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# COMMISSIONER WORKSHOP ON NEAR-ZERO VEHICLES AND LOW-CARBON FUELS

REMOTE VIA ZOOM

Session 2: Liquid Low-Carbon Fuels

WEDNESDAY, JULY 29, 2020

2:00 P.M.

Reported by:

Martha Nelson

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AGENDA



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P R O C E E D I N G S

2:00 P.M.

WEDNESDAY, JULY 29, 2020

MS. RAITT: All right, we'll go ahead and get started. Good afternoon everybody. Welcome to today's IEPR Commissioner Workshop on Near-Zero Emission Vehicles and Low-Carbon Fuels. I'm Heather Raitt, the Program Manager for the Integrated Energy Policy Report, which we call the IEPR. Today's workshop is being held remotely, consistent with the Executive Orders N-25-20 and N-29-20, and the recommendations from the California Department of Public Health, to encourage physical distancing to slow the spread of COVID. This afternoon, we'll focus on liquid low-carbon fuels.

This meeting is being recorded. We will post a recording and written transcript on our website. Also, today's presentations have been posted.

We'll be using the Q&A function again in Zoom, if you were on this morning, so attendees may type questions for panelists by clicking to the Q&A icon. And before typing a question, please, check to see if someone else has already

posed a similar question. And, if so, you can click the thumbs-up to vote on it. The questions with the most thumbs-up or clicks are up-voted to the top of the list. And we'll reserve about five minutes at the end of the panel for attendee Q&A. And given the time restrictions, we won't be able to elevate all questions received. Also, we don't plan to raise the attendee Q&A for the presenter before the panel.

So now I'll just go over how to provide comments on the material in today's workshop. There will be an opportunity at the end of today's session. So using the Zoom online, click raise-hand icon to let us know you'd like to make a comment. And if you change your mind, you can click it again and your hand will go down.

For those on the phone, press star nine to raise your hand and we will open your line during the public comment period.

Alternatively, written comments are welcome and they are due on August 19th.

And with that, I'll turn it over to Commissioner Patty Monahan for opening remarks.

Thank you.

COMMISSIONER MONAHAN: Thanks, Heather,

and good afternoon everybody.

So as I noted this morning, this topic is particularly interesting because we have a legacy suite of diesel vehicles that are causing a lot of health problems in the state of California and making it really hard for at least certain air quality management districts to attain the state and federal standards needed to protect public health.

So we also have a number of transportation sectors that are very difficult to electrify. And when I say electrify, I mean either with battery-electric or fuel cell electric, and sectors like air travel. So I'm very curious to hear the thoughts of the folks on this panel around what we can do to ensure that we're both protecting public health and advancing our goals on climate change.

So with that, I'll see if Commissioner Douglas, who I believe is also on the line, has any opening remarks before we turn it over to the panel?

COMMISSIONER DOUGLAS: Hi. Good afternoon. I'll pass on opening remarks so we can get into the panel, but thank you,

Commissioner Monahan. And I'm looking forward to hearings from the speakers today.

COMMISSIONER MONAHAN: Great. Thank you.

All right, well, let's introduce our first speaker. As Heather said, we're first going to have a speaker, we had one this morning, too, to kind of just give us a lay of the land before we have the different interests on the panel speak. So today we have someone from the Air Resources Board, our partner agency who is the lead for the Low Carbon Fuel Standard. I think it's, arguably, the reason why we have so much investment in low-carbon transportation alternatives is because of the Low Carbon Fuel Standard. I would say it has a terrible moniker but it's a very powerful regulatory tool.

So Arpit Soni is the Manager of the Alternative Fuels Section at the Air Resources Board. And that's one of three sections at ARB that's overseeing the implementation and development of the Low Carbon Fuel Standard. It's short -- it's also called the LCFS for those in the know. So Arpit's section is primarily responsible for regulatory and policy development of the Low Carbon Fuel Standard. Previously, as

a program staff person, he supported the development of electricity -- of the electricity and hydrogen provisions of the policy. And he also worked on streamlining the LCFS implementation.

So I'll turn it over to you. And then I'm going to turn my video off during your presentation.

MR. SONI: All right. Thank you Commissioner Monahan and those for the introduction and providing this platform, which I hope will result in an engaging conversation about the role of low-carbon fuels that we have in California, long term climate strategy and you raise some very, very critical points over there and I'll try to address some of those to my presentation.

So today I'll be discussing the role of low-carbon fuel standards, or LCFS, as we call it for short, in promoting the alternative fuels in California. But before I dive into that I want to discuss California's broader approach towards to climate change.

Next slide please.

So as you can see over here in California we have chosen a portfolio approach for addressing climate change. The reason was not to rely just on one program, but instead adopt a suite of policies that could help

reduce emissions in broad sectors and various sectors. And some of California climate policies, as I mentioned, over here on this slide. And you will notice that these policies do not operate in isolation, but often overlap with each other. And you will notice a pattern over here that most of these policies actually overlap with transportation sector, and there is a very good reason for that. Next slide please.

So as you can see, transportation sector in California accounts for fifty percent of states emissions when you also account the emissions from refining all oil production processes. That's where they'll LCFS content to the big term it is California leading policy to promote alternative fuel use and reduce emissions from the transportation sector, in addition to reduce -- reducing emissions as LCFS also helps with transformation and diversification our fuel. While also helping reduce the petroleum dependency of the state. And it also makes us health progress on achieving the air quality benefits, which is one of the key goals of our agency. Next slide please.

Thank you.

Before I jump into discussing how is LCFS has been performing, what are the key factors, I want to take a minute and just explain how LCFS works for everybody's

interest, and as a refresher. So LCFS is a performance standard program with a built in market mechanism. It sets an annual declining carbon intensity benchmark for gasoline and diesel and the alternative fuels that replaces them.

All the fields that are reported in the program are assigned a carbon intensity score, or as we call it CI score, based on lifecycle assessment. The providers of high carbon fuels with CI value above the benchmark end up generating deficits in the program. And the fuel providers who are bringing in low-carbon fuels, which has the CI scores below the benchmark, they generate credits in the program. At the end of every year, deficit holders have to either produce or buy these credits to meet their obligation. And that results in an active LCFS credit market. And that, hence the market mechanism.

This slide shows the annual carbon intensity benchmarks expressing the terms of percentage reductions in CI values from 2010 baseline. Now when LCFS adopted the goal of the program was to help reduce 10 percent help -- get a 10 percent reduction in Stage 2 carbon intensity by 2020 from 2010 levels. But in 2018, we went back to our board and we strengthened our targets, reduction targets, that we have to make 20 percent reductions by 2030. I just want to point out, it is very

important to note that LCFS program does not have an end date currently. If the regulations are not amended in future this 20 percent reduction targets will continue on indefinitely after 2030.

But it is very likely that we will go back to our board in next few years and in a broader scope of things as we are discussing carbon neutrality 2045 we have. We also have some near term, 2030 climate goals, just to align everything together, we may go back to the board. And at some point, we may request them to further strengthen our reduction targets for future years.

Next slide please.

So this shows the progress so far in LCFS. As you can see the two charts show here the diversification of the fuel types that coming to California and how that has been somewhat separated by LCFS. Over the last 10 years as a program has been implemented. The chart on the left here shows the alternative fuel volumes reported in the LCSF program. And the chart on the right shows the corresponding number of credits that originated from that fuel volume. As you can see in the earlier years of the program the majority of the alternative fuel volumes were made from ethanol, specifically corn ethanol. But in recent years, we have also seen a significant increase in volumes of renewable diesel, bio diesel, renewable

natural gas and electricity playing a bigger role in transportation fuel in California.

This in 2019, I believe that combined volume of biomass base these are raised almost, almost 800 to 900 million gallons. And collectively all the alternative fuels reported in the program displays about two and a half billion gallons of petroleum fuel just in 2019.

Now looking at these two slides in tandem gives a more complete picture of emissions benefits that have been realized in the program. You will see that although electricity was a small part in terms of volume - but the emission reductions achieved are higher because, again as I mentioned, we look at the life cycle and various factors that accounts for the emissions accounting. And there is this Energy Economy Ratio, which gets accounted for when we talk about these vehicles and their fuels, which have a higher displacement factor than fossil fuels. Next slide please.

So this is one of my favorite charts. As you can see, this slide provides an indication of the support that LCFS is providing to low-carbon fuels. The annual LCFS value, shown here, represents the basically a product of the multiplication of the number of credits generated in a year times the average credit price in that year. But as you see that this value support that

the program has been providing has been increasing very steadily in the last several years, and in 2019 alone, it provided almost $3 billion dollars worth of revenue to low-carbon fuel providers. Next slide, please.

Now in 2018 we went back to our board as I was mentioning, we went back and requested to further extend and strengthen the CI reduction targets in the program up to 2030. Besides that, we made several other amendments to the program: including we updated some of the life cycle assessment models that we use for data mining the CI values.

In addition, we also added a third-party verification program to help ensure the integrity of the program data. Besides that, we added several new categories for providing opportunity for creating in the program for new fuels or different other project types that can help reduce emissions from transportation sector. Some of those are highlighted here, but I will be talking about more in more detail about individual additions in the following slides. So let's actually just go to the following slides. Can I have the next slide please?

