. So when we go into our heavy-duty realm, what we looking at is the standards on it. So there has been a lot of fundamental learnings on the vehicles, infrastructure, and actually the characteristics of the algorithm itself to the point that now we are pretty much learned from that sense. But there’s not enough open regulatory requirement, as I pointed out earlier, for any of these vehicles like fueling, fuel economy, and the hard work necessary for the entirely flow fueling of the vehicle.

MR. SAMUELSSEN: Thank you. James, can I go to you for response?

MR. KAST: Of course. And so I think, you know a key point that Antonio was also alluding to is really just the predictability of policy. So as much as policy can be predictable and you can plan for it, that really helps volume that is, you know these are -- these are not things that take
one year to develop, these are very long lead times to
to actually develop trucks and move them out to where they need
to be. So having things like this mandate that’s, you know,
right now, 15-, 20-year, you know, really horizon for what
this looks like, helps us really enable how do we actually
develop direct technology to meet these kind of requirements.

But of course to actually do this, there needs to be
the incentive structure to allow the end customer to be able
to afford these new vehicles. And I’ll note that the total
cost of ownership for heavy-duty trucks is very different
than a typical light-duty Mirai customer. They’re using this
vehicle as a tool for a business and not just something to
get to work to and from every day. So they’ll certainly be
very receptive to cost and we need to be able to build out
the infrastructure to bring down the fuel cost to do that.
And of course, the vehicles themselves, we can actually get
truckers into the vehicles to meet the requirements that
we’re trying to achieve from an air quality perspective.

MR. SAMUELSSEN: Thank you. Brian, what is your take?

MR. LINDGREN: Sure. Yeah. Many of the good
comments have already been taken so I’ll tag on a little bit
with those. One of the concerns I guess I have that is
the -- the zero-emission certification for a vehicle that is
clearly zero-emissions inherently. Seems a bit burdensome
and I think there is an opportunity there that might be able
to be addressed for vehicles that are clearly zero-emission by design. Another one that has me a bit concerned are the excise tax and sales tax on these vehicles. Especially the early ones. If we’ve got a 12 percent federal excise tax and a 10 percent sales, local -- state and local sales tax, that’s on an expensive vehicle, as these early ones are. That can be a big burden on the end user. I think that’s something that the state and the federal governments could address if they choose to.

MR. SAMUELSBN: Jaimie, do you have a few items to add?

MR. LEVIN: I would say the unfunded mandates, which others have spoken of, I think sales tax on emerging technologies makes no sense, especially if we’re using state funding to develop these programs. On the positive side, because of California’s leadership, the House just this week passed Invest America Stimulus Program. Now, whether that’s going to get through the Senate in this year, but it could very well likely happen next year. There’s $1.7 billion that have been proposed for zero-emission buses. And that has survived the process through the House, and that is really taking the next step beyond what the state of California is, to help transit make this conversion.

MR. SAMUELSBN: Lauren, I’m going to save the last policy and last question for you. It has to do with the
California Air Resources Board decision last Thursday to adopt the rule that by 2045 all trucks sold in California must be zero-emission. Because you’re in the L.A. area, you may have seen a few days later, in the Los Angeles Times on Sunday, an editorial supporting the initiative and stating, “This rule is the first of a kind and among the most ambitious efforts in the world to replace diesel trucks with battery powered and other zero-emission vehicles.”

My question to you is really twofold, but to associate with that last part of their phrase, battery powered and other zero-emission -- other zero-emission vehicles. Number one, do you know of other zero-emission vehicles and battery electric vehicles? You might be able to name one. And secondly --

MS. SKIVER: Well, I think -- sorry.

MR. SAMUELSN: -- why is it we find it so difficult for politicians and decision makers, and policymakers, and in this case the editorial board, to use the words fuel cell?

MS. SKIVER: You know what, that was going to be my comments. That when we talk about electrification, we have no problem talking about all battery electric, but it cannot come out of most people’s mouths other than those that are actually operating it or working to develop it, the benefits of fuel cell. And so my ask was going to be that there is more discussion, there is more award. And there’s this,
maybe it’s an educational, and a form like this, there’s lots
of education about what the industry is doing for fuel cell.

And I will lead the audience with this, SunLine’s
been operating fuel cells, as I said, for over 20 years.
I’ve been there seven. The first five years I was there we’d
have a visitor from around the world, maybe six times a year.
We’ve had more transit agencies come to our facility in the
last six months to see what we’re doing in hydrogen. And
these are organizations within Southern California that have
really centered around all battery electric and see that they
won’t be able to take it to the finish line with their fleet,
with an all battery electric solution.

And so I agree with those comments. It was what I
was sitting on my hands to say. I think that fuel cell is
working. People are using it. Major corporations are
developing and commercializing vehicles in it, yet we have a
problem talking about it. And I don’t think it should be
some kind of gaseous or solid secret that we can’t bring out
into the -- out into the atmosphere. I also think that
awards by our funders in California and across the country
need to include fuel cell awards. It typically is an orphan
that gets a small award, or at one agency gets an award for
fuel cell and the rest of the money goes to all battery
electric, and I think there needs to be parity on those
awards and those deployments.
MR. SAMUELESEN: Thank you, all participants involved --

MS. SKIVER: Wish I could answer that, Scott.

MR. SAMUELESEN: -- for this very stimulating moderated discussion.

That will bring this portion of the session to close, and let me move the microphone over to Jonathan for attendee questions and answers.

MR. BOBADILLA: Thank you, Scott.

I’m going to start with the ones with thumbs up. Start from the top.

With concerns -- this one’s from, I’m sorry, Travis Andren. With concerns around mass transit compared to -- around mass transit compared to social distance, is the mass transit sector of the mindset that things will return to normal operation? Or are we facing a significant usability shift that may affect ridership permanently going forward?

And that question’s not directed at anyone in particular, so it’s open to the floor.

MR. SAMUELESEN: Jaimie?

MS. SKIVER: Well I mean, I’m an operator, so I’ll say that normal is not a word we use anymore, but it’s adaptability. And so I think that we are looking at how many, you know, the productivity of our buses. We’re developing our own rideshare. We’re looking at other micro
transit sorts of applications to use. Will it all be a 40-foot or 60-foot bus in the future? Maybe not. But will it be a combination of those services? Yes.

And actually in my opinion, and this is one person’s opinion, COVID-19 actually pushed transit forward to look at a service that needed to be looked at for 25 years, and to start being more entrepreneurial and innovative in the way that we are delivering service. So I actually think there’s going to be a huge benefit to the riding public and to transit agencies, based on what COVID-19 has brought forward.

MR. LEVIN: Yeah, and I would add to what Lauren said that it isn’t going to stop us from moving in a direction of zero-emission. Regardless of the specific technology or the vehicle modes, zero-emission is our future. That’s not going to go away and so it shouldn’t affect what we’re all trying to accomplish with fuel cell electric technology.

MR. BOBADILLA: Thank you.

And then next one came in from Raoul, sorry if I misspoke that. The State of California has invested in a trial of fuel cell vehicles and fueling stations over the last few years. That trial has shown that this is a viable technology for zero-emission vehicles. In 2019, California’s 8,000 FCEVs traveled about 90 million miles and used about 1.5 million kilograms of fuel. FCEVs are a drop-in replacement for ICE vehicles, but the fueling network needs
to be built. This trial provides convincing evidence that the public will adopt FCEVs once there is a robust fueling network in place. Why not make the policy commitment now and move as quickly as possible to get that fueling network built so widespread adoption will be possible?

And that -- it’s not directed at anyone in particular, but it’s open to the floor.

MR. LEVIN: Well the optimism is that the Energy Commission has already identified a forthcoming grant funding opportunity for transit infrastructure. Heavy-duty transit infrastructure. So we’re seeing signs of movement in the right direction.

MR. KAST: And I think the only thing I’ll add is just, you know, instead of assuming that two can happen by themselves, infrastructure kind of in its own bubble and the fuel side in one bubble, the two just need to come together and collaborate even more than we already are today so that we could match up the investments to scale both vehicles and the infrastructure so it actually meets the needs of customers at the end of the day.

MS. SKIVER: And that was what I was going to add. I mean, right now, currently, a fleet operator could do one set of grants for the vehicles, but then has to go apply at another area for the infrastructure. I mean, the beauty of the CARB grant for us was it was both. It was infrastructure
and vehicles and we need to see more of those package deals
go out as grant opportunities so that you’re not having to
piecemeal your program. It makes it very difficult to plan
when you may have all the opportunity in the world to get
vehicles, but then you can’t fuel them.

And so I think communication and collaboration,
there’s a lot that happening now in California. I think
that’s going to be the blueprint for the future on how
deployments happen more successfully and how they happen more
rapidly.

MR. LEVIN: And, you know, to that point, Lauren, CEC
is actually with CARB for the first time are soon going to
release a GFO for dredge truck and fueling infrastructure
together. So it’s wonderful that these two agencies are
working in concert to do that very thing.

MR. BOBADILLA: Excellent. And I believe we have
time for one more question. This is from anonymous. Toyota
has said that scaling light-duty fuel cell electric cars will
assist in cost reduction for heavy-duty fuel cell electric
trucks. Are there examples now where light-duty car
components are used directly in heavy-duty truck diesel
engine drive train systems that support this assumption?

MR. KAST: So the short answer is every single one of
them, Toyota’s built. We haven’t manufactured any different
fuel cell technology so even the Prius itself, all the hybrid
components were then utilized for Mirai, and now all the fuel
cell stacks you see in every single fuel cell component that
we build around the world uses the exact same fuel cell
technology.

MR. LINDGREN: If the question we’re looking to say
are we using any passenger car pieces in today’s diesel truck
power train, I’m struggling to come up with any. In the
power train, no. There might be some bits and pieces in the
cab that get borrowed from passenger car technology, but
frame rail, chassis, power train, those are pretty
much -- those are pretty much truck oriented. But the
technologies are not very different. The specific parts tend
to be different.

MR. BOBADILLA: Thank you. And Brian, since I
already have you, actually there is one directed towards you.
Also from anonymous. Is Kenworth currently working on long
haul usage of their trucks? And if so, how are they
addressing the issue of fueling stations?

MR. LINDGREN: So the way we see hydrogen fuel cells
working out is primarily ones that are going to run either
point to point or start at some hub and then come back to
that hub to refuel. Over time, I see the infrastructure
building out and we do have discussions with a few fuel
suppliers in terms of how that will work.

And, but I see it growing organically. I think there
will be a lot of -- a lot of trucks that will be centered around the ports of Los Angeles and Long Beach. So it makes sense to have fueling infrastructure there. Those trucks will start moving around the L.A. basin. Many of them will go to the Inland Empire. It makes sense to have a fueling station up in the Fontana, Ontario area.

The same kind of thing will happen, I think, in the Bay Area. We’ll start to see trucks running out of the East Bay, and then ultimately running over to Stockton and Sacramento. So there will probably be some fueling stations, both East Bay, as well as Stockton, Sacramento areas. And then eventually maybe something around Kettleman City would make sense. In between so that trucks can run the entire length of the State, but -- or at least between Los Angeles Basin and the Bay Area of Sacramento and not have worries about being able to refuel along the way.

And then over time that will move up the I-5 corridor, up to Seattle and Vancouver British Columbia. And over time that will move eastward out I-80 and I-10, but that will be -- that will be over time.

MR. LEVIN: Just a note to Commissioner Douglas, we hope that the Kenworth Toyota trucks, or any of the truck fuel cell operators will be delivering hydrogen to the fleet operators, to the transit operators.

MR. BOBADILLA: Thank you so much.
And with that, I believe we’ve reached our break.

MS. RAITT: Actually, thanks Jonathan. This is Heather Raitt. I, and thank you to the panelists and to Professor Samuelsen.

I -- if I could just jump in before we take a break. It’s always dangerous to jump in before a break, but we would like to do a quick panel -- I mean excuse me, a quick poll to help us gauge how many people would like to make verbal comments during the public comment period. So we’ll just run a quick poll. Just take a few moments here. And if you are interested in making comments, please just go ahead and let us know and that’ll just help us do a little bit of planning. We’ll just give it a few more seconds here.

All right. Well I think we can close it. All right. So it looks like we have about seven people interested in commenting. Thanks so much everybody and so we’ll go ahead and take a break and we’ll be back promptly at 3:00.

(Off the record at 2:46 p.m.)

(One the record at 3:00 p.m.)

MS. RAITT: This is Heather Raitt. We can go ahead and restart.

So we’re back on the record and so we’re going to move on to our second panel which is on Hydrogen Supply and Fueling Infrastructure, moderated by Joan Ogden. So, go ahead, from -- Professor Ogden is from UC Davis. So go
ahead, Professor.

MS. OGDEN: Well good afternoon.

MS. RAITT: I am so sorry.

MS. OGDEN: It’s really a pleasure to be here.

I think we’re on the fuel cell --

MS. RAITT: Yes.

MS. OGDEN: -- vehicle market status.

MS. RAITT: I am so sorry. I don’t know what I was thinking. We are absolutely on the light-duty fuel cells.

Thank you.


So I’m really, it’s really a pleasure to be here.

And we’re going to have some opening remarks from each of our panelists. And so we’re going to hold the questions until all the panelists have made their presentations.

And -- and then we’ll -- I’ll start off with introducing our first panelist. Maybe I’ll ask the panelists to turn on their videos, too, or our first one.

Jackie Birdsall, are you -- are you here? Let’s -- I guess let’s move on to Jerome, then. Jerome Gregeois. Hmm.

Okay and what about John --

MR. GREGEIOIS: Yes. This is Jerome. I don’t know if you can hear me. I can --

MS. OGDEN: Yes.

MR. GREGEIOIS: -- I can speak, but I’m locked out of
the video right now. It says that the host has stopped me from forecasting.

MS. BIRDSALL: Yeah. This is Jackie. I’m having the same. It says my camera is disabled.

MS. OGDEN: Okay. I don’t see any of the other video for the other, for Jonathan or Monterey either. Maybe Jackie, we’ll go ahead and start with you, then. And I’ll just briefly introduce.

Jackie Birdsall is a senior engineer in the Fuel Cell Hybrid Vehicle Group of Toyota Motor, North America Research and Development, and specializes in hydrogen infrastructure, high pressure hydrogen systems, and associated codes, standards, and regulations. She also serves as a technical spokesperson for Toyota Mirai. And has been in numerous publications, including Car and Driver Fortune, Wall Street Journal. She’s had long experience in the automotive industry prior to joining Toyota in 2012 and has 12 years of experience with fuel cell vehicles.

So Jackie, I’ll turn it over to you.

MS. BIRDSALL: Thank you so much for that kind introduction, Joan. Can I confirm that everyone can hear me? But you can’t see me. Okay. Got that.

Well, we really appreciate the opportunity to share Toyota’s perspective related to light-duty hydrogen fuel cell electric vehicles in California today. So here at Toyota,
our goal is to provide mass market solutions, to reduce the
impact of greenhouse gasses and local pollutants by
increasing our electrification portfolio.

We see programs and policies from California agencies
such as the CEC and ARB as critical to achieving these goals.
I mean, really realistically, we could not launch our zero-
emission vehicles without the regulatory signal that our
technology is welcome, and that sufficient infrastructure
will be made available.

For hydrogen policy specifically, this means equal
footing with other zero-emission technologies. That means
investments like the upcoming GFO for hydrogen infrastructure
and a signal that these policies will be sustained, allowing
for the expansion of green jobs, and for new programs to be
launched. So if you could go to the next slide, that would
be great.

So thanks in large part to the State’s effort to
date, we now have more than 6,000 Toyota Mirai on the road
fueling at 4,100 hydrogen stations in California. And we
also have several Class 8 fuel cell electric trucks hard at
work in and around the ports of Los Angeles and Long Beach
moving freight, reducing local air pollution, and improving
the lives of local communities, as you may have heard earlier
from my colleague, James. And we’ve seen the capabilities
of fuel cell electric technology when adequate hydrogen
infrastructure is available. And this means that vehicles

can fill within minutes, one after another and then drive off

with 300-plus miles of all electric range.

This makes zero-emission driving accessible to our

customers without dedicated parking spaces, much less a

garage, or for those whose -- who have families who share a

vehicle, or who otherwise just prefer fueling to charging.

And you may have heard this in earlier panels, but in

California, our hydrogen infrastructure has been tried with a

greater demand versus supply than anywhere else in the world.

And we believe this is a testament to the ideals of

Californians and our aspirations for electrification.

Could you go to the next slide, please?

So last year we announced our latest contribution to

our collective goal, the 2021 Toyota Mirai. And we scaled up

production capabilities by an order of magnitude. But really

regardless of how fantastic I think this vehicle is, for it

to be a success, the availability and reliability of fueling

infrastructure is key. So to that end, we support the CEC to

apply the full $200 million allocated to light-duty hydrogen

infrastructure, to align with the 200-station goal per

Governor Brown’s 2018 Executive Order on ZEV infrastructure.

And to take that a step further, we also align with

other stakeholders on the premise that enhanced ZEV targets

also call for bolder infrastructure goals. For example, to
align with Governor Brown’s target of 5 million zero-emission vehicles by 2030, we believe that California must also commit to a goal of establishing 1,000 hydrogen fueling stations to enable one million fuel cell electric vehicles.

So with that said, I’ll go ahead and stop talking and again express my gratitude for this opportunity. And really look forward to a fantastic panel.

Thank you, Joan.

MS. OGDEN: Okay. Thank you very much, Jackie.

Our next speaker is Jerome Gregeois. And Jerome is a power train senior manager at the Hyundai Research Lab in Chino, California. The Hyundai California Lab develops power trains for zero-emission vehicles, researches eco technologies marketability, and supports refueling infrastructure development. He holds a master of science in Mechanical Engineering. And prior to joining Hyundai in 2008, he held positions in design, testing, and quality for power train systems at Nissan in the United States, and Renault in Europe. Jerome.

MR. GREGEAIS: Good afternoon, everyone, and thank you for having me. I hope you can hear me well or well stop me if you can’t.

So I’ll be discussing the efforts that Hyundai has been doing developing fuel cell vehicles and specifically in California.
If you want to move to the next slide.

Just a quick introduction about Hyundai Research and Development worldwide. We are located in South Korea, and we have two R&D centers there, the Namyang R&D Center that is in charge of developing the large majority of vehicles, including vehicles that will have fuel cell power train. And we have a dedicated fuel cell center in the City of Mabuk that works on the fuel cell systems and hydrogen storage.

And if we move into the U.S., we have the R&D that is headquartered in Michigan. But we have a large presence in the state of California with three entities that are under R&D, our California proving ground where our vehicles have been tested, our fuel cells and durability. The California design studio in Irvine that works on packaging and also developing vehicle systems. And the California fuel cell lab where I am located in Chino, California that has been since the early 2000s working on fuel cell vehicles first reviewing programs. And recently on the NEXO, our latest vehicle. And finally we also have our Hyundai Motor America headquartered in California, which is the sales organization that is in charge of selling the vehicles and servicing the vehicles.

Next slide.

So I have a few dates on this slides to kind of indicate when it started and then what’s the vision from 1998 to 2030. 1998 is really the year where Hyundai started
working on fuel cell technology. And it took until 2013 in
order to have a vehicle that would be available as a lease to
This is the first time where any OEM introduced a hydrogen
electric SUV. That vehicle was sold in -- 18 vehicles in
America and Europe and was used in global taxi and car
sharing services and got an award, The Ten Best Engine in
2015.

Our second generation came on the market in 2018, and
it’s to date, the world longest zero-emission range SUV with
380 miles. So that’s a vehicle that not only is zero-
emission but is also Hyundai’s technology flagship.
Contributes to purification of air. Some of us not familiar
with the fact that fuel cells actually get air through their
system and contribute to purification of air. And you can
get 380 miles of range in 5 minutes of refueling and keep
doing all day long. That vehicle also received an award in
2019, with awards, and it is currently available for lease in
California at $399 a month. And also with a credit of
$13,000 of complementary fuel, which is an incredible bargain
for a vehicle of that level.

And if we project ourselves into the future, really
the vision for Hyundai is the quote that I will do from our
Executive Vice Chairman that mentioned that as a first mover
in the forthcoming hydrogen economy, Hyundai will lead us a
society that uses hydrogen as its main source of energy. So this includes transportation and beyond.

Next slide.

So if we want to focus a little bit more on California I’ll give, I guess, the history of how Hyundai got exposed with retailing vehicles in the U.S. market and it started in 2014. But it has a milestone, first milestone at 2013 where there were zero public retail stations in California. It was not possible to go anywhere and buy, with a credit card, hydrogen. When you were able to access a station, there would be a protocol that would get you a cost of in between the 15 to $30 per kilogram, depending on where you would be refueling. And it was a complex process, more industrial like with thin pad.

If we fast forward to this year in 2020, we have 41 public retail stations where anyone can use their credit card and buy fuel as easily as gasoline. And we have a price that’s diminished significantly, but still is at 10 to $17 per kilogram, which is not competitive with gasoline. And if we look at the retail market, we now have three options for consumers. So there’s the beginning of the competitive retail market which will benefit consumers.

The enabler, really. from that progress in those seven years is AB-8, as AB-8 contributed to establishing the stability for all the different stakeholders, that they would
be station builders, OEM, industrial gas providers, and also consumers feeling competent that the technology was backed up.

And as we fast-forward into the future, I didn’t put a date there but looking forward to a time where we could see around 1,000 public stations. That would be giving the coverage equivalent, or very close to gasoline, and possibly a price at $5 per kilogram of hydrogen. Which seems very challenging today, but in some areas in the world, we’re not that far from that. And that would be a real enabler for getting to a wide range of vehicles that could be put on the market and that would offer competitive options for consumers.