So as one of the major additions to the program was alternative jet fuel, and with large support from a number of stakeholders, we were able to add alternative

jet fuel as an opt-in fuel in the program, which can generate credits when it is uploaded in an aircraft in California. However, I want to know that currently conventional jet fuel is still regulated at the federal level. So it is not subject to that regulations and conventional jet fuel is not generate deficits in the program.

But as a result of this new amendment of this provision, we are already seeing additional investment and interest going towards alternative jet fuel as evidenced by very recent announcements. I'm sure most of you may have heard Amazon has agreed to purchase a large order of AJF from World Energy who are producing this sustainable innovation fuel right here at the facility in California and I know Gene will be speaking later today, so he may have more to add to it. Besides that, Neste, who is also one of the leaders in providing renewable diesels, they announced that they have delivered, for the very first time, sustainable aviation fuel to San Francisco Airport via pipeline, which we think is a major breakthrough in terms of just infrastructure of providing this alternative fuel to aircraft.

To date in LCFS, we have, I think ,we have approved about four alternative jet fuel pathways. And they have a very, very range of CI values but again it

just shows that within a year, we have garnered the interest from the industry about deploying more facilities for producing alternative jet fuel.

Second major addition -- Next slide, please. Thank you.

Second major addition. Yes, this is the one. Second major addition to the LCFS was the adoption of protocols for carbon capture and sequestration. This protocol details the quantification and permission requirements that allows for CCS projects at biorefineries, oil fields, petroleum refinery, as well as direct air capture projects products to receive credits under LCFS framework.

Again, in just a short period of time we have seen significant interest in LCFS projects, and we have already certified a design-based application and we have posted one more last week for public comments. We are currently reviewing several other applications and we have received several other interest. Both the applications that one that we posted in the review and currently are attached to an ethanol facility. This will result in reduction of the CI for the -- it's not coming up in those -- facility by a factor 25 to 30 grams per megajoule of CI units. Next slide please.

And then are RNG is another important fuel that

LCFS is really trying to promote, especially again, going back to Commissioners' main point, for these sectors which are really hard to decarbonize by electrification right away. And through 2018, nearly 100 percent of the renewable natural gas that was reported under LCFS was coming from landfills.

However, when we made some amendments in 2018, we streamlined the application projects process for our energy projects. And this included adoption of simplified CI calculators and providing other tools that helped applicants shorten the approval process for their pathways. And since the beginning of 2019, since we have streamlined some of this process, we have received application for fifty-three of the lower CI pathways, forty-one of those are from dairy and swine manure digestors, six are related to diverting organic waste from landfills, and six are related to wastewater treatment plants.

There's the fuel volume and credit generation for these low CI sources of RNG coming into the program increased almost about (indiscernible) just in 2019. Next slide please.

Now electricity is another important fuel in LCFS program. And since the inception of the program, utilities have been receiving credits for the residential

EV charging and because it's not readily metered all residential EV charging what CARB does is recalculate the average CI on the California grid, and we use that we also estimate the number of EV charging at residential locations in California, and we calculate and allocate these residential recharging credits just to utilities.

However, in 2019, we started allowing entities to generate credits for matching low CI electricity, such as from solar, or wind, or maybe some of these ultra-low carbon projects coming from R&D from dairy to power projects. We allow entities to match these low and ultra-low CI electricity with charging at residential locations and for that they can generate an incremental credit which represents the CI reduction from the grid average carbon intensity to that of the renewable low CI electricity that they are matching. Under this provision, the crediting must be based on actual metered charging - that was one of the key factors we built into that. And the important thing was that we did not only rely on the metered chargers and level two chargers, but we also allowed telemetrics to be used, which was sort of a first in our program.

So far, I would say we have seen a great deal of interest in this provision as well -- about almost nine or maybe ten entities reporting for this provision.

Five of which are major automakers they are reporting for over 300,000 EVs in California. So we have a database or just in my system, which represents almost half the EV population in California today. Next slide please.

Starting 2019, as I mentioned earlier, along with incremental crediting we also added several other offer transportation categories for generating credits for supplying electricity as a transportation fuel. This included the shore power going to ocean-going vessels at-berth, electricity use for electric cargo handling equipment and transportation refrigeration units. Within a short period of time, again, we are seeing a lot of interest from some of the entities and these categories and just in Q4 2019 in the past quarter, I think we gave away about 30,000 credits, which is what $6 million of value, just for these categories.

In LCFS, we have a provision which requires revenue from electricity credits to be real estate and transportation electrification projects. And we expect that the value going for these categories will get reinvested in transportation electrification at ports and warehouses, which we think is, again, very critical, because these are some of those hard to electrify categories which we have been saying for a long time and we think it's a key to help these sectors transition for

achieving our long term climate goals. Next slide please.

Along with all these additions we were also very aligned with broader goals as I mentioned earlier, and in 2018, Governor Brown signed an executive order with the goal of installing 200 hydrogen refueling stations and 10,000 DC fast-chargers by 2025. This was in alignment with our long-term EV adoption goals. While making this order, he did direct LCFS to help achieve these refueling infrastructure goals and in response to that, CARB approved the ZEV infrastructure provision in LCFS, which, essentially, promotes a rapid deployment of every refueling infrastructure, by supporting these projects. With additional LCFS credits, which came to be known as capacity credits, especially with the utilization of these stations are very low in early years. Today, nearly 50 hydrogen stations and about 500 DC fast-chargers have been approved to generate infrastructure credits under this provision. Next slide please.

Now I'm going to shift gears here to talk a bit about carbon intensity modeling for the LCFS and impact that CI values play on which fuels get supplied to the California market. The CI value that we calculate based on life cycle assessment includes direct and indirect effects. The direct effect of producing and using the

fuel as well some of the effects of the process of production and transportation are calculated using the two tools that we have. One is GREET, California GREET model, and the other is OPGEE model. These basically capture the direct effects. At the same time, we have a model called GTAP and we also developed another model, the Agro-Ecological Zone Emission Factor Modeling, which complements GTAP to assess the indirect effects of land use change, which is a critical factor in LCFS while assessing CI values, and I'll come to that in next couple of slides. Next slide please.

So this is a just an example for presentation purposes, how CI is calculated based on the lifecycle assessment of a fuel and how we account for well to wheel process while accounting for emissions in the process. These numbers here are just for presentation purposes. And you will see that we look at all the major steps in the process and we are look at values and, in some cases when there are byproducts, we use the mass energy balancing, accounting principles, to make sure that we are allocating the right amount of emissions with the fuel. And I think this is probably one of the most critical aspect of LCFS. The scientific preciseness and accuracy of calculating CI values have been really critical for implementing this program. Next slide

please.

And on that note, I want to just add any good program seeking to lower the CI of transportation fuels must base their policies on accurate assessment of real world emissions. And there is a consensus in the scientific community that increasing demand for crop-based biofuels can indirectly incentivize global land use change. Unfortunately, land clearing for producing these alternative fuels always come to, not always, but most of the time, come at expense our world's most carbohydrates and biodiverse forest in a lot of these forest areas.

All the modeling of these effects is admittedly very difficult, but failing to account for land use change emission sends inaccurate market signals that misrepresent the fuel emission benefits of these tools that we're incentivizing here in California.

Therefore – Oh, I'm sorry I'm still on this slide.

And that's why staff engage in robust modeling efforts to estimate land use change emissions for several major crop-based fuels and incorporated them in our life cycle processes and tools and doing so accurately represents the true overall emission reduction from each crop-based fuel consumption. Next slide please.

And we have seen the results of this approach.

It's been very effective. Just looking at the outcomes that we have seen for the biomass-based diesels, which include both renewable diesel and biodiesel. As an example, you will see here, the vast majority of biodiesel and renewable diesel volumes are produced lower CI feedstocks such as distilled corn oil, which I believe is represented here in red. And tallow, which is an animal byproduct, represented in a teal blue color. And used cooking oil.

So these are mostly waste-based products on a volume basis. These feedstocks without land use change represent over 90 percent of total volume of biomass-based diesel that came into California just in 2019.

And this breakdown reflects the impact that correctly assess regulatory signals can have when accounting for full lifecycle emissions of transportations fuel. So, in summary, estimating land use change impacts is feasible and is critically important. Next slide please.

Now I want to conclude by saying that as much as the state is advancing our vision for a widespread transition to ZEV, low-carbon alternative fuels, especially those that achieve criteria toxic emissions reductions are so critical to our broader climate and the air quality goals. Even in the most aggressive scenarios,

the transition to ZEVs will take a number of years. Low-carbon alternative fuels are needed to displace fossil fuels in the short term while this transition ramps up. And we expect that low-carbon fuels are likely to play a very large part in reaching the aggressive 2030 LCFS carbon intensity targets. Specifically, we expect renewable diesel, among others, will be very critical for that that goal. In addition, certain transportation numbers are very difficult to rectifiy as Commissioners mentioned early on. Specifically aviation sector, and then we have marine sector, certain heavy duty offered applications. These may still heavily rely on low-carbon alternatives fuels until there is a breakthrough.

Now, we cannot rule out the possibility of technological innovations in the future that could electrify even these difficult sectors. But we cannot take the risk to not act now, in hopes of future breakthroughs that may come along for these categories.