And this is my last slide so if we want to move to the next one, that will be my conclusion.

I’m looking forward to the panel so we can discuss how we can bring vehicles like this one, powered by the renewable energy that’s in the background. Thank you.

MS. OGDEN: Thank you, Jerome.

Next I’d like to invite our next panelist, Jonathan Palacios-Avila. He’s the chief executive officer of StratosFuel. StratosFuel, Inc. is a renewable hydrogen production company that owns and operates refueling stations, production plants, and the fuel cell car carrying company, StratosShare. Prior to cofounding StratosFuel, Jonathan
studied chemistry and public administration at California State University, Los Angeles. And received a bachelor degree in 2012.

While at CSULA, he learned hands on about the functionality of hydrogen stations and fuel cells. And in 2013, Jonathan and two other team members founded StratosFuel with a purpose to create a renewable hydrogen infrastructure. As CEO at StratosFuel, Jonathan leads the overall corporate strategy in the citizen development process for the company’s production facility. He also oversees the car share company StratosShare, as it’s a huge part of the company’s strategy of offering an all-inclusive hydrogen infrastructure.

Jonathan.

MR.PALACIOS-AVILA: Thank you so much for that. So like you said, my name is Jonathan Palacios-Avila cofounder and CEO of StratosFuel.

If you could please go to my first slide.

So this slide I’m going to talk a little bit about StratosFuel and our background. We were founded in 2014 with the sole purpose to make hydrogen an everyday fuel. We are a proud recipient of multiple CEC grants relating to hydrogen stations, renewable hydrogen production, and zero-emission shared mobility services.

Currently StratosFuel is building out the first phase of their 100 percent renewable hydrogen production plant that
uses in-state renewable electrical feedstocks. It has an intake capacity of 5,000 kilograms and this plant is specifically designed for the hydrogen fuel cell mobility market. Secondly, StratosFuel in collaboration with the California Energy Commission and Toyota deployed 15 fuel cell electric Toyota Mirai vehicles to -- within the inland empire, which are available to be rented by the hour or day through the StratosShare app.

Next slide, please.

So for the sake of this discussion today, I’m going to be talking a little bit about our -- how we’re making hydrogen mobility more accessible, and kind of the effects of that and the benefits we have to the greater overall infrastructure.

Next slide, please.

So what StratosFuel’s doing with StratosShare is we’re providing on-demand vehicles that are rented by the hour or day. And what this is essentially doing is providing access to zero-emission vehicles for communities that otherwise don’t have the infrastructure or don’t have the vehicles or affordability to have them. Our initial rollout of the 15 cars were deployed in disadvantaged communities. We targeted San Bernardino and Riverside. One because of the -- based on CalEnviroScreen score, they ranked the most highest as disadvantaged communities, and they have some of
the highest pollution rates within the state of California.

And what we found is that deploying the area, deploying fuel cell vehicles for shared mobility in these areas allows us to increase a hydrogen demand for the local stations.

Next slide, please.

And additionally, the shared mobility services reduce congestion. We see that one shared vehicle can replace up to 15 cars on the road. And for every zero-emission mile that our fleet has traveled, we’ve reduced 24 pounds of greenhouse gas emissions that otherwise are emitted. And we also reduced the cost of ownership for vehicles which make sometimes owning a vehicle, yet alone a zero-emission vehicle, prohibitive for some people.

Next slide, please.

So kind of what we’re looking at as a policy push is one to really increase funding for zero-emission transportation. We have some extensive data on the utilization of these vehicles and how much fuel they are using on a daily and weekly basis. And we’re seeing that if we can incorporate this with subsidized transportation, such as LIFE, which stands for Low Income Fair is Easy, that’s available in Los Angeles County which provides -- essentially, it’s a card that allows people to ride the bus and take other modes of public transportation for free or for
subsidized cost.

We’re seeing if we can utilize that and subsidize zero-emission transportation through shared mobility, then we can really come to a cost parity where it is more cost effective to take a shared vehicle, or another form of mobility service which we think that right now we’re -- we can rapidly deploy more vehicles in areas that need to go zero-emission. And if we can make it more affordable, this would also help target areas that maybe don’t otherwise have zero-emission infrastructure but can help spawn that in other communities.

So that’s kind of the policy recommendation and the strategy with StratosFuel and Share. And thank you and back to Joan.

MS. OGDEN: Thank you, Jonathan.

All right. Our last panelist now is Monterey Gardiner. Monterey spent two decades supporting working to accelerate the commercialization of hydrogen technologies and promote renewable energy policies. He started his career at the UC Davis Institute of Transportation Study, completing his PhD under the guidance of Andy Burke and Joanna Groza while building a cryogenic storage hydrogen prototype tank based on activated carbon at the Hydrogen Research Institute at the University of Trois-Rivieres in Quebec, Canada.

He now works at the BMW technology Office in Mountain View.
View, California exploring and working to remove barriers to eMobility and representing BMW North America within the hydrogen community. He spent five years technology scouting for BMW Group and in North America, part of that he spent seven years with the U.S. Department of Energy’s Fuel Cell Technology Offices, directing R&D efforts to bring down cost of hydrogen delivery technologies and component costs, operating strategies for refueling stations.

While at DOE, he advocated for one of the lowest cost and the highest density advanced storage options called cryo-compressed hydrogen. For about three years he was a safety engineer at the California Fuel Cell Partnership and then managed Hyundai’s first fleet of fuel cell vehicles in Northern California.

Monterey, it’s a pleasure to see you, as a former Aggie, still an Aggie, among all the other things that you’ve done. So, we’ll turn it over to Monterey.

MR. GARDINER: Thank you so much, Joan, for that kind introduction. I assume everybody can hear me okay.

MS. ODGEN: Yes.

MR. GARDINER: So as Joan mentioned, my name’s Monterey Gardiner and I work here at the technology office in Mountain View, California. And I would also like to thank the CEC Commissioners Douglas and Monahan for this opportunity and dialog to share some perspective from BMW
group.

I have a long history with hydrogen, and I spent more than ten years outside of California. So living in D.C., exploring the national cost reduction opportunities for hydrogen, living and working in Germany and Japan for BMW before returning here ten years later with my two boys and family. They were born in Davis.

I grew up in Sonoma County without grid connected electricity, just using a small generator through eighth grade just relying on LPG for cooking and lighting. And personally, I feel we’re at a cusp of a tipping point. Given the promising presentation this morning on the cost reduction of hydrogen and progress made by multiple countries. Just last week Germany announced a 9 billion Euro investment plan to promote hydrogen technologies and deployment of upwards of 5 gigawatts of electrolyzers. So there’s an enormous amount of effort going on now.

The BMW Group’s committed to the height of the Paris Agreement and already offers a wide range of electrified vehicles. We’ll have upwards of 25 models globally in the next couple years. But we really believe in the power of choice for customers and hydrogen vehicles could be part of that story.

Next slide, please.

So as you can see here, we have a bit of a rollout
strategy. Our former board member of Development, Krauss (indiscernible) said that from the start of our fuel cell development, we pilot, we master, and we scale technology. The next step in the rollout for BMW’s high hydrogen NEXT is really pressed to master that technology with a small fleet. So we’re currently developing that based on our X5 model, and it’ll be possible, some of these vehicles could be brought to the U.S. for testing and even California in 2022 or 2023. But they won’t be sold to customers. Not yet.

For passenger vehicles, we’re convinced that we really need this choice in respect to the power trains and that best suit their needs. So we need to have a customer that wants something more than existing electrified models on the road. Long distance travel is more flexibility and where they use those vehicles, and regular access to charging and infrastructure, and that’s what’s most critical.

We appreciate California’s efforts to build out the network of hydrogen fueling stations and that the hydrogen commodity is -- glides hydrogen at a competitive price. It’s renewable based and it’s something that our vehicles customers will find useful and convenient. But it really needs to be matured globally, not just in California.

So we’re continuing our R&D program in preparation for this market introduction, possibly in the second half of this decade. Exact timing and models are still being decided.
and it really just depends on each market conditions.

Next slide. Thank you.

So on the right side, I think you’ve already heard a bit, some of this may be fairly basic, but the fuel cell system that we’re looking at provides upwards of 125 kilowatts of electric power and we have the -- the motor will be 270 kilowatts power. But right now really the focus is learning how that technology. So there’s two 700 bar tanks in the system, which can give upwards of 600 -- 500 kilometers of range and refuel in just a few minutes.

So that’s the, probably the most important aspect is, right, finding that convenience that gives something over and above like the existing electric drive car chains on the road. So with regard to hydrogen, BMW right, has shown, right, this, you have this very valuable green energy. You want that highest efficiency going where there’s least conversion losses. But we also recognize, right, that this long-range convenience will require hydrogen. But it will be for larger vehicles, it will be for trucking, as we heard from other sessions. And so it’s just a matter of time for that to be built out.

But hydrogen needs to be cost efficient versus that direct use of electricity and really focusing on that CO₂, and right, reducing that where it has the biggest impact.

So I think I’m going to keep it short here and I
really look forward to everyone’s questions and I appreciate
the time to share a little bit about BMW’s strategy.

MS. OGDEN: Thank you very much, Monterey.

I think now we’re going to ask all the panelists to
turn their video back on and we’re going to now go to the
Commissioners. So we’re going to ask Commissioner Monahan,
Commissioner Douglas to invite them to ask some questions of
this panel. And maybe we’ll start off, let’s see, whichever
Commissioner would like to go first.

COMMISSIONER MONAHAN: Well, I can start. And Joan,
thank you. Thank you for your leadership for so many years
on hydrogen fuel cells, clean transportation broadly.

And I do feel a little like there’s a conspiracy
going on with the UCITS Davis folks just basically
infiltrating every aspect of clean transportation. It’s been
a theme going on with many of our panels.

MS. OGDEN: We have UCI and CS UCLA here too, among
others.

COMMISSIONER MONAHAN: That’s true and I don’t mean
to -- not everything begins and ends at UC Davis, even though
Dan Sperling may say otherwise.

So I had a question and I asked this question in the
morning -- in the morning. I’m curious about what you all
think too. You know, I think of how we move the market on
fuel cell vehicles and it really does take global investment.
And you all have referred to some global investment happening, but I wonder if you could deepen the discussion of that. And, you know, one of -- one of the kind of, I’ve been just pondering what does it take to build a global market for fuel cell electric vehicles. And to me, China is really important. World’s biggest market. They’re leaning in more on heavy-duty fuel cells, not so much on light duty. We have Japan, Korea making some investments. Germany’s starting to. But I wonder if you all can talk more about how you’re seeing global momentum towards fuel cell electric vehicles in the light-duty space.

And one question I had for Monterey Gardiner on the -- on the BMW side is just why so long? Second half of this. Why not next year? So just give us a sense of what your -- what the hurdles are to getting commercialized and just building this whole global momentum on light-duty fuel cell electric vehicles.

MR. GARDINER: Did you want me to start or?

So I think for BMW, right, profitability is very critical. If you look at some of the other auto manufacturers, even amongst the European ones, we have this 8t to 10 percent profit range that is just part of our culture and just being very focused, right, on the workers and that we don’t have these big jumps from, right, a few percent of profitability to 20 percent. But what that does,
and it means that our technology development has to be very methodical, and it has to be very measured where the markets and that we don’t make missteps. So BMW is somewhat risk averse in that, so we build technology that’s, right, very desirable, but we want to make sure that we can make money with it.

And so the reasoning is, right, we’re looking at $20 a kilogram, then we need that maturity. And I think that’s where California can step in to give that certainty to industry for end to end investments where you have really large scale renewable based hydrogen, as we saw from Dr. Wang this morning, right. Those costs can come down. Large scale storage and like jump starting that market to the transportation fuel to match what industry needs. So we know it works, it’s just a matter of getting to scale.

I don’t know if I answered your question or if there’s anything else I can expand on.

COMMISSIONER MONAHAN: I think you answered my question on the why so long, but not on the what other, you know, what’s sort of the global theory of change for how we bring down prices and really build the market, that’s fuel cell light-duty vehicles.

MR. GARDINER: So we need that scale, right? We need the -- for the auto manufacturers, that certainty that the fuel’s going to be there. Cost and convenient for our
customers. But we need to see it in China, in Korea, in Japan, where it’s coming in Europe, and California. But like having building cars just for California is not something we can do. But it’s really that scale and I think we’re seeing that both in China and Europe in some of the announcements and that it’s coming.

But I think another panelist can answer more to that question about global scale manufacturing.

MR. GREGEOIS: Yeah, I can make a comment if nobody else wants to jump in.

I guess I’ll give some comments on investments that are made in Korea so that gives you a perspective, I guess, on the efforts that Hyundai has been doing. But Korea’s really the first market where Nexo has been deployed. So we have about a little over 7,000 Nexo’s on the Korean market. It started in 2018 and 2019 was about 4,000 vehicles and then this year we’re on the same track as before, about 5,000 vehicles. And it’s a market that has currently 30 stations.

COMMISSIONER MONAHAN: Is that -- Jerome, is that new vehicles? 5,000 new vehicles or 5,000 vehicles cumulatively?

MR. GREGEOIS: That’s 7,000, over 7,000 cumulated vehicles. And then this year is expected to be 5,000 so --

COMMISSIONER MONAHAN: Additional.

MR. GREGEOIS: From January -- from January 1st, 2020, 5,000 vehicles additional to the market.
COMMISSIONER MONAHAN: So then Korea will take the mantle from California for having the most fuel cell electric vehicles on the road in the light-duty space.

MR. GEGEIOS: It will be close. Depending on how things go. Yes, the market could be about the same. But the difference is there’s really, Nexo is the player on the Korean market so maybe that’s helping us. There’s not a lot of competition to go and shop around.

But that’s enabled by, I guess a couple item, is one is the Korean market is very favorable to fuel cell vehicles because the country, in general, believe in that hydrogen society and you can actually acquire a Nexo for the price of some of the gasoline vehicle. Really the price you would get is around $30,000 after incentives starting from a little over $60,000. So that’s one element.

And then the second element is that fuel in Korea is also very cost effective. Depending on where you refuel, you’re in between 5.8 to $7.3 per kilogram. And that’s 5.8 in a market that has gasoline more expensive than in the United States, you’re already at a benefit when you -- when you choose to have a vehicle.

So that’s explaining I guess where the -- the efforts are going. And obviously the California market is critical. We don’t have as many vehicles here, but I think that every market in the world is looking at the California market as
really the leader in pushing the technology and showing that
you can have the best retail experience and with a, I guess
more established market, or mature. And so that effort in
Korea is definitely also because of the efforts that were
done in California.

MS. BIRDSALL: I would also like to interject, if I
may.

I really agree with that sentiment that this needs to
be a global development, right. And so that’s why the Toyota
Mirai is a global vehicle. And that allows us the capability
to sell it anywhere, in Japan, in Europe, as well as in
California.

I think as far as a global effort, really what’s
going to drive the development of the vehicle is the
infrastructure. So we’ve seen large investments poured into
Europe and you just heard about South Korea. In Japan it’s
about 1.5 billion over six years that they’ve put into
establishing some kind of infrastructure around fuel cell
vehicles in Japan.

But there is a little bit of kind of nuance work
that’s being done on the back end that doesn’t get quite as
much time in the spotlight, because it’s not as sexy, really.
And that’s the development of code standards and regulation.
And really if you want to judge the staying power of any
technology, you look towards that effort. And there’s been a
huge effort, including from the federal level at the U.S. to establish what’s called the Global Technical Regulation. In addition to standards like SCG-2600 for the interface of the station to the vehicles. That’s also an international standard now, through ISO, and allows our vehicle again, to be launched anywhere, and a station in Europe can fill a vehicle from California and vice versa.

And there’s really, a really great cooperation amongst the industry to make sure that internationally all the standards are there to really capitalize on investment that not only the governments are making right now to support this technology but that the OEMs and the station providers are making to ensure that a component that we make, you know, in Japan, can be used anywhere else in the world.

COMMISSIONER MONAHAN: Well, I have found it interesting, really, how Korea has stepped up its incentives and support for fuel cell electric vehicles. And it’s curious to me that California has more fuel cell electric light-duty vehicles than Japan does, even though Toyota and Honda, who have been the leaders on fuel cells for as long as we can remember, right. Hyundai is a new -- a new enter into the space.

And I, you know, what I want to see is this global movement where Japan follows suit and actually has, you know, a robust fuel cell electric vehicle market. Together with
Korea, together with potentially Germany, together with China, then we build a market, and then we could scale up. So it just, you know California, we’ve been doing this for a long time. We’re continued -- we’re going to continue to do this because we’re committed to zero-emission transportation. But we need to think about this in a global context is where I’m, the point I’m trying to make.

And I have one question for Jonathan because I love your project so much, as do many folks. I’m curious what you’re learning as you try to roll out, I mean, what are the -- do you have any stories for us about the customer experience and? I mean, this is pretty new for a lot of folks, getting into a shared vehicle, let alone a fuel cell vehicle. What are -- what are you learning as you do this?

MR. PALACIOS-AVILA: Yeah, so I think that that’s a really great question. And one of the things that we -- that we learn is the excitement that people get when they drive these cars. I think first when were -- we initially launched, I think a lot of people were renting the cars and didn’t really understand that they were hydrogen fuel cell vehicles. I think they thought they were kind of like a new type of Prius design. And when they actually got the feel of one, a lot of people wrote us. They comment -- they can leave comments on the app and they said I want to buy one, where can I get one?
So I think that -- this is a great way, not only is it a great way to really increase, I guess, demand for hydrogen stations, but it’s also a great marketing tool to get people assimilated to hydrogen fuel cell vehicles. That they look and feel just like a regular gasoline car, but with more power and range. And I think another comment that people really got was that they were surprised that it was electric and the range that it had.

And we have a couple of fleet customers. I think the County of San Bernardino is one of them that utilize our vehicles within their fleet motor pool program. And these vehicles have a 300 mile-plus range, which allowed them to go to other parts of San Bernardino County which is the largest county in the U.S., that they otherwise wouldn’t be able to have done in a battery car, such as a Volt or something like that, that has the, you know, 180-mile range. So I think that was the positive side.

And another thing is we encourage the customers to fill. We give them a credit. I think they get like 30 minutes free of rental time if they go and refuel the vehicle. And we’ve had people refuel the cars. We have a sheet how to refuel and we haven’t had any problems. I think people initially are kind of confused on how to use the card and the pin, but once they get assimilated to that, it’s pretty simple and you have people refueling the cars quite
often now.

COMMISSIONER MONAHAN: All right, thank you.

MR. PALACIOS-AVILA: No problem.

COMMISSIONER MONAHAN: Commissioner Douglas, do you have questions?

COMMISSIONER DOUGLAS: You know, I don’t think so.

It’s been a great discussion. I don’t -- I don’t. I think you asked some of my questions.

COMMISSIONER MONAHAN: Oh, sorry.

Well Joan, why don’t we turn it over to you and we’ll get off video and you can continue the discussion.

MS. OGDEN: Okay. Thank you. I’m excited. I enjoyed the discussion, that part of the discussion.

So -- so now we’re going to go to another part of the -- of the panel. And I’m going to ask you some questions and just maybe direct these to different panel members to talk about. I just have a, kind of a free discussion off of these.

So the first one I wanted to ask you is how has the COVID-19 crisis impacted your overall assessment of the hydrogen and fuel cell market?

And maybe Jackie, I’ll ask you to lead that one off.

MS. BIRDSALL: Sure, Joan. That’s a -- that’s a very valid question. I think we’ve heard from earlier panelist that this is kind of a rare opportunity to slow down and
reevaluate your values. And for us that has not deterred us at all away from what we call our environmental challenge 2050, which has been a Toyota internal goal to reduce our CO₂ impact related to our fleet.

And again, the way of getting there for us is electrification, which includes fuel cell EV technology. So for us, there’s been even more of a shift towards supporting the rollout of fuel cell electric vehicles and finding new ways, as James mentioned before, new potential solutions where we can introduce fuel cell technology to solve problems, or to solve -- to step in as a solution for things that used to be powered by diesel or gasoline.

So, yeah, I think it -- I think it’s one of those rare opportunities that you really get to slow down and evaluate your values and for us, that has not changed ours.


MR. PALACIOS-AVIA: Yes. Yeah, I think, you know, the effects of COVID-19 really changed the way how we serve the public in terms of transportation. I think one of the things we saw was that, you know, transportation is an essential business, but we were now supporting a limited number of customers, but we still wanted to maintain our excellent level of service that we would normally do. So that included ramping up I guess, cleaning procedures for some of our
rides, taking vehicles off -- offline after they’d been
returned, allowing us to have time to clean them. Going
through checklists, through our app and with the customers.
If they’re experiencing any fever, or COVID-related symptoms.

So those are some things that we’re implementing and
just doing constant cleaning. But it’s really changed the
way, kind of, how we operate. But we still want to ensure
that people have, you know, that 100 percent reliability that
they can turn on their phone and reserve a car and still go.
And we’ve been really thankful for the hydrogen stations that
have maintained online, and during this time and had fuel
which was really, really good, and really helpful for a lot
of the drivers that were still commuting.

MS. OGDEN: Thank you. Monterey, you want to say
something on this too?

MR. GARDINER: Yeah, just a short sentence coming
from the European perspective. It’s really stirred a lot of
interest in investing these recovery funds towards hydrogen.
And it’s accelerating these discussions on urban mobility,
right. As you see, sidewalks are expanding into parking
spaces. And air quality, we’re seeing what a (indiscernible)
zero-emission landscape looks like now. And by -- there’s --
it’s really initiated a lot of dialog between BMW and
stakeholders in like, how do we get there faster.