Therefore, further innovation in low-carbon fuels is critical to decarbonizing the transportation sector, as some of these fuels, may be a best option for decarbonizing certain technology, even in the long term. Lastly, I just want to point out, reaching our carbon neutrality goals by mid-century will require integration of currently distinct sectors. It is very possible that

some low-carbon fuels developed and incentivized by LCFS may play a role in decarbonizing other sectors. For example, renewable gas could be generated from excess renewable power and then serve as a replacement heat source displacing some other fossil fuels. And similarly hydrogen can be used as a good storage option.

So there are co benefits of policies like LCFS besides the transportation sector. But I'll be very happy. So that basically concludes my presentation over here and I'll be very happy to take more questions or answer any specific details of anything I presented in my slides. Thank you.

COMMISSIONER MONAHAN: Great. Thank you.

Commission Douglas, if you have any questions, feel free to join and the virtual dais.

I had a few questions. One is I wonder -- I was involved in the low-carbon fuel standard at its inception, but I've not been tracking it over the last 10 ish years and I'm curious about - are there any sustainability criteria that are built into the program, besides carbon as a metric in indirect land use change.?

MR. SONI: Yeah. That’s a very - very good question. And, in fact, I think this, and this probably pre-dates me, but I think but based on my understanding

of the programs there was certain informal discussions around 2015 and maybe earlier to consider including other sustainability criteria in the program. But, currently, we do not have any framework which accounts for anything besides the lifecycle of these emission reductions.

Thank you.

COMMISSIONER MONAHAN: I'm - I'm wondering about, and maybe this is too early. I'm not sure, but -- the interaction with the advanced clean truck rules. How will the credits work between the Low Carbon Fuel Standard and say, if I'm a big company buying trucks, will I still be able to get credit under the Low Carbon Fuel Standard for buying an electric truck, even though it's being required by the ACT.

MR. SONI: Yeah, exactly. So I would say in LCFS we generally don't have any additionality requirements. So, even some of these trucks, clean trucks or buses or any other low-carbon fuel vehicles being deployed -- no matter if they're deployed for any regulatory reasons, they are still eligible to generate credits in LCFS program.

COMMISSIONER MONAHAN: And I'll ask the question I asked this morning of Jeremy Martin from the Union of Concerned Scientists, which is about a national or, you know, as the Low Carbon Fuel Standard spreads to

other states and, potentially even nationally, that was necessarily mean that there would be, I mean, not necessarily but likely means that there will be fewer fuels coming to California because there'd be more competition for those very low-carbon fuels.

California is kind of the only game in town. Except for Oregon, and, I guess part of Alberta, but yeah, the more.

So, how are you thinking at the Air Resources Board about the expansion of the program to other states in the country?

MR. SONI: Yeah, no, that's, that's, I think, a very critical and good question. We have been very supportive about the deployment of LCFS in the jurisdiction and maybe nationally, and, in fact, at CARB, we have been coordinating with these jurisdictions. So we help extensively with Oregon's clean fuel program. We have been in coordination with British Columbia, since they implemented their program. We are working with Canada, who are planning to roll out their LCFS equivalent in next two to three years. We advise Brazil for developing their own LCFS equivalent. And currently, we are in conversations with some of these Midwestern states. And some of the Eastern states who have shown interest in LCSF.

I agree if currently California represents a major chunk of LCSF-like programs out there, and does get benefit of that monopoly, sort of, if you will, to attract most of the fuel in California. And it's possible that if we expand in terms of LCFS-like policies in other jurisdictions. The fuel may start diverting to other areas as well.

However, we will still see that as a win, because we will think that there will be greater signal in the marketplace, which will eventually increase the amount of investment, and potentially, increase the supply of low-carbon materials globally, which should eventually make up or whatever, even if any minor division that we see initially.

COMMISSIONER MONAHAN: Yeah. And I totally agree with you that -- I mean -- it's -- it would really be a sign of the success of the program, were to migrate beyond the borders that it currently has migrated to. So it's, I mean it's I think a testament to the tenacity of California for passing the standard withstanding a lot of pressure to weaken it and to roll it back. And then, you know, at the end of the day this is such a major driver for all types of low-carbon transportation fuel. So it really is, I think, an undeniable success story, and hopefully it will migrate

even further.

And I think I missed - you said you you've been talking with Canada, Midwestern states, Eastern states, did I miss a locality that is considering a low carbon fuel standard? Or is there any talk this in, for example, the EU or any other countries?

MR. SONI: So EU will maybe have something equal to RFS if you will. They have this great program, which is not really a standard-based program like LCFS but it's more like a volume mandate like RFS. But they have had some discussions with us, and I think they recently passed their equivalent of Green New Deal. And they have some mentions about transportation, low-carbon fuels program in future. Besides that I did mention that LCFS-equivalent was implemented in Brazil to begin starting 2019. .

COMMISSIONER MONAHAN: I did not realize that. And it's an LCSF program. It's not just an ethanol program?

MR. SONI: It's more like an LCSF program. Yes, although I think majority of the fuel who will be made up from ethanol, which was the case with California LCFS as well in the initial days.

COMMISSIONER MONAHAN: Alright, just two more quick questions.

MR. SONI: Sure.

COMMISSIONER MONAHAN: One is that when I – way back when I was involved in the passage of the regulation, there was some discussion about having a super credit for ultra-low carbon fuels. So that's because that's where California needs to get to. Is there any talk of having any extra credit for a fuel say that has a very low CI.

MR. SONI: So yes, that's a – that's a good question. Thanks for bringing that up.

So in LCFS credit generated is primarily proportional to the carbon intensity of the fuel. And how what the delta between the fuels carbon intensity and the benchmark. So, the lower the carbon intensity, the higher the amount of credits they get. So we have seen some pathways, especially some of these daily pathways are energy pathways that I was referring they have carbon intensity ranging into negative 300 or even lower.

So when they applied that CI in our credit calculations, they actually get a very significant boost of credit amount for the same amount of fuel. If that was reported to us for other natural gas pathway or some other low carbon fuel pathway instead of an ultra-low carbon fuel pathway.

COMMISSIONER MONAHAN: I see, but it's not

like a super credit. It's actually just the actual CI credit.

(LAUGHTER)

MR. SONI: Yeah, we don't call it different credit. But yeah, they do get the additional credits.

COMMISSIONER MONAHAN: Okay. I think we just have a few more minutes. I want to make sure – Commissioner Douglas, do you have any questions, please feel free to come on to the video. I'll wait for --

COMMISSIONER DOUGLAS: I'm here. I don't have any questions, but appreciate the presentation.

COMMISSIONER MONAHAN: Okay, I'm just going to ask one last question, then we can move on to the panel.

MR. SONI: Sure.

COMMISSIONER MONAHAN: So on the slide that where you talked about ocean going vessels at berth and giving credits for electrification, we actually just this morning saw a presentation from the South Coast that listed ocean, basically vessels, were something like the third biggest sources nitrogen dioxide emissions in the air district which shocked me. I thought what I thought that's a lot of NOX coming from these ocean going vessels, marine vessels, and I'm curious why just electrification, what, why not any other fuel, I mean,

the I know there already are some sulfur limits on the fuel when they come close to, to, to shore, but it is it really the only solution is electrification for these ocean going vessels?

MR. SONI: So LCFS, what LCFS does given our authority of regulation, we can only apply our rule to the ocean-going vessels at berth. And, primarily the options that we have on LCSF for crediting, electricity is the only, I would say, is the only option that makes sense to LCSF framework. However, we have a separate regulation for at berth vessels, which also targets other emissions, like you mentioned, and NOx and SOx emissions from those idling engines at the berth. And that provides a variety of other options besides electrification like mitigation options they can have covers and they can have auxiliary powers besides their engine on board. So that regulation captures the broader extent of air quality issues that are coming from vessels. What LCSF does is only promote electricity as an alternative option for reducing the GHG emission from idling engines and vehicles at berth .

COMMISSIONER MONAHAN: Okay. Great. Thank you. Well, Arpit, thank you so much for coming and presenting to us. And thanks for all your great work to make sure that the Low Carbon

Fuel Standard remains a powerful policy.

MR. SONI: Yeah. Thank you for inviting. I was happy to engage in a very meaningful discussion. Thank you.

COMMISSIONER MONAHAN: Great. Well, let me turn it over to Heather, who is going to be introducing a panel that Tim Olson is facilitating.

MS. RAITT: Great. Thank you, Commissioner.

Thank you, Arpit.

Yeah, so we'll move on to the panel on low-carbon fuels. And Tim Olson is our facilitator from the Energy Commission. And Michael Comiter is also from the Energy Commission and he will be helping to moderate the Q&A from attendees.

So with that, go ahead, Tim. Thanks.

MR. OLSON: Thank you. Welcome everybody. We have another distinguished panel this afternoon.

And I'd like to remind the panel members to, when you're speaking, of course, un-mute and make sure your video is on. And then close that off when other speakers are speaking.

So today we have four panel members. And we're going to start with Gene Gebolys who is the Founder and CEO of World Energy, which owns and operates several biodiesel plants in the United States and the very notable renewable diesel plant, renewable jet fuel plant in Paramount, California.

So, Gene, go ahead.

MR. GEBOLYS: Well, thank you, Tim. Thank you, Commissioners, for the opportunity to be here. Good afternoon to all who are on the call today. Appreciate the opportunity to make a brief statement to start and look forward to today's important conversation.

Before I go, I want to applaud the Commission for recognizing the importance of over-the-road vehicles and, in particular, of heavy-duty vehicles in bringing about a transition to more socially responsible energy use in California.