So thanks to that question from Monahan, this morning
right. Previously, right? What’s it taking to accelerate it? I think that COVID-19 has pushed that a fair amount.

MS. OGDEN: Yeah. Interesting.

Jerome, did you want to add anything on this -- on this one?

MR. GREGEOIS: Sure. One -- one sentence, I guess. Short term, if we just look at the sales of the vehicles, overall we’ve observed, you know, like for any brand, things are a little down since the beginning of the year and it seems like maybe electrified vehicles may be a little more affected, but we’ll have to see how that trend evolves.

But I’d say that’s for the short term. For the long term, we’re looking at 2030, and then the strategy that I mentioned before. I don’t think that this has changed the direction.

MS. OGDEN: Okay, thank you.

Let’s move on to another question. I wanted to get your thoughts on what is California’s role in scaling up the industry? In particular, what benefits regarding state action in the light-duty fuel cell market. What’s California’s role in helping catalyze that market?

Anybody want to go first?

MS. BIRDSALL: I feel like I already spoke to it several times from the light-duty infrastructure perspective.

So I’d like to maybe give Monterey a chance.
MR. GARDINER: Yeah. I may be a broken record here and don’t know if this is entirely BMW’s perspective. But I think it’s incredibly important, the investment from the state in these early stations, and like maturing the technology, making sure the codes and standards are there. But moving to the next stage, right. What do we do in the next coming years? We really need that investment. I think there’s various bills working it through the legislature and, right, this discussion of like how do we connect electrolyzers to the grid? How do we make that officially part of the conversation between CEC, the CPUC, and ARB? And like recognizing that electrolyzers have a role in accelerating, yeah, renewable energy by forcing it to be a direct connection to where that renewable energy is located. Really puts a roadblock to the scale that’s needed.

And we take that one step further, we need large scale local faction and, right. Take a hard look at California. Why did that have to happen in Nevada, right? A few miles from the border. And what does it take to do large scale storage that’s needed connecting, right, the electrolyzers and that mixed capacity factor to a liquefier. And I think, Joan, you know about it as much as that of any of the panelists here.

MS. OGDEN: Thank you, Monterey.
Jonathan or Jerome, did you want to talk about California’s role in the scale up?

MR. GREGEOIS: Sure. I think -- yeah, I think from my perspective, California’s still looked at the leader in deploying new technology. And, you know, we’re talking about California today but, you know, seen from Korea, California and, you know, is on the West Coast of the U.S. and so there’s, I’m sure, perception that what’s happening in California has the potential to spread in a larger market. And that that market is still the largest economy on the planet.

And so there’s a -- there’s a strong signal coming from California to every other market, even though there’s a lot of Nexo’s in Korea, you know if there were a sense that California was changing its mind, it may be considered maybe the U.S. is changing its -- its position. And so there’s a strong -- a strong element, you know, when you’re the leader, people look at you, even though they may can sometimes surpass your -- your market, they still look at you as the place where it all started and as a place that has the good model for corporation between the different members.

So for me it’s, you know, it’s keystone is what’s happening in California.

MS. OGDEN: This links to maybe the next question.

Maybe I’ll jump to this one, too, which is a little bit more
about global trends with the deployment of SEDs and how is
what’s going on in California compare to other regions, let’s
say Germany, Japan, Korea, China. I’d be curious to get your
take on how people are doing things differently, how
California’s doing it. Compare it, maybe contrast with other
parts of the global market.

So let’s see, Monterey, do you want to take the
European perspective here on that?

MR. GARDINER: Sure. One of the really smart things
that happened early on with the National Organization of
(indiscernible) but the (indiscernible) organization that’s
like helping manage those government funds and investments is
really making an agreement with auto manufacturers, we’re
going to put in a certain number of stations and it’s up to
you to fill up those stations which we’ll define that next
step.

And I think that’s similar to where California is
now. But I find that very frank discussion between industry
and government to make sure the rollout happens hand in hand.

And so there’s a lot of discussion should light-duty
vehicles be part of this hydrogen strategy that was released
last week. And like to recognize those are part of it but
it’s not just vehicles, it’s also heavy duty, it’s also
greening of aviation fuels and like can legally get to this
cost competitiveness of electrolyzers replacing natural gas.
All of those topics are on the table (indiscernible) and I think we’ll see a lot of advancement here in the next few years.

MS. OGDEN: Yeah. Anyone else like to weigh in on this? Because we have lot of parts --

MS. BIRDSALL: Yeah, sure.

MS. OGDEN: Yeah.

MS. BIRDSALL: So, you know, in Japan obviously there’s, you know, a lot of support for hydrogen. We’ve invested $300 million into the -- although the big switch will unfortunately be postponed. But to demonstrate the vision of hydrogen, right, how we can have a hydrogen society.

I think California and actually I’m glad that I can kind of loop back to the previous question. Because I think California has done some practical things that are really brilliant and are leading the rest of the world. And those are, you know, the HRI credits for the LCFS. Even the language that goes into contracts for the hydrogen stations for the GFO. Right? Making them available 24/7 to our customers. These things aren’t available in Japan, the stations aren’t available 24/7.

So there’s some real practical learnings from California that we think could be applied to the rest of the world. Even metrology. I think California was the first to
make hydrogen a retail motor fuel. So there’s all, again, these little nuance details that are something that should be shared learnings worldwide and they are currently kind of a differentiation point between what’s happening in California and what’s happening in Japan.

MS. OGDEN: Yeah, interesting.

Jonathan or Jerome, do you want to comment on sort of California compared to other parts of the world?

MR. PALACIOS-AVILA: Yeah, I think I can comment a little bit to the point. Not too familiar with other global industries going on but I know that California really is the market beater in things that are being demonstrated here with kind of a statewide rollout of hydrogen fueling stations, renewable hydrogen production, and I think California is the first state in the U.S. to really have a hydrogen fuel cell shareability program that is focused on serving, you know, Southern California community.

So I really can’t speak to the global side on what’s going on but I know I’ve seen similar projects in Europe. I don’t know how well those performed. But I know that without California’s commitment to develop in the infrastructure, some of these projects in commuting would not be possible in the fuel cell.

MS. OGDEN: Hmm-hmm, yeah.

Jerome?
MR. GREGEOIS: Yeah, I’ll just make a comment I guess along the line of what Jonathan mentioned. I think the California market, although it’s, you know, relatively small market, it’s still more mature than other markets. And, you know, although maybe there’s as many or close to as many Nexo’s as fuel cells you would have in California versus Korea, I think the mechanism to get to $5.3 per kilogram may be challenge, maybe over time as the models are scaling up.

And I think, you know, in California and in the U.S., people will have a more -- people will have an eye on it needs to become a market that will sustain itself at some point. And so what we put in motion right now is always with the perspective of, you know, competition and the best benefit for everyone in the end.

And I think in that dimension, maybe California is the only market where you can find all three vehicles currently available and then diversity providers of stations. And you’re not going to find that in Korea as much, I’m not sure about Japan. But, you know, that competition and market spirit is definitely more alive here.

MS. OGDEN: Thanks. I’d like to kind of change gears here in the next question and talk a little about considerations of equity, of social justice equity in the deployment of fuel cell vehicles.

And maybe, Jonathan, I’ll ask you to kick this one
off. Can you discuss a little about that?

MR. PALACIOS-AVILA: Yeah, definitely. I think -- I think initially when you look at -- you just take a look at a CalEnviro score, EnviroScreen process and you kind of see where disadvantaged communities are and that is based on income demographics and environmental and pollutants.

The Inland Empire ranks highly among that group of individuals and air quality but has the least amount of hydrogen stations. So what we wanted to do was really impact that by deploying a fleet of vehicles within the surrounding area to help reduce those air quality.

And secondly, you know, our plant is based within this Inland Empire region that is going to provide fuel to zero-emission -- or hydrogen stations and provide fuel cell zero-emission vehicles. So we’re looking at really if we can deploy more stations and vehicles in these areas, then that can spawn more growth and I think really cross the border of focusing more on the higher demographic communities such as coastal areas and things like that.

MS. OGEN: Very interesting.

Let’s see, Jackie would you like to say anything, too, do you have anything for us?

MS. BIRDSALL: Sure. This is fun to do via Zoom. I don’t want to step on anyone’s toes so I’m just waiting to see if I get picked.
So, yeah, I mean, environmental equity, right? It’s about making zero-emission vehicles accessible to everyone. And for that, that, you know, that’s why Toyota has pursuit of portfolio approach so that our customers can choose the zero-emission vehicle that suits their lifestyle.

So I mean, for me, I’ve lived in L.A. for eight years now. For half of that I didn’t even have a designated parking spot. Right? So plugging in for me was not an option, for many people it is. That’s fine. But when we talk about serving everyone and everyone having access to this technology, that means that we need to make all these technologies available.

And if you go a station, like I have one just down the road from my apartment now and you see a vehicle fill one after another after another, it makes so much sense, again, for those people that are in highly urbanized areas that don’t have the luxury of going into a garage and charging overnight.

So, yeah, I think that the environmental equity is incredibly important. I think as we see economies of scale go up and the price of both battery electric and fuel cell electrics go down, it’s going to become more affordable and we need to make sure all those options are on the table.

MS. OGDEN: Okay. Monterey, do you want to give us some thoughts on the equity in the fuel cell?
MR. GARDINER: Sure, of course, I’ll take a stab at that.

Like for BMW, the equity is fundamental for any of these zero-emission vehicle strategies. For BMW, there’s no difference between whether it’s a battery electric vehicle or fuel cell electric vehicle. It has to be part of the conversation.

Right now in the fuel cell technology, it’s still expensive and so we are planning on implementing that in our premium vehicles. But at the same time, we just launched a premium electric vehicle that can be below $19,000 new from the dealer. It’s a mini electric, if you take the stock incentives, it can reach that. So like making sure the codes or incentives are available and like there’s no difference you’re going to see in disparity likely, federal level. It’s not something that California to deal with but that we did lose the federal tax credit for a bit and that again impact how decisions are made.

So equity is important but making sure the incentives are across the board for any of the zero-emission vehicles.

MS. OGDEN: Yeah.

And Jerome?

MR. GREGOEIS: Sure. Yeah, I think, you know, the technology of the fuel cell is still young and is obviously, you know, not fully at scale so it’s still kind of expensive
and not as accessible as it could be. I think that’s why
OEMs in general not only Hyundai participate in subsiding the
fuel. And, you know, for us it’s $13,000. It’s probably
what you will spend over three years if you drive like an
average Californian. And I think that at least five
(indiscernible) so very, very competitive. You know, our
vehicles, it’s 3.99, you can find cheaper than that.

It’s not quite as cost effective as some of our
hybrid technologies that have been there for a longer period
of time and are made of, you know, larger volume. But that’s
one way that we can contribute to expose as many people as we
can.

And also we’ve had, you know, vehicles engage in the
various car sharing activities which is maybe the ultimate
low-cost transportation if you don’t have a need to have a
private vehicle for your lifestyle. And, you know, in that
regard, you know, fuel cell or other technologies would be --
would be equal there. But that’s how we can try to strength
technology as much as we can in our community.

MS. OGDEN: Thanks. I think we’ve still got a few
minutes left here so I’m going to throw out a question now
which we touched on earlier in one of the earlier panels, the
previous one on heavy duty which are what are your thoughts
of light-duty vehicles interacting with heavy-duty vehicles
at the refueling infrastructure stage?
So let’s see, maybe Jackie, can you kick that one off?

MS. BIRDSALL: Yeah. Absolutely. So I think, you know, in urbanized area again and, you know, a lot of the CEC GFO awards that go to these retail hydrogen stations, there are colocated hydrogen dispensers at gasoline stations in urban areas.

For the most part that means heavy-duty trucks can’t even fit under the canopy, right? So as far as colocation of heavy-duty with light-duty dispensers in urban areas, I’m struggling to see that as a foreseeable option. But when we talk about major thoroughfares and, you know, like rest stops that you see along major corridors, it absolutely makes sense where there’s the footprint to allow for it to, again, capitalize on that investment.

That said also a point that we alluded to earlier, there is a synergistic development of the two technologies. Light-duty vehicles drive up the scale, the production of the fuel cell stacks themselves which drive down the cost. Heavy duty provides the throughput, there’s a lot of hydrogen that these trucks are going to go through. And that’ll, you know, incentivize new players into the hydrogen space and drive down the cost of the fuel.

So there’s a large synergistic approach. But as far as if you’re referring to colocation of dispensers in urban
areas, that could be a little difficult.

MS. OGDEN: Okay. Anyone else? Some thoughts maybe in some other geographies of where -- how heavy duty and light duty might interact on the infrastructure side?

You can raise hand if you want to speak.

Okay. Jerome.

MR. GREGOIS: Yeah, I’d think I’d say the, you know, if you compare fuel cell, you know, hydrogen is somewhat similar to the gasoline experience, that’s kind of the idea to have something that’s as fluid. And there’s not a lot of shared, you know, gasoline between heavy duty and light duty today. And we could argue why but it’s just not there.

But I think for stations that are connected to stations, for instance if you’re driving from L.A. to San Francisco and here’s a station that on the weekend may see a higher demand than during the week or not, it may have a lower demand at some point. If you have a local heavy duty also market for that, that could be a combination because you’re now more traveling and it’s not your experience.

And there’s a great example, you know, in between L.A. and San Francisco where you can even your (indiscernible) if you wanted to, you know, you can (indiscernible) you want at that location. And it’s a large footprint, it’s very pleasant. But there is a, you know, refueling station for trucks nearby my office and I don’t see
myself maneuvering there. It’s more intimidating when you’re there than when you think about it as when we’re in a Zoom experience or in a meeting room. It’s a different experience. But for connector stations, definitely I think it would make more sense to have that kind of setup.

MS. OGDEN: Yeah. Okay.

Okay, Monterey.

MR. GARDINER: Yeah, I can’t say much more than what’s already been said about connector stations and how difficult it is in central business districts. It’s hard enough putting hydrogen refueling stations (indiscernible) in trucks. Anybody who has been in San Francisco at lunch time knows the challenges.

That being said, I think we are missing opportunities when we look at the scale throughput in the scale production. And I understand that each agency has their jurisdiction, but where there’s opportunities to allow incentives for large-scale production with the liberty of hydrogen and backup (indiscernible) we needed for the light-duty infrastructure for back-up supply, that there really needs to be a hard look by the CEC to find intelligent ways with policy to support both and really drive down the cost in the production side.

MS. OGDEN: Okay. Thanks.

Well, I think we’re getting to the end of our time for my part of the panel now for this part of the Q&A. And
we’re going to -- we’re going to move now.

So maybe I’ll ask Jonathan to set up with the Zoom Q&A and sort of take over. And it’s through some of the top questions that the attendees have been submitting.

So I’m going to end my part of the panel now. And Jonathan, ready to turn it over to you.

MR. BOBADILLA: Thank you.

So this question is for the other Jonathan. The question from Raoul. He said, would -- sorry, it got moved -- it got shuffled. Have you considered deploying the Mirai lease returned vehicles that are on the market for under $20,000 including a fuel card?

MR. PALACIOS-AVILA: Yes. So I think that’s -- what we’ve looked at we’ve been in the StratosShare program. You know, we’ve looked at the possibility of incorporating, you know, off-lease vehicles and new vehicles into our service. We do include fuel with every rental that is available, fuel maintenance insurance amongst other things. So I think the fuel card would be great but I know that we haven’t really discussed that in much detail with the OEMs for including that. But we have looked at off-lease fuel cell vehicles as being incorporated into the StratosShare program.

MR. BOBADILLA: Great. Thank you.

And then Glenn Rambach asked: Are there any meaningful efforts within the OEMs to move away from CapEx
and OpEx costs related to 1,000 bar compression for station
as well as vehicle storage and the negative 40 CF chilling
for fast fueling?

And that’s open to the panel.

MR. GREGOEOIS: Well, you know, it depends how you
want to quality what a meaningful life that is. But I think
if you look at the history of fuel cell vehicles maybe in the
2000s we had applications with 350 bar and then that moved to
700 bar for the following generation. And the direct benefit
of that is basically twice the range.

Obviously there is additional costs with the
compression on the storage side, but it’s also what brings
the great benefit of fuel cell over maybe all the technology
of long range and the ability to refuel quickly a larger
amount of energy.

So I think all the light duty going to -- going
backward would first not necessarily be compatible with the
next -- the current generation of space deployed and the next
one coming. Not all of them are capable of 350 and then you
lose the benefit of that long range which is maybe allowing
you to reach in only once a week or twice a month.

MR. GARDINER: This is Monterey.

BMW doesn’t make stations and we don’t have
significant number of cars out there but it’s pretty clear
that 700 bar is make the direction for the vehicle that’s
going worldwide for passenger cars and decided took a stab at some alternatives but it didn’t pan out.

That being said, I think there are a few very small players are looking at potentially much lower costs technologies that could support maybe a lower pressure fuel, no communication than cooling. That being said, it may not be entirely compatible with some of the existing OEMs but I would really like to see additional dialog with these new states that are maybe not ZEV mandate states or in between to find this alternative where, okay, it’s not a full 700 bar fueling but if it could be a fraction of the cost, maybe there’s a connector station or a small rural area that could benefit this.

MS. BIRDSALL: Yeah, and to Jerome’s point, really the strength of the fuel cell vehicles come in the range and the quick refueling time. So for us, 700 bar, 10,000 psi will be the next generation Mirai, the 2021 Mirai will incorporate and we expect that to be filled with minus 40 CF fueling allowing for the three- to five-minute fueling target time for our customers. So for us, that is the future.

MR. BOBADILLA: Thank you. And we have a question from Geoffrey Budd.

He says hello and the question is for Jerome.

Thank you for your great summary of Hyundai’s progressive activities and deployment of SCEVs. If at all
possible, can you provide any information on the adoption of
fuel cell power trains for Hyundai’s heavy-duty applications
in the U.S.? Many thanks. Geoff Budd.

MR. GREGEOIS: Geoff, thank you for question. I can
almost answer the entire question except the last three
words, in the U.S. So I’ll just mention that there’s efforts
from Hyundai in the heavy-duty field and currently the one
program ongoing was announced last year and is ongoing is in
Switzerland where there’s a total of 1,600 trucks that will
be deployed I think until 2024. And so that’s what we --
we’re working on.

The initial power train on those trucks that are
Class 8 or equivalent Class 8 for Europe is largely inspired
by the technology of the Nexo but that will evolve also over
time.

And we, you know, had people in the U.S. recently
to -- from our commercial division to look at eventually
(indiscernible). This was before COVID so they are now back
to Korea. And that’s as far as I can go on that topic.

MR. BOBADILLA: Thank you.

And question from Raoul. Would the automakers please
comment on the potential for plug-in hybrid fuel cell
vehicles; i.e., plug-in battery electric plus a fuel cell
system that would take over when the battery is depleted?

MS. BIRDSALL: From Toyota’s perspective, I mean
technically that’s feasible, right? It comes down to cost and weight and really what the customer usage case is.

So if we can demonstrate a customer with 2021 Mirai, for example, you can fill in less than five minutes and get over 400 miles of range, it seems kind of unnecessary to also be able to plug in. And then again you’ll have to account for a larger battery, additional weight for reduction in your fuel economy attributed to the additional weight of the battery.

So there is a crossover there where you need to do some engineering calculations to figure out where that makes sense from a cost and complexity standpoint.

MR. GARDINER: This is Monterey --

MS. BIRDSALL: Sorry if I stepped on your toes,

Monterey.

MR. GARDINER: Oh, no, that’s fine. I’m happy you jumped into it. I was only going to say that like (indiscernible) has tried that in the past and like they’re both expensive technology is more than existing. So trying to shoehorn two different storage technologies into a vehicle is quite difficult. Right? It may make sense sometime in the distant future but for now, really the focus is just on hydrogen fuel cell vehicle.

There is a small battery (indiscernible) kilowatt hours for bootstrapping in very cold weather and you might
see that change, right, if you look out to very, very low
cost batteries and low-cost fuel cell but in different
configuration that evolve. There may be more space and
flexibility in some of the buses and heavy duty. And if we
are seeing weather change, more droughts, there may be an
interest in having mobile tower more accessible.

So I don’t think it’s going to happen now but the
idea of maybe you could just plug it at home and go in the
future, that’s probably very distant future.

MR. BOBADILLA: Great. Question from an anonymous
attendee. Well over 90 percent of Californians drive on
gasoline. What steps are the panelists and their companies
taking to inform these Californians that driving on zero-
emissions hydrogen fuel vehicles is even an option?

And that question is open to anybody that wants to
take it.

MR. GREGEOIS: I guess I’ll get started.

I think there’s a fair amount of effort to promote
the technology. You know, incredibly even though we’re --
most the people in this call are familiar with hydrogen,
there are a lot of people who are completely not aware. And,
you know, one reason for that I think is the amount of
efforts that everybody’s putting in, you know, putting other
types of technology on the market. Or that marketing money
is going towards vehicles that are solely market volume today
than the fuel cell just because of how many vehicles we can
put on the market or what’s our production capacity.

But if you imagine the world where we withstand, for
instance, at Hyundai as much money promoting the Nexo as we
would maybe promoting the Palisade or Acona or Santa Fe, we
would have a long line of unsatisfied customers looking for
Nexo’s and the lucky ones, you know, may be struggling to
actually have a good experience after that as they’re trying
to refuel because we’re saturating the market as we’re trying
to grow both infrastructure and market at the same time.