You understand that a diesel vehicle purchased today is likely to still be on the road in the 2030s. The only question is: What fuel will power it?

You understand that an airplane brought

into a fleet today will fly well into the 2040s or 2050s. The only question is: What will power it?

No matter what we do with new equipment in the passenger care segment, any meaningful progress must include in-service heavy-duty equipment. Thanks for understanding that often overlooked fact.

It's because of that and because of California's leadership in facing the reality, that reality, that World Energy invested in California in 2018 to purchase our partially-converted renewable refinery in Paramount. That's why we are spending over $1 billion converting that site into 100 percent renewable 360 million gallon production and distribution hub with fully operational multimodal distribution for all forms of lower carbon motor fuels.

That's why we are blending biodiesel and our renewable diesel there today, making 100 percent renewable gas line there today and pioneering the path to renewable jet fuel there today. That's why we intend to build a community-focused innovation center in Paramount

to continue to grapple with how best to drive down CI in existing fleets and more effectively do that tomorrow. That's why we are focused on incorporating renewable hydrogen, renewable electricity, renewable natural gas, carbon capture, and other promising innovations to continue to do more and to do better in California.

Upon completion of our conversion project our plant alone will displace ten percent of the state's diesel fuel use with much lower CI impact, renewable diesel and renewable jet fuel, but there is much more to do.

We are committed to stimulating California-based solutions to make huge strides in pioneering innovation. We do not intend to fully convert our facility and then just operate it. The challenge of energy transition cries out for continual improvement and continual innovation, and so that's what we are setting out to do.

We are on our way but we would have never gotten here without public policy leadership and without CEC support in particular. More importantly now, we will never get to where we

need to go without continued and sustained public policy leadership.

All innovation starts with the societal investment. California's information tech revolution that allows us to now meet this way, virtually, could have only happened with sustained public investment in space and military initiatives over many decades. Those investments have changed everything about how we live. Now we need to do the same with fuel.

That's why we intend to build -- that's why we are focused on incorporating -- I'm sorry.

California is the global leader in the great energy transition that is coming. Like in other technology breakthroughs the key is continued and sustained commitment of support over decades. The push to date is resulting in the transition of service fleets to lower carbon intensity fuels but we've just begun.

There are those that will argue that California should pull back, that the solutions aren't perfect enough, or that others should now lead. To do that would be a grave mistake at a critical juncture. We need more leading-edge investment, more infrastructure investment, and

continued consistent policy stability. Now the push to our energy future must accelerate, not slow down, so that California can reap the environmental and economic rewards of its first mover advantage.

I appreciate the opportunity to be here. Thanks very much.

MR. OLSON: Okay. Thank you. Thank you, Gene. Thanks. Thanks for those comments.

Our next panel member is Jennifer Case, CEO and President of New Leaf Biofuel and operates a biodiesel plant near San Diego, and also has a role on some of the distribution.

Welcome, Jennifer, and look forward to your comments.

MS. CASE: Thank you everybody. Thank you, Commissioner Monahan, Commissioner Douglas, and Tim Olson for inviting me to speak today. My name is Jennifer Case. I am the Founder and President of New Leaf Biofuel in San Diego.

We are just finishing up our latest round of expansion, thanks to the Energy Commission for funding that project. Without your support of our industry and our plant, in particular, we would not be there, be where we are today, so

thank you very much.

So I want to talk today a little bit about the market and where we are with biodiesel infrastructure and some of the opportunities I think we have going forward.

As has been mentioned by multiple panelists today, the Low Carbon Fuel Standard has been very successful, thanks to low-carbon fuels. Liquid biofuels make up three-quarters of the program. And nearly half of that is coming from alternative diesel substitutes, like biodiesel and renewable diesel.

As of 2019, these renewable fuels make up 22 percent of the diesel pool which is fantastic considering we just started in 2010. The Governor has stated that it's his goal to be petroleum and diesel free by 2030 and our industry has a way to get him there.

Last year the California Advanced Biofuels Alliance published a white paper explaining that, with continued investment, we can achieve 100 percent petroleum replacement with just renewable diesel and biodiesel blends.

And go ahead to the next slide.

Since 80 percent of those liquid biofuels

consumed in California last year came in from out of state and, in fact, out of country, that's because the Low Carbon Fuel Standard credit values are very attractive.

By 2030, we expect the California diesel demand will be about 3.4 billion gallons. And we believe that, with a combination of biodiesel and renewable diesel, we can achieve an 80 percent renewable diesel and 20 percent biodiesel blend that will completely eliminate fossil petroleum diesel from the fuel supply here in California

And go ahead and go to the next slide.

So the reason that this program has been so successful and why so many people are sending their fuel to California is because the Low Carbon Fuel Standard has provided a significant economic benefit. The carbon score -- the Low Carbon Fuel Standard is fetching about $200 per metric ton right now, which can translate to about $1.50 to $1.75 per gallon that should go back to the producer, which is why so much fuel is coming in. It's very attractive.

The problem that we have -- you can go to the next slide -- the problem that we're having here in California is that with all this fuel

coming in there's a bottleneck that is happening at the storage and distribution space. What's happening is lots of fuel is coming in and the areas that can actually distribute that fuel is very limited. It's mostly at the petroleum refining and trading space. And what happens is the downstream petroleum participants with that proprietary infrastructure are demanding very deep discounts in order to take that fuel.

So what happens is there's a potential -- there's a perpetual market glut of biodiesel and renewable diesel that's coming into California and it's not able to get to the end user and provide an economic benefit to the end user.

It's also robbing the producer of the Low Carbon Fuel Standard credit because that discount that's being forced on them in order to get their fuel into the marketplace.

So this is where the opportunity comes in. We believe that with very limited investment to independent storage and distribution outside of the petroleum space, specifically focused on renewable diesel and biodiesel, we can de-bottleneck the state and allow both the producer and the end user to get some more value out of

the Low Carbon Fuel Standard.

The other benefit that we're going to have if we invest in some independent storage and distribution in California is we'll be able to increase the blend levels. Because the major distribution is within petroleum space, a lot of the times the distribution is limited to either B5 of R5, so we're not getting the opportunity to blend the fuel all the way up to B80 -- or R80 and B20, which really should happen if we want to reach that 2030 goal.

You can go to the next slide.

The Commissioner pointed in the beginning to this section about legacy vehicles causing problems still and we recognize that that's an issue. Renewable diesel, especially, will help solve that problem. Renewable diesel improves and offsets any NOx from biodiesel increases. However, we're also expecting that the turnover in the fleet will happen in the next few years, so there's no reason why we should not be investing in biodiesel and renewable diesel blending and infrastructure.

Importantly here, these investments do not have to be large. There will be an immediate

carbon reduction return on investment of between $0.50 and $0.75 per metric ton of greenhouse gas reduction over the next ten years. That is significant. It will result in immediately deployment of near-zero emissions equipment, including significant criteria tailpipe emissions reductions. So this will facilitate dramatic decarbonization of the heavy-duty diesel sector. And I hope you guys will consider putting some funding towards renewable infrastructure.

Thank you.

MR. OLSON: Thank you, Jennifer.

And our next speaker on the panel is Aaron Robinson, who is Sustainability Manager for United Airlines, and we're looking forward to his comments about some of the sustainable aviation options.

Go ahead, Aaron.

MR. ROBINSON: Thanks Tim. Good afternoon and thank you for the opportunity to speak about low-carbon fuels from the aviation perspective today.

We were the first airline to commit to reducing our greenhouse gas emissions in the United States. We committed to a 50 percent

reduction by 2050, which is the equivalent of removing all the cars in Los Angeles and New York City combined.

As Gene mentioned, aviation doesn't have electricity as an option in the near term. Aircraft we're ordering today, many of them will still be flying in 2050. And as a result, we rely on liquid fuels for our decarbonization transition.

In 2019, we bought over 700 million gallons of jet fuel in California, 1 million of which was derived from sustainable sources and produced by World Energy, so we will have a long way to go.

This fuel also came in at a high price premium, so we also need help in transitioning. Part of this can come from government incentives and, in the process, help create clean energy jobs.

As Arpit had mentioned, jet fuel joined the Low Carbon Fuel Standard in 2019. And this addition directly led to many new purchase agreements, including our own renewal with World Energy, and several production announcements by new producers that had not yet received the

financing they needed which the Low Carbon Fuel Standard was able to provide that certainty for their investors.

The Low Carbon Fuel Standard is a powerful magnet. Today, when airlines want to buy sustainable aviation fuel, they've come to California. And I'm not just talking about U.S. airlines. Airlines in Europe and Asia don't buy it in their own region, they buy it here, in Los Angeles and San Francisco.

But, unfortunately, producers are deliberately locating themselves and their production facilities outside of the state in Reno or Southern Oregon, for example, because the permitting process in California takes so long. World Energy and its production facility in Paramount is the exception, not the rule, and clean energy jobs are being lost to other communities as a result.

In addition, other states are starting to add incentives, as well, so California needs to continue advancing to maintain its leadership in this space.

Moving back to aviation, diesel is actually cheaper to produce than jet fuel, it

sells at a higher price in the market, and it generates more Low Carbon Fuel Standard credits. These three factors alone make it a significantly higher price premium for sustainable jet fuel than it is for renewable diesel. Gene knows that we would love to buy more sustainable aviation fuel from World Energy but we have to make it worth its while. We have to pay a significant premium to overcome the profitability gap we could make by producing diesel instead.