With that said, yes, I think there’s a lot of people
who are not familiar with the technology, not familiar with
the OEMs that are promoting that technology. But there’s
enough, I think, right now that are aware in order to be able
place as many vehicles as we can with the current structure
of the market.

MS. BIRDSALL: I think the first thing Toyota did was
launch the Prius and that was, you know, to get the customer
used to the idea of having a large battery and then an
electrified power train as part of their daily driving habit.
And now we have over 10 million of them, I believe.

And now as we’re moving towards fully electric zero-
emission vehicles, we are similar to Jerome’s point doing
targeted campaigning around where the vehicle is available
based on the dealerships that are trained to sell and service
the Mirai as well as where the hydrogen infrastructure is available.

Again, the last thing we’d want to do is market the Mirai to a customer that has no hydrogen dispenser available to them and then have them asking for a vehicle that they couldn’t drive. So hopefully if you live in one of our market areas, you’ve actually seen one of our ads. And if not, we’ll probably have to go back and talk to our marketing group about what they’re doing wrong there.

MR. PALACIOS-AVILA: Yeah, I’d like to add something too.

So I think, you know, after being a CEC recipient of a few grants, you know, public outreach is part of the grant requirement. So what we do is when we go into communities, we really do market heavily by partnering with the cities themselves. You know, sometimes nonprofits in the area that’s supposed to have a good community presence.

And additionally what we do, too, is we educate, we have some education on hydrogen fuel cells on our website and we also kind of have what we call a welcome kit. When you come into your rental, it’s just a pamphlet that explains a little bit about the California Energy Commission, the funding that it was used for. It explains it’s a hydrogen car and it also has links, web links to our website as well that show you how to refuel a car and the process behind it.
and how much percentage of renewable hydrogen is within the stations.

So education is really large and I think a lot of the demographics that we attract as part of that. Otherwise, would it really know what a hydrogen car is unless you’re looking, you’re very environmental friendly, you’re looking to drive -- looking for a zero-emission vehicle to drive, then you would know.

But if you’re just looking to get from Point A to Point B in a vehicle, I think that’s the group that we’re really educating. And I think it’s opening doors to new possibilities and new markets for the OEMs to really look at. And that’s data that we’re collecting now. And I’m excited to see kind of where that data could go over the next, you know, 12 months.

MR. GARDINER: This is Monterey.

I would just mention three quick points. I think what StratosFuel is going is incredibly important. Of kind of consumer studies I’ve seen like without having experience in an electric vehicle. You don’t know what’s available, right, for Davis has done some studies showing like they’ve tripled, doubled the number of charging stations in California and it hasn’t changed their opinion. Right? If you can’t see the chargers because you don’t know about them, you don’t know to ask.
And the second point I’d like to make, a couple of years ago, the fuel pump partnership put out their 2018 vision document. And they showed a succinct plan, right, between heavy duty, light duty to reach (indiscernible) stations in California by 2030. They could reach something like 97 percent of disadvantaged communities and over 90 percent of Californians.

But we need that widespread infrastructure to have the confidence and be able to do widespread marketing that these vehicles are available. As Jackie succinctly put it, it’s really hard. We don’t want to make unhappy customers, so we really need infrastructure to be accelerated.

MR. BOBADILLA: Excellent.

And we have the last question from Travis Andren. Have any of the panelists or their companies successfully receive VW mitigation funding, specifically funds managed by Electrify America?

A follow up to that. Do the panelists’ organizations play an active role in state by state representation of fuel cell electric vehicles within legislation, state coalition, and other educational efforts?

And that’s open to the panel.

MR. GARDINER: So BMW’s not pursuing the funds. I would say that like periodically and next week there’s open webinar for public input. And I think we’re going to be
listening to see what’s happening, but to make sure that hydrogen is still on their radar. As was mentioned some of their challenges with gee, this is an investment and that likely they need to be conservative where those funds are.

The second thing I mentioned in terms of the northeast, they’re starting a new program within a like decarbonization and transportation and valuing that. So BMW’s monitoring those efforts and looking at how fast that can happen. There’s other challenges to refueling stations in the northeast but we’re monitoring the progress in these different states looking at the role out of the mandates as it accelerates through the U.S. And it’s just a matter of finding out what is the right time to jump in.

MR. BOBADILLA: All right. Thank you very much, panel.

Heather, give it back to you.

MR. RAITT: Great. Thank you so much, Jonathan. And thank you panelists for that excellent discussion.

So now we’re going to move on to public comment part of this workshop. And RoseMary Avalos from the Public Advisor Office is here to walk us through that.

And -- but I will just say just a reminder, if you’d like to make public comments, go ahead and use the raise hand function on Zoom. And if you’re on the phone and you’d like to make comments, press star 9 and that’ll let us know.
And so go ahead, RoseMary. Thank you.

MS. AVALOS: Thank you, Heather.

This first -- I would like to first call on attendees using the raised hand on the Zoom. And please state your name and affiliation for the record. And you could please remember to spell your first and last name after you’re unmuted and before you begin commenting.

And also, please do not speak on a speaker phone feature when talking because we won’t be able to hear you clearly.

All right. Christian Peeples, go ahead. You are unmuted.

MR. PEEPLES: Good afternoon. My name is Chris Peeples, C-H-R-I-S, P-E-E-P-L-E-S, and I’m an elected at-large director of the Alameda-Contra Costa Transit District, and I’m a banana slug rather than an Aggie.

We have been running fuel cell buses for a little under 20 years. In fact, we inherited our first fuel cell bus from SunLine almost 20 years ago. And have accumulated millions of miles and millions of passenger boardings and have basically proved that this technology, at least in the 40,000-pound class, works very well and is quite durable.

We would really like to thank the CEC because when we built out our fueling station in our Emeryville division, they provided us funding so that Emeryville provided one of
the very early light-duty 10,000 psi hydrogen fueling
stations in the Bay Area.

We’ve approved a program and gotten pieces of it
funded through CARB to do a comparison between 30 fuel cell
electric buses, 30 battery electric buses, 30 diesel electric
buses, and 30 straight diesel buses. And we hope that that
will provide a lot of information for CARB and CEC and NREL
to verify some of their modeling with actual on the street
work.

What’s really important for us now, we’re convinced
that this is the way to go and that any fleet, any large
fleets going to be a mixed fleet with both battery and fuel
cell electric.

But it’s particularly important to get more fuel cell
vehicles out there so that the fuel cell market gets more
mature. I mean, as Jaimie pointed out, we get our hydrogen
from Southern California. Orange County gets their hydrogen
from Northern California. That’s the way we’ve got to do it
now. But on the long-term, that doesn’t make sense.

We make some of our own, we make some of it with
solar power and some of it using bloom boxes that use natural
gas. But in an urban area, we really believe that the -- we
don’t refine our own diesel so we buy hydrogen in liquid
form.

So the more that can be done to roll out hydrogen
and get the hydrogen economy more mature, and thus lower the 
price of hydrogen, I think that’s extremely important as 
things move along.

But anyway, Commissioners Monahan and Douglas, thank 
you for your attention today and for your interest in this. 
Former Commissioner Peterman actually was at the kickoff of 
our Emeryville station.

Thank you.

MS. AVALOS: Thank you, Mr. Peeples.

We’ll move on to Nico Bouwkamp. You’re unmuted. And 
please spell your first and last name.

MR. BOUWKAMP: Can you hear me?

MS. AVALOS: Yes.

MR. BOUWKAMP: Okay. So my name is Nico Bouwkamp, 
I’m with the California Fuel Cell Partnership and the staff 
fleet for heavy-duty fuel cell battery vehicle activities. 
My first and last name is spelled as follows: N-I-C-O; last 
name, B-O-U-W-K-A-M-P.

Good afternoon, Commissioner Monahan, Commissioner 
Douglas, and moderators and panelists. Thank you for 
recognizing these specific market status update workshops and 
opportunity to provide public comments.

We know you CEC commissioners are very busy and 
you’re also working together with staff on the IEPR 2020 
update. And you plan to provide a complete overview of the
ZEV market status and include both fuel cell vehicle and battery electric vehicle technology.

For the base of -- for the purpose of this update, I just want to emphasize and add the following points to the excellent overview provided by the panelists of both panels this afternoon. So in addition to continued support of light-duty hydrogen infrastructure investments, there is a need for balance investments and heavy-duty ZEV fueling infrastructure, heavy-duty hydrogen fueling and fast charging. Also, there’s a need for an emphasis on both heavy-duty and light-duty vehicles in the IEPR vision.

Next point, with regards to comments made about redundancy early in the panel -- earlier this afternoon, this applies both to the fueling infrastructure location, but definitely also to production and distribution. So include -- so inclusion of both renewable gas-based and renewable electricity-based source is important.

Although, James Kast of Toyota mentioned use of fuel cell vehicles, fuel cells, and many applications. And, Jack, your reference a little bit as well heavy, heavy-duty off-roads was not mentioned such as Anglo American is doing with applying fuel cells in mining trucks. It’s an area that’s maybe mentioned as well on the reports.

With regard to IEPR policy recommendation, currently there’s a need for an overarching hydrogen strategy for
California, something along the lines of what the Hydrogen Council has published for the U.S. overall.

Also question with regard to the IEPR, could this document also include recommendations with regards or consideration for recommendations with regards to heavy-duty hydrogen fast fueling technology development and testing such as CEC is doing to its best fit individual funding programs for vehicle charging. And also establishing heavy-duty HRI and FRI LCFS credits to encourage large capacity and high performance heavy-duty ZEV fueling infrastructure investments by private industry which will also encourage increase investment of renewable resource for the fuel.

And finally, I don’t want to forget about our other CFCP industry members. Aside from all those that have already participated in the panels today, Cummins and Hydrogenics, Iwatani. Then also the folks that provide fuel and vehicles, Ballard, Linde, Praxair, New Flyer, important for the bus market, as well as BAE and NEL for the hydrogen production. And AC Transit is the other bus operator in the state aside -- in addition to SunLine.

Thank you for your attention.

MS. AVALOS: Thank you, Mr. Bouwkamp.

Next public commenter, Travis Andren. You’re unmuted. Thank you.

MR. ANDREN: Thank you very much. My name is Travis

First of all I’d like to thank each and every one of the panelists today from both the heavy-duty sector as well as the consumer sector. Your efforts are -- and due diligence are greatly appreciated across this country and within the entire industry.

My comment today is in response to a topic that was first brought up in the heavy-duty sector and echo through Jackie Birdsall’s comments in regards to fuel cell electric vehicles being recognized as zero-emission vehicles as compared to BEV or battery electric vehicles.

Across this country, we are seeing legislation in multiple states. The prioritize is BEV infrastructure as well as applications and funding for both over fuel cell electric and hydrogen infrastructure and application funding programs. If at all, recognizing fuel cell and hydrogen as a zero-emissions vehicle technology. These legislations are being supported by state electric vehicle coalitions, Public Utility Commissions, and independent public providers all in partnership with BEV automotive and infrastructure companies such as Tesla and ChargePoint.