In Europe, Arpit mentioned the renewable energy directive there. Authorities have recognized this dilemma and they actually have a credit multiplier for jet fuel to help overcome this problem.

One of the opening comments from one of the Commissioners also talked about wanting to learn about social benefits and what we can do beyond decarbonization? Well, I think there's a powerful opportunity here. LCFS credits or other financial incentives can help solve other problems California faces.

For example, one SAF producer, Red Rock Biofuels, entering the market soon, produces their sustainable fuel from woody biomass and

waste residues. This can help reduce California's forest fire risk.

Another thing we've also looked at is documenting the local air quality benefits that sustainable aviation fuel offers. We're estimating that there's, depending on the pollutants, anywhere from a 10 to an 80 percent reduction in that pollutant, and that it can help improve the air quality and the health of California citizens.

Further support for low-carbon fuels, it's not only good for the economy and decarbonizing aviation or the broader economic but it's also good for our society as well.

Thank you.

MR. OLSON: Okay. Very good, Aaron. Thank you very much for those comments.

And our final panel speaker is Annie Petsonk of the -- a principal with Environmental Defense Fund. We're interested in -- and she's got some really relevant comments about this comment area.

Thank you, Annie, and please proceed. It looks like your muted, Annie.

MS. PETSONK: Is this better?

MR. OLSON: Yeah. We can hear you.

MS. PETSONK: Yeah. Great. Thanks so much. And thank you very much to the Commissioners for your invitation to participate and for your attention today.

The Environmental Defense Fund has been working in the International Civil Aviation Organization, I-C-A-O or ICAO, for the past six years to develop sustainable aviation fuel standards which have now been agreed by the countries of the world and, for the most part, are in effect. Under these standards, sustainable aviation is evaluated on a lifecycle basis for its carbon benefits. Each fuel to be accepted into the ICAO Program must satisfy stringent sustainability criteria. The total number of sustainability criteria are 12 criteria, 3 of which have already been adopted and the other 9 are before the ICAO Governing Body of Council right now for adoption. And those cover social sustainability, economic sustainability, as well as environmental and community sustainability.

We see a great opportunity for the LCFS to build on the work that's been done in ICAO

which, in turn, builds on what the LCFS developed originally. And there's no question that the two processes have been reinforcing of each other.

Implementation, the ICAO Standards apply the lifecycle analysis to the entire lifecycle, including -- and they are feedstock-neutral. They include attention to direct and indirect emissions. And this is something that we think the LCFS could be updated to take into account.

For example, in CARB's introduction to the LCFS, they spoke about the accounting for indirect emissions for crop-based biofuels. But those are important, also, for non crop-based biofuels. For example, consider a biofuel that's produced from tallow, animal fat. If that fat was previous a waste then and going to landfill, then the benefit of producing the biofuel from it can take into account reduced emissions as a result of it not going into a landfill.

But if that tallow was going to be used, let's say, in the candle-making industry or the cosmetic industry and those industries, because they're not getting that tallow, now have to turn to alternatives, let's say palm oil imported from countries that are destroying tropical forests to

generate the palm oil, then that's an indirect effect which can cause an emissions increase over the lifecycle. And we think that the LCFS could benefit from following the ICAO approach to take into account these indirect emissions, regardless of the feedstock.

We also think that the LCFS could benefit from scrutinizing the environmental attributes of the feedstocks over their whole supply chain. That is something that the E.U. is moving toward and that ICAO has done.

Third, we'd like to call attention to the fact that as the carbon price signal from the California AB 32 Program increases and becomes a more and more significant incentive in the coming years, it may be useful for CARB to reevaluate its current approach, which is to give a zero CO2 combustion rating for biofuels, and instead for CARB to transition to a system that taps into the lifecycle analysis approach applicable in the LCFS.

Fourth, we note that some of the carbon intensity pathways in the LCFS might need to be reviewed to ensure that the lifecycle emissions claims are consistent with rural emissions

reductions. For example, a fuel based on municipal solid waste that claims that methane emissions can be avoided over a 100-year time frame is not the best practice today in the field.

What's exciting to us is that the LCFS, even with these features that could be improved, is proving to be an inspiration, an inspiration to the International Civil Aviation Organization to move ahead with its standards, which the United States has now exceeded to, and to other regions and countries that are putting together their own lifecycle approaches.

I'd be happy to answer questions about how the ICAO approach is developing but I want to finish by saying that, as we see it, aviation is at a crucial juncture. There's no question that the current COVID crisis has caused horrendous job losses and the real greatest economic challenge in the history of the industry.

Our assessment is that the industry is at a crucial point. Real leadership would mean rebuilding the aviation industry in a climate-compatible path consistent with near-zero emissions by 2050.

Thank you.

MR. OLSON: Thank you, Annie. Thank you very much for those comments.

So, Commissioners, we're now going to turn it back over to you of questions of the panel members and proceed from there.

COMMISSIONER MONAHAN: Great. Thank you. And thanks to all the panelists. That was really, really interesting.

I first have a question, I guess for Aaron, and your comments around there's a big price difference with buying renewable jet fuel, even with the credit from the LCFS. I'm curious but can you give us a sense of how far off we are from having the LCFS be a sufficient driver in terms of just, you know, the price benefit of having a low-carbon fuel? Like how far off are we from having a sustainable model where you don't need any -- where the LCFS is enough of a driver?

MR. ROBINSON: Yeah. Certainly. So without going into too specific numbers, kind of the United side and what we've seen, you know, the industry kind of rule of thumb out there is you're looking still at about $1.00 a gallon

price that's being faced. Now that was also a pre-crisis number. And one of the things we saw in the crisis, of course, was that conventional oil prices fell quite a bit. And at one point they were a dollar lower than they had been previously. Now that's certainly come back up a bit. But one of the long-term benefits we see for low-carbon fuels is that they are relatively insulated, at least on a production cost basis, versus conventional fuel.

So, you know, perhaps the gap today is in kind of the $1.50 range. But that's also going to vary based on the producer. And you know, certainly, the LCFS does provide a strong incentive for them to figure out how to lower that carbon intensity further.

But, you know, kind of pre-crisis, I would have said, rule of thumb is about $1.00 a gallon is what you're looking at.

COMMISSIONER MONAHAN: Great. Thank you.

And, Gene, I wonder if you could elaborate a little more? I mean, you seem like one of the few success stories in terms of being able to build out in California and deliver low-carbon, both biodiesel and jet fuels. What's the

-- like what's been the ingredients of success for World Energy in coming to California?

MR. GEBOLYS: Well, look, obviously, a number of folks have commented on it, the LCFS is the driver of all the economics. And all the investment chases the opportunity to participate in the program. It actually helps in that everything gets double weighted, right, because you get -- when we're counting carbon what we're really doing is counting how much fuel it takes to get something from A to B. And so you're motivated, just on an economic basis, to reduce that number anyway.

But when you're able to operate in California and touch feedstock once instead of twice, and you're able to touch fuel fewer times and move things around less, it's you get the benefit of the lower cost and you get the benefit of the higher CI.

And so, you know, I would say the -- I would say it's too early in the game to say what our keys to success have been. I can tell you where we're headed. Everything we're going to do going forward is about continuing to drive CI down in every way we can possibly get there. And

you get the double benefit of doing that. You get the lower CI and, therefore, the higher returns, and you get the lower cost.

So location is critical. I think Aaron made a really good point about where you're seeing these investments are kind of close to but not in California. I don't think that's by accident. Maybe we were either too foolish or too optimistic to do something similar.

But look, the only way you're going to really get there is to go right were the fuel is getting used. And so, yes, it's a lot more difficult to do business in the center of Los Angeles County than it is to do it other places. There's no easy pathway where we are, so it's got to be a long-term commitment and long slog, but the promise is built right into the LCFS.

COMMISSIONER MONAHAN: I'm curious, you know, do you intersect with GO-Biz or any of the folks in California? I mean, because we want businesses in California, clean energy businesses, to thrive. And we want to figure out how we can overcome the barriers so that we can make sure businesses can succeed here in California producing fuel that we're going to

need for the future.

MR. GEBOLYS: Yeah.

COMMISSIONER MONAHAN: So are you intersecting with GO-Biz and other interests --

MR. GEBOLYS: Look --

COMMISSIONER MONAHAN: -- in the Governor's --

MR. GEBOLYS: -- yeah, and --

COMMISSIONER MONAHAN: -- Office around --

MR. GEBOLYS: -- we do the very best we can to recognize that we have to be part of a joint solution. There's no one-company solution here. It's going to have to be a broad industry response for California to get to where California needs to go. And there's nothing that can't be replicated about what we are doing. It's hard, it's really hard, but it can and will be replicated.

There are some unique conditions. We are a permanent oil refinery in L.A. And we are intending to voluntarily give that up in exchange for a much smaller permit to produce 100 percent renewable fuels.

So there are unique conditions in any

particular site that makes it easier or harder. But what Jen is doing down in San Diego is really an important piece of the picture. What Crimson Renewables is doing is really an important piece of the picture. You know, there are a lot of folks kind of swimming upstream to make these liquid fuels on the diesel side increasingly displacing diesel.

COMMISSIONER MONAHAN: Great. Well, I hope you keep swimming upstream. I hope it gets easier.

MR. GEBOLYS: It hasn't so far.

COMMISSIONER MONAHAN: Annie, I was really curious to hear that ICAO is developing a fuel standard. Can you just elaborate a bit more on that, what that standard looks like, and how similar it is to the California Low Carbon Fuel Standard?

MS. PETSONK: Sure. What led the International Civil Aviation Organization to develop its approach is a commitment by governments, which has been altered in the past month but we can talk about that in a minute, to cap, to limit the emissions, the carbon dioxide emissions of international flights between

participating companies at the average of 2019-2020 levels.

So the cap is set with the average of 2019-2020 levels and airlines must reduce emissions down to that level or, if they can't reduce down to that level, they must either offset using approved offsets or burn alternative fuels that meet ICAO sustainability criteria and that achieves measurable reduction compared to conventional jet fuel in an amount equal to their emissions above the cap.

So in order to quantify how much sustainable aviation fuel reduces emissions compared to conventional jet fuel, ICAO could have said, well, it's sustainable aviation fuel, we'll consider it to be automatically zero emitting, but it didn't do that. It recognized that some of the fuels can be worse than conventional jet fuels if they're not carefully done if indirect effects aren't addressed and so on.

So ICAO developed, and it took them six years to do it, a set of methodologies for quantifying the emission reductions of the sustainable aviation fuels on a lifecycle basis,

including direct and indirect effects. I has a set of pathways that are recognized. Also, pathways have to be approved by the American Society for Testing and Materials, ASTM, in order to be used in the aircraft, from a point of safety. And then once they're recognized pathways, then they have to be certified as meeting the ICAO sustainability criteria and achieving at least a ten percent better than conventional jet fuel emissions. That ten percent threshold, we think, is way too weak. And it was internationally negotiated among 190 countries.

Last month the house -- the U.S. House of Representatives Transportation and Infrastructure Committee introduced a bill that would provide financial support for -- thank you, sorry -- for --

COMMISSIONER MONAHAN: We need a little levity these days. I was -- I thought it would be more dramatic than a teenager.

MS. PETSONK: Okay. Thanks.

The House Transportation Infrastructure Committee bill provides loans and loan guarantees and grants for facilities that are going to build

new sustainable aviation fuel facilities. And it requires a 50 percent better than conventional jet fuel threshold but builds on the ICAO standards. And so that, I wouldn't take the ten percent as something that California would need to adopt. It can go much more stringent than that. And the LCFS has the effect of doing that as well.

COMMISSIONER MONAHAN: But do the airlines need it, though, to be a more efficient airline? I mean, I've always thought about ICAO setting efficiency standards, not fuel standards. So with the ten perception, you know, reduction -- or I'm sorry.

Could you meet -- could airlines meet the standard, not just through liquid low-carbon fuels but also by improving the efficiency of the aircraft?

MS. PETSONK: The portion of the standard, which is called the Carbon Offsetting and Reduction Scheme for International Aviation, or C-O-R-S-I-A, CORSIA, the portion of CORSIA that sets the limit on emissions sets that as a net limit, taking into account offsets and taking into account alternative fuels, it does not

dictate to airlines how they meet that limit. They can meet it by --

COMMISSIONER MONAHAN: Got it.

MS. PETSONK: -- flying few flights --

COMMISSIONER MONAHAN: Okay.

MS. PETSONK: -- which is what's happening now and which is why the airlines went back to ICAO and said, please, change the limit from the average of 2019-2020 to 2019 only. And ICAO has done -- has changed it, only for the first three years, 2021, 2022 and 2023, then it will reconsider what to do.

COMMISSIONER MONAHAN: Fascinating. The Trump Administration has agreed with this?

MS. PETSONK: Yes.

COMMISSIONER MONAHAN: Fascinating. All right. Well, I think that's it for my questions.

Commissioner Douglas, do you have any questions before we turn it over to Tim to facilitate the panel?

COMMISSIONER DOUGLAS: You know, maybe just one or two.

One question, just kind of big picture, because I haven't spent much time focusing on aviation fuels and low-carbon fuels, but I know

it's difficult, it's more difficult to do, what do you see besides the Low Carbon Fuel Standard? Like how important is the Low Carbon Fuel Standard in the big picture in getting this industry off the ground? And what are some of the other policies that would be needed to really get it to scale?

Go ahead. Yeah.

MR. OLSON: Aaron, are you going to take that one?

MR. ROBINSON: Sure. Thanks. Thanks for that. Yeah.

I mean, I think the way I see it, there's always been three key problems. One is the price gap which, certainly, the Low Carbon Fuel Standard is critical to reducing and solving that problem. The other two problems, you know, are more difficult but they can -- they have solutions too. The first of them, I think, is just the capital costs involved. So building a biorefinery costs hundreds of millions of dollars. And the problem is where is that money going to come from?

Gene, you know, not to speak for Gene too much here, but the World Energy expansion in

Paramount is on the order of, I think it's -- I think it was like $150 million or $200 million, something north of that, and that's just for an expansion, not even to build a new facility.

And we're going to -- you know, I mentioned, you know, also the scale of the problem. So United, we're buying 700 million gallons of jet fuel in California each year. And World Energy, at best, could put out for us maybe 20 percent of that. And so, you know, you can see you're going to need a lot more facilities. And so, ultimately, we're going to need oil majors (phonetic) and further financing to come into that space and really drive that investment.

The third problem, I think, is one that's really on the airlines, in fact, to solve and it's how do we make this visible to customers? And, really, the challenge for that is fuel right now is invisible in our process to our customers because we want it to be something they don't have to think about or worry about. But we can see very clearly with a lot of other environmentally-friendly products, like your newest Prius or Tesla, that those products are designed and engineered to look different and

appeal to their consumer to be able to show those green credentials. And that's something that we haven't figured out how to do yet here.

COMMISSIONER DOUGLAS: So Annie?

MS. PETSONK: I'd agree with what Aaron said in terms of the difficulties. And as we see it, the aviation industry, having been hit hard by COVID, is going to be it's going to be a challenge for the aviation industry on its own to finance what's needed.

COMMISSIONER DOUGLAS: Um-hmm.

MS. PETSONK: And so at the same time, and this is something that I've actually learned from Aaron, there are major customers of airlines who have who are increasingly asking and demanding that airlines fly sustainably because those major customers want to reduce what's called their Scope 3 emissions, that is the emissions of the company associated with travel.

And so what's interesting for us is that while Europe, there's starting to be significant consumer pressure in favor of just not flying, just don't fly, Get a sunburn, take the train, take the boat. In the United States the train and the boat may not be available and so we think

that people will want to continue to fly, they will want to resume flying, but major customers have had their employees, who might buy 10,000, 20,000, 30,000, 40,000 air tickets a year, have been in front of video screens for the past four months. And so those companies have started to see that they can save a lot of money by flying less.

If they do want to resume flying, we think that they ought to help participate here and take some of the money they've been saving from not flying and devote that to helping defray some of these costs so that they can be assured and their employees can be assured that when they fly, that flying is more sustainable.

Now how to bring that together is a real challenge. But one of the things that we're hearing from various governmental entities is governments often buy a lot of air tickets. And could governments participate in this kind of approach? And that's something that we're interested in discussing with other stakeholders.

COMMISSIONER DOUGLAS: Okay. All right.

Anyone else on this question?

MR. GEBOLYS: Yeah. Jen, you go first.

And then I've got a couple thoughts too.

MS. CASE: Yeah.. You know, obviously, aviation is a really important piece of the puzzle for the future. My entire presentation was about something we can do right now that is a very low-cost solution to decarbonizing the heavy-duty sector. It's very expensive to do business in California. I can speak to that. I've been doing it for 13 years. It is very, very difficult. I am currently waiting on a permit that's in the city that's been, you know, 18 weeks because of COVID and I'm pulling my hair out. And, you know, I know it has to be done but it's challenging.

What we're asking for right now for infrastructure de-bottlenecking is really cheap, $0.50 to $0.75 per metric ton over the next ten years with ridiculously huge emissions reductions because we can't build a bunch of renewable diesel plants quickly to solve a lot of these problems. But you know what? A lot of people already have in other states.

So the question is: How can we get that product in here, into California, to meet these standards and really help out the instate

producers by reducing this perpetual glut and making it easier to get to the end user?

COMMISSIONER DOUGLAS: Um-hmm.

MR. GEBOLYS: Well, Commissioner, I think that the question is: What can the State of California do to foster advancement; right? And I completely agree with what Jen just said in terms of direct investment at critical spots.

You know, it's well documented that but for the collapse of the economy in 2008 and the responding stimulus money that came out in 2009 that Tesla would not exist.

You know, this notion that you're going to get the kind of fundamental shift that comes from companies like Tesla -- I'm a proud Tesla myself. I am one of the first 10,000 and bought that, not because it was a car but because it was important beyond it being a car, but that didn't just happen. That was a result of a direct investment from the government in making something happen that wouldn't otherwise happen.

So the backbone of all of this is the LCFS but -- and that's a critical backbone. Without it, you don't get people swimming upstream, or whatever the analogy that Jen just

used was. You don't choose to do the hard stuff if you've got an easier path.

COMMISSIONER DOUGLAS: Um-hmm.