My comment today is a call of action to both the CEC as well as CARB who is not on this call. As the legislative opponents to the Volkswagen settlement, calling for the
funding management by Electrify America, you are the
representing body who maintains the order and the
responsibility that Electrify America distribute these funds
equally or at least market appropriately. Thus far, through
Cycle 1 and Cycle 2, Electrify America has been prioritizing
all BEV funding excluding fuel cell and hydrogen electric
infrastructure and applications.

As goes California, goes the rest of the country. We
are seeing misinformation happening across this country and
we need California to step up with industry partners to make
sure this funding is being handled appropriately and that
these BEV participants are no longer using public utilities
to drive their own agenda and manipulate markets and
disinform consumers.

Thank you very much.

MS. AVALOS: Thank you, Mr. Andren.

Next public commenter Kevin Maggay. You’re unmuted.

MR. MAGGAY: Hi, can you guys hear me okay?

MS. AVALOS: Yes.

MR. MAGGAY: Hi, thank you. First off, thanks to the
CEC for holding these workshops today, this has been great.
This has been really informative and timely, especially after
the adoption of the gasoline trucks regulation by CARB.
First at the beginning of the meeting, hydrogen was kind of
branded as the other zero-emission technology. I would urge
everyone to rebrand it as the long-range fast fuel low
(indiscernible) impact zero-emission technology. There are
so many inherent advantages of hydrogen, many of which have
been stated already but I think they still get overlooked,
unfortunately.

I agree with the statement made earlier that there
should be parity in how zero-emission technology is treated.
A few weeks ago there was a zero-emission market trend
workshop, and then today we had the hydrogen market trend
workshop. They should be one in the same.

And market signals like that matter. A number of
state agencies put very high value on market signals, even
more so than things like actual emission reductions. One of
those market signals is the CEC is proposing to remove all
the funding for low-carbon fuel production supply in the
Clean Transportation Program for the upcoming 2020-2021
fiscal year. And this would be funding that could be used
for low-carbon hydrogen. Talked this morning about the
potential for ag and food waste for low-carbon hydrogen which
this probably could fund.

This being proposed to be zeroed out, I think this
sends a negative signal to the market. And I’m concerned
that some signals being sent out are not are completely
technology neutral. But even with that said, I think that
CEC has done a good job supporting hydrogen and trying to
create certainty in the market by putting future funding into the fold with the current solicitations. And that kind of certainty is gravely needed.

Looking forward, I think that it would be detrimental to the market if the CEC were to every pull or consider pulling some of those dedicated funds if we reach some of the targets like 100 retail stations. So I think that’s certainty and strong where market signals CEC would be beneficial.

Thank you.

MS. AVALOS: Thank you, Mr. Maggay.

I’d like to remind the folks on the phone that if you -- you can use the star 9 dial -- dial star 9 and raise your hand and star 6 to mute and unmute.

All right. Thank you. And we’ll go on to the next public commenter, William Zobel. Go ahead, your line is unmute.

MR. ZOBEL: Yes, good afternoon, hope you can all hear me. My name is Bill --

MS. AVALOS: Yes.

MR. ZOBEL: -- Zobel, B-I-L-L, Z-O-B-E-L.

I’m the executed director of the California Hydrogen Business Council, glad to be here. Appreciated the panels this afternoon, they were very informative and do appreciate the CEC support in this area.
We would note from both panels this afternoon that
scale was mentioned more than once and it’s the key to
unlocking some of the broader benefits and lowering the cost
of broader hydrogen deployment.

Several panelists mentioned the importance of the
light-duty sector. The scale that is available on that
market, the advancements that have been made in that market,
and including those in the international standards area. All
seem to agree that the two markets, light duty and heavy duty
complement one another. We could not agree more with that
and that scaling both markets simultaneously will expedite
the benefits of fuel for everyone.

All this gets back to one important theme discussed
on this morning’s panel where speakers there were calling for
regulatory certainty to facilitate investment. Those
comments were again reiterated on this afternoon’s panel that
we would make note of those as well.

In that regard AB-8 was also mentioned on this
afternoon’s panel. We would note that CARB recognized the
importance of extending AB-8’s funds beyond the 2023 sunset
date in its recent SB-498 report. This recommendation is in
line with holding the goals of the governor’s zero-emission
vehicle Execute Order. And we urge the CEC to join this call
for extension of AB-8 funds in its recommendation in this
IEPR update.
The notion of, you know, what are the international markets doing was discussed quite a bit on this afternoon’s panel, both in Asia and in Europe. We would point out that recent announcements made by the EU and specifically Germany committing to spend 9 billion Euros on research investment on the hydrogen economy is noteworthy. This very recent and compelling example were clear and consistent policy signals support the business case which will spur investment and allow markets to grow to scale and mature.

This all takes us back really to where Dr. Wang started us off this morning from Bloomberg New Energy Finance on her first panel providing a compelling information and making it clear that we can unlock tremendous benefits with scale, innovation, and investment which can only be initiated by clear and consistent public policy.

In closing, the Council urges the Energy Commission to include in the IEPR update programs with clear and consistent policy that helps scale the hydrogen market so the state can meet its decarbonization goals.

Thank you.

MS. AVALOS: Thank you, Mr. Zobel.

Our next public commenter is David Park. Go ahead, your line is unmuted.

MR. PARK: Good afternoon, Commissioner Monahan, Commissioner Douglas, online hosts. Thank you very much for
having me. My name is David Park, last name P-A-R-K. And I am the California Fuel Cell Partnership industry liaison for the light-duty manufacturers and infrastructure development members.

And I’d just like to continue my comment from this morning. To echo the -- this panel’s comments, the world is looking to California for guidance on carbon reduction. We emphasize the road to achieving the ZEV tipping point that Dr. Leighty this morning pointed to will require the state and the world to enable all mechanisms to lower this hurdle across all ZEV platforms.

I’d like to emphasize the theme of consistent policy signals that was just discussed by Mr. Zobel and the panel this morning. We cannot put more emphasis on the fact that California needs to provide clear market signals to the investment community. That will alleviate the perception of risk in investing in the ZEV marketplace.

We point to as an example to a recent occurrence which was Governor Brown’s executive order to achieve 200 fueling stations by 2025 and 5 million ZEV by 2030. This would achieve a tipping point but -- and that was a massive positive signal to industry that their investment decisions in fuel cell electric vehicles were well made.

However, when that order was not backed up by funding, this created massive uncertainty within the fuel
cell electric vehicle manufacturing sector. We feel that the Energy Commission is that organization that can provide those clear policy signals and we look forward to our continued partnership in creating a healthy economic marketplace to support this emerging zero-emission vehicle ecosystem.

Thank you.

MS. AVALOS: Thank you, Mr. Park.

Are there any other comments? Please raise your hand. You can -- if you are on the phone, you dial star 9 to raise your hand and star 6 to mute and unmute.

Okay. We have a raised hand on the phone. 9-1-0, go ahead and speak.

MR. RENAUD: Yes, thank you. Yeah, this is Raoul Renaud; R-A-O-U-L, R-E-N-A-U-D.

I drive a fuel cell vehicle, I’ve been driving one for three years. I think -- I’ve been listening today and all day and I think this is a terrific day and very informative.

If I’ve heard kind of a theme, it’s risk. So let me just address that briefly. The state of California has taken a risk in seeing if fuel cell transportation can work. And so we’ve built some stations and vehicles have come in and I think you’d have to say that it worked. The -- if you want to call it an experiment, I think the result would have to be called a success. We’ve seen that the vehicles themselves
are fine. The fueling experience is comparable to that of gasoline. And if you ask consumers who are driving gasoline vehicles why don’t you switch to hydrogen vehicle, the only reason that you ever hear from anybody is well, there aren’t enough stations.

So I’d just like to encourage the state to continue with this. You’ve taken that first big risk, I think that risk has paid off, and I think it’s entirely appropriate, acceptable, and sensible to continue -- to continue forward on this project, continue the investment, encourage investment from private industry, work with -- work globally to build out the fueling network to the point where widespread adoption can take place. I think you can feel quite certain that it will take place once the fueling network is on its way.

So thanks again for putting out all this information. Very much appreciate it.

MS. AVALOS: Thank you, Raoul.

And we’ll go on to commenter Mikhael. You’re unmuted.


And I’ll follow up with comments so that I can close this out briefly. We appreciate discussion today and wanted
to reiterate some of the comments we heard from other folks today.

As Kevin indicated, I think this separation of fuel cells from the zero-emission vehicle I’ve heard -- hearing. In the future, I think, you know, as we talk about light duty, we should talk and zero-emission vehicles both fuel cell and battery in the same context. These are complementary technologies in many ways but the fuel cells excel in certain categories and as consumers make their use cases, we will see how things develop.

And we also heard the underpinnings of infrastructure is really what and deeper penetration and based community. Any effort to get, you know, complete the GFO and get those funding out the door (indiscernible, unstable Internet connection) HIR credits.

Also California has some of the most aggressive and binding climate targets in the world. We don’t have a chance to wait for global markets to develop just as we didn’t have the chance to let global markets develop for the adoption of renewables. And I think yesterday we saw Mary Nichols and former CEC commissioners tweeting about how successful that was with 90 percent of yesterday’s electricity coming from zero carbon sources.
And I think it’s important that we underline, you know, the develop of hydrogen in the same context that we underline the development of wind and solar in California and that we continue to send those strong market signals for investment in state to help us achieve the 5 million zero-emission vehicles that are needed in order to achieve our goals as well as our carbon neutrality goals by 2045. The infrastructure’s agnostic with the function pathway and indeed carbonize over time. So it’s important to get that in the ground so that we get the vehicles and further decarbonize fuel source.

So we’re very excited to hear all of this today and the global announcements this week from our kind of climate partners internationally and we hope that we can continue to work on sending the substantial signals that are needed to drive hydrogen infrastructures to decarbonize on this economy.

Thank you.

MS. AVALOS: Thank you, Mikhael.

At this time, we have no further public comment.

I’ll hand over the meeting to Heather.

MS. RAITT: Thank you, RoseMary.

So really just Commissioner Monahan, if you have -- or Commissioner Douglas if you have any closing remarks, I’m all done.
Thank you so much.

COMMISSIONER MONAHAN: Just want to thank everybody for participating, we’ve had a really interesting day. And -- yeah, it’s been a really, you know, great day in terms of talking about how we need to move to zero-emission transportation and the role of hydrogen and fuel cells in that future. And now we know as we go forth, we just need to make sure that we are staying safe and doing all we can to help bend the curve and get California on a good trajectory again.

So thanks, everybody.

(Thereupon, the Hearing was adjourned at 4:43 p.m.)

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REPORTER’S CERTIFICATE

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

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

IN WITNESS WHEREOF, I have hereunto set my hand this 29th day of September, 2020.

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IN WITNESS WHEREOF, I have hereunto set my hand this 29th day of September, 2020.

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Myra Severtson
Certified Transcriber
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