MR. GEBOLYS: But what is not going to happen is the State of California investing in plants in Nevada and Oregon and elsewhere.

COMMISSIONER DOUGLAS: Um-hmm.

MR. GEBOLYS: And so if you can facilitate around the edges the critical investments that allow us to try to get a little bit farther out there on carbon capture, that allow us to get a little bit farther out there on infrastructure that wouldn't otherwise happen, those little small things around the edges are what make the difference.

We didn't go from the abacus to the iPhone. We got there because of government investments. And, unfortunately, the reality is California is the first mover. California's got the lead. California is in the best position to succeed but it requires continued investment.

COMMISSIONER DOUGLAS: Okay. Well, I think we should probably -- I think those are all of my questions. But I appreciate all of your participation and responses today.

MR. OLSON: Very good. So I think we can now continue on with some moderation -- moderated questions here. So thank you very much. Good discussion up to this point.

I want to ask a question of all of you. And I don't know if you heard Jeremy Martin's presentation this morning on a different panel? He did an overarching kind of outlook of what the potential sources are and the contributions, kind of broad based, even though he was a lead-in to the biomethane, his comments were valid for pretty much all the low-carbon fuels.

And Jeremy Martin is with the Union of Concerned Scientists. He has done some of his own studies with other UCS staff. And he referred to other analytical work that had been completed. And you know, for the most part, he said we need contributions from a lot of different low-carbon fuel sources. And they all have -- each one of them has pros and cons. And he noted that, you know, this preference for waste-based feedstocks and to create either biomethane or a low-carbon liquid biofuel.

And his point was he was kind of surmising that we're going to reach a point where

there's a limit, not for reasons that -- some of those have to do with competition for other products. Some of them have to do -- there's -- is there a finite limit on just the waste-based feedstocks? And this kind of turmoil over whether certain products make sense to pursue, like the palm fatty acid distillate and which, you know, you could describe it as it's kind of like corn oil, it's a byproduct cold product, a base product from the ethanol production process but it's used in biodiesel production. And it's eligible for LCFS credits.

And so I guess I'm kind of wondering what your insights are and views are about this? I don't know if it's an assertion but just an outlook that there may be limits for transportation fuels. And is -- what's the best use of those residues compared to, as Annie pointed out, there might be competition for the same product producing cosmetics, waxes, other kind of products?

So I'd like to start. Jennifer, I'd like to start with you on that. And if you have any insights or just viewpoints on that? And you need -- there you go.

MS. CASE: Thanks. Hi Tim. Yeah, thanks. Can you repeat the last part of your question? Because I was -- there was a lot in there.

MR. OLSON: Well, just kind of this point that is there a limit? Is there a limit? And he was surmising that there is a limit on waste-based feedstocks.

MS. CASE: Got it.

MR. OLSON: And particularly if you look, not only in California but across international. And as Commissioner Monahan was posing earlier this question about if you have -- with Arpit -- if you have some replication of the LCFS in other states and other countries, will there be a diversion of that kind of waste-based material to other locations?

MS. CASE: Yeah.

MR. OLSON: And then you've got this competition for other products, so to speak.

MS. CASE: Yeah. I mean, when I first started in this industry, you know, back in 2006, the concept that we would ever get to, you know, 4 billion gallons of biodiesel in the United States was, you know, super farfetched because

there just wasn't that much feedstock, you know, even if you add in all the soybean oil and canola oil that was grown across the whole country. But, you know, here are we, you know, ten years later with crop fields being, you know, historic and continuing to find new ways to recycle cooking oils and animal fats and everything else.

So it's hard to say what we're going to see in the next ten years. I do believe in innovation and I do believe that we're going to continue to find new ways to meet the demand for these things. Sure, there will be diversion, I'm sure, from, you know, other parts of the country.

I am familiar right now, we are partners, with a rendering company that has, you know, international rendering facilities. And there is still a lot of cooking oil that's going overseas. It's not staying here because there's still a huge market.

So I think we have a lot. I think we still have a lot to grow here. But I think there needs to be innovation as well.

MR. OLSON: And, Annie, what's your view on this question?

MS. PETSONK: So, for me, it depends on

the rules. If the rules are well crafted they will incentivize, first, going after the waste-based and, second, going into, then, more expensive materials. For example, at the kind of other end of the spectrum from the cheapest base-based sources, it might be direct air capture, carbon prepared with hydrolysis of water, provided you can generate enough renewable electricity to power those two processes, put them together, and you get a hydrocarbon. That's a really complicated process. And so far, humans haven't figured how to do it better than plants do, but people are working on it.

If the rules are lax, you get things -- let me use the cooking oil, for example -- you get these chicken-leg problems where a restaurant puts the chicken leg in the cooking oil and says, oh, it's now used and sells it because you can get a higher price for the used cooking oil in the LCFS-type market than you can otherwise.

And so crafting the rules is really important. It's like taken ICAO six years, even building on the strong work of the LCFS, to focus on direct and indirect emissions.

And it's why the interaction with other

policies is important. For example, in the case of crop-based renewable fuels, there's concern that the crops might result indirectly in deforestation up the value chain in other countries as lands are deforested to supply crops and those countries to meet their demand where their crops were previously -- were being diverted to meet California's or LCFS demand elsewhere.

California has the tropical forest standard under AB 32. It provides a counterbalance against that and, certainly, having strong sustainability criteria providing for the counterbalance.

So just to draw a line under it, rules really matter to get the incentives right.

MR. OLSON: Very good.

And, Aaron, I'd like to hear your comments. You know, your company, you mentioned you have an offtake agreement with Fulcrum, a company in Nevada, which has generated a biocrude and liquid-based bioproduct from MSW. But that same conversion process could be woody biomass too.

Is that -- first of all, do you have any

comments on the overall questions? And then what's the role of these more advanced technologies that could come into play that take advantage of really difficult kind of waste greens, the woody biomass, agricultural orchard prunings, all the different kind of waste in the valley and these forest issues?

MR. ROBINSON: Well, certainly. So there's a lot to unpack and that's -- but, yeah, I'm absolutely concerned about the optimal use of feedstocks.

I mean, for us, back in 2011, we signed an agreement, our first, in fact, purchase agreement with a sustainable fuel producer. And then, three years later, when oil prices fell they looked at the market and they said, "We don't think there's a future in jet fuel." And so, today, they're still in the market but they're producing exactly that, cosmetics, from a lot of the same processes. And so, you know, you may have an efficient market today but that doesn't necessarily mean that those are the optimal uses of your resources tomorrow.

So, certainly, if you look at heavy transport in particular, it's going to take

longer to decarbonize that than road fuels, for instance, and electrifying that. I mean, if you have range anxiety in a Tesla today, imagine feeling range anxiety when you're over the Pacific.

So, but yeah, I mean, I agree with Annie. There's definitely -- I don't think there's a limit to having it be just waste feedstocks. You know, ten years ago no one was even thinking about waste feedstocks hardly at all. It was all about crops. You know, in the last few years, we've started thinking beyond waste, even, and recognizing there's a lot of carbon dioxide in the air we can capture and, in some sense, need to capture to avoid climate change impacts.

So I don't think there's a single solution to any of these problems. I think it's really a multitude that we're looking for.

MR. OLSON: And, Gene, you're in a unique position. You're ramping up pretty significant volumes. Is this issue of maybe a limit on feed -- low-carbon feedstocks an issue for you or do you anticipate that?

MR. GEBOLYS: Well, yeah. Obviously, if you're spending the kind of money that we're

spending, you've got to have a pretty good feel that you're going to be able to source the right feedstocks to make it all work.

But -- so, yes, we look at these as global markets. Energy markets tend to be global markets. Agricultural markets tend to be global markets. So we will have to source globally from wherever we can get the most appropriate feedstocks and have the greatest flexibility possible to run as many as possible. And then the markets will do what the markets will do in pricing carbon. And the markets are pretty efficient at finding the right balance between various feedstocks relative to their carbon impacts.

I think Annie pretty much hit the nail on the head. If you get the rules right then the markets will do what they need to do.

I think, you know, if I can step back just a bit from palm fatty acid distillates and the more specific approach and just look a little bit more broadly, you know, if you looked in 1880 at people poking holes in the ground in Pennsylvania and saying, well, there's not nearly enough of that black stuff coming out that could

power all these kerosene lamps that light up London and New York and everywhere else, this doesn't make a lot of sense, why would we do this? You would never have the oil industry that we have today. They didn't know 140 years ago what they know now about getting after hard to get to sources of oil.

And even what Jenn was talking about, 13 years ago, you know, 13 years ago the Chinese hadn't grown at 7 percent annually, at least, for 13 years. And their diets didn't change. And the -- where 13 years ago there was almost no used cooking oil industry in China because they would just continue to use cooking oil until it would go away. Now they're moving towards best practice of changing out oil. It's not healthy to continue to cook with used oil. Their diets have moved in such a way that there's a lot more feedstock coming out of Southeast Asia and the developing world in general. I don't know that we all would have predicted that 13 years ago.

But I guess the point relative to feedstock is markets drive everything. And so there's been a lot of talk about algae (phonetic) for many years. There's a lot of uphill sweating

that still needs to be done relative to algae. But the oil guys didn't get there in a week either. So unless you take the steps you can take you don't get to the places that you need to get to.

And so I think as it relates to all feedstocks, I certainly understand, appreciate and support what Annie was talking about, about not creating unintended consequences around feedstocks, that's absolutely spot on. But we need to be cognizant of the fact that any source of fuel needs to go through its periods of innovation and transition.

So I don't have a particular thought one way or the other about PFAD. I do think there are lots of waste streams that can be captured, whether it's woody biomass streams or municipal waste solid waste streams or others that can be captured for deployment into low-carbon fuels. But I just would encourage a broader, longer view.

MR. OLSON: Let me, Gene, let me just ask this: Are you aware, are any of the other panel members aware, of studies that have kind of dug into this in a deep manner to really address that

kind of -- whether there's a limitation?

MR. GEBOLYS: We're in the middle of one right now. This is probably our sixth or seventh or eighth. We're constantly evaluating what the future looks like in terms of feedstock. And it's always changing. If I pull one off the shelf from three years ago it will be a lot different than the one we're just working on now.

MR. OLSON: Okay. Yeah, go ahead, Annie. Un-mute yourself and go ahead.

MS. PETSONK: Thanks. So ICAO has also done a lot of work in this area. And I'd be happy to go back and look at what their most recent analyses are and send those along, if that would be helpful?

MR. OLSON: That would be helpful. We always like to put those kinds of documents in our public docket record.

Okay, so I have another question and it's related to -- triggered by another comment that Jeremy Martin made this morning, and then kind of reinforced by Arpit in the LCFS presentation, and that's the growth in this area, and particular in California, the growth of liquid biofuels.

And Jeremy described -- he presented some

information, primarily from DOE EIA data nationally, that five percent of the transportation market in 2019 came from alternative fuels. Well, our data in California shows it's more like 12 percent is -- combining all the alternative fuels. And in 2018 to 2019, it grew one percent. I mean, that was the kind of trend. I don't know what that -- whether that same thing occurred from 2019 going into 2020. That has to be analyzed. But it looks like, when he mentioned 800 to 900 million gallons of renewable diesel, diesel substitutes, that's a significant trend.

And I guess one of the -- the question here is kind of two part, depending on how you see the kind of circumstances, is what government intervention actions or conditions in the marketplace, circumstances in the marketplace, will -- do you see a continued growth in this area or do you see any kind of slowing because of the stock market slowing a bit more in growth?

And so I would like to start with, maybe, with Jennifer going first.

MS. CASE: Tim, your voice cut out just for a second there, you were -- at the very end.

I think I understand your question saying, do we expect there to be continued growth? And that answer to that is, absolutely, yes. As Gene said, you know, markets are driving everything. And the Low Carbon Fuel Standard is going to continue to be a driver.

As it steps up every year, it's going to be more and more dramatic how many fuels are going to be sent here. Now that will be, you know, significantly offset over time as other low-carbon fuel standards happen around the globe. And that's a good thing because we -- you know, I would prefer, as somebody who focuses on making sustainable biodiesel, that fuels stay in their home town. That's best for everyone. Eventually, low-carbon fuel standards should pop up everywhere and that will help decarbonize the world.

But, yeah, I believe the market will continue to grow. I think that the type of fuels will definitely evolve. I think that we may see, even, fuels that we don't see yet today before the end of this, the end of the program in 2030. So I'm excited for the future and the new fuels that may come along.

MR. OLSON: And, Aaron, along the same lines, how do you see this? You're in an industry that's facing some significant softening of demand in air travel. Do you see a growth potential? And what's really driving that for the airline industry to kind of shift to a sustainable fuel or sustainable options?

MR. ROBINSON: Sure, Tim. Yeah. I mean, I think, despite the crisis, sustainability may be a bit on pause for the moment for aviation and, perhaps, many other industries as well. But I think long-term plans and commitments really still remain in tact.

You know Jennifer talked about still seeing continued growth. I mean, I don't think I can ever think of a time when history really moved in a straight line. And you know, during this crisis, people are really seeing and enjoying the environmental benefits that they're encountering in the short term.

I mean, I was in L.A. a few months ago and I could see the mountains pretty clearly. You know, there's less noise and other kinds of pollution as well. And, ultimately, people aren't going to give this back. So

sustainability is remaining on the long-term agenda for companies and society as a whole.

So you know, in sustainable low-carbon fuels for aviation, we've seen market hits delaying developments before. Oil fell in 2014. And you know, we're seeing other kind of, obviously, bit challenges today. I think the silver lining is that these are all happening simultaneously instead of sequentially one after the other. So we can, hopefully, get through these as quickly as possible and get back to the course we were headed before.

MR. OLSON: Very good. Thank you.

Annie, your focus has tended to be on aviation jet fuel. And what's your sense about this as a growth area?

I mean, some of my colleagues in the state government are uncertain about what can happen in this area because we don't have any real state government authority over that industry like we do in some of the on-road vehicles and some of fuels.

And so would an international standard be a factor in this, either as a stimulus to go in a more low-carbon direction or may preclude some

kind of future development?

MS. PETSONK: This is why, when I was referring to the potential tools for overcoming the hurdles that Aaron identified as far as cost and demand, that I maybe a bit obliquely suggested that California can look at it's role as a demandeur (phonetic) of aviation-related services. I don't know. And I apologize, I should have done this homework before this meeting but I wasn't able to do it.

But in terms of the air tickets that California institutions purchase, whether those are institutions of higher education or government agencies, and also the -- if Californians -- if California State Government utilizes air cargo services, I don't know if they do, but air cargo has not seen nearly as precipitous a drop in utilization as the passenger services have, so much so that many passenger flights actually have converted to carrying more cargo than they otherwise would in the belly of the aircraft.

And so to the extent that California can tap into its role as a demandeur, there may be leverage that California could apply in its

purchasing -- government purchasing power that it could build on the LCFS, the ICAO standard. And it helps stimulate even further that market development.

MR. OLSON: Very good. Appreciate that.

Gene, I would like to hear whether you have a comment on that question, that overall question, and if you have any insights?

We've talked mainly about diesel substitutes and aviation -- petroleum aviation substitutes and haven't really addressed the gasoline substitutes. So if you could respond to the overall question? But if you have any insights about what potential growth areas might occur and/or not growth areas that could occur in the gasoline substitutes? Any comments there?

MR. GEBOLYS: Sure. I absolutely think that California has a role to play. Hats off to CARB for including aviation fuel in the LCFS. That's one really important example of the role that California plays.

For those of us who didn't grow up in California, it's kind of like having -- it's like having this big brother or big sister who's like really good in school or whatever and always

tends to lead.

And so what California does is so important, not only for the markets but also for the symbols and the messages sent when California does things, like CARB including aviation fuel in the LCFS.

So as far as aviation being some -- you know, people say, well, it's controlled by the federal government in the U.S. And so the state and local municipalities have, really, less to say about what kind of fuels get used in the state, California has plenty to say about what gets used in its state. And we want to continue to recognize that role and continue to be active in it.

So does the market. If you look at -- Arpit was good enough to mention the deal that we just did with Amazon but, in fact, we did that deal with Amazon and Shell. And I thought it was a really important deal, not just for the volumes of fuel that it moved, but as a precursor to kind of where things are headed.

So Amazon is an amazing story; right? In these last few months, all of our doorsteps have just been cluttered with Amazon products; right?

It's just all of a sudden this is just how we get stuff. Well, they didn't just originate at the doorstep. They had to get there. And so as Amazon is going through its amazing growth, they simultaneously have committed to zero-carbon emissions by 2040. So think about their growth and think about that commitment. And think about the folks in the Skunkworks project at Amazon that have to find how those two things fit together.

So their social license -- you don't get to be Amazon and continue to grow at their rate if you don't care about your interface with society. Their social license depends on them making huge leadership strides to be able to continue to grow their business. Otherwise, they can't grow.

If you look at somebody like Shell, who is primarily a fossil fuels-driven business today and a very, very large one but one that has taken a very public stance to transitioning to a company that distributes lower-carbon fuels, they can't just talk about it. They've got to actually take action to doing it. You know, it's no easier to turn one of their tankers than it is

to turn that company.

But that deal was really important symbolically to show that, where Shell is going with their business, where Amazon is going with their business. And it's not about just getting out a green press release. This is fundamental to who they have to become to have social license to continue to grow.

And so the marketplace, ultimately, if we could close our eyes and then kind of open them in 2035, we could easily imagine a carbon-priced world. And in a carbon-priced world, your social impact gets priced into everything you do. So if you're moving your t-shirts made in Bangladesh to stores in St. Louis, that all gets priced in.

And so the entire complex, thinking about doing things more efficiency, reducing carbon impact, the social cost of energy being priced into things, this isn't something that's just, you know, being done in, you know, NGOs in the corners. Some of the largest businesses on the planet are looking at how does the world shift and how do we lead that shift?

MR. OLSON: Very good. I have a question for Jennifer.

And Jennifer, I wondered if you can just elaborate a little more about this distribution of biodiesel and how critical that there's a challenge, there's an impeding there, and how critical that is in expanding volumes of fuel delivered into the market?

MS. CASE: Yeah. It's really critical. It's critical, not only because it will bring in more fuel, but it will -- it's critical because it's going to help also bolster the instate production of fuels, which it really kind of sounds strange that making it easier to bring in fuels from out of state and our of country would actually help instate, but it will because it de-bottlenecks the system and it avoids a perpetual glut.

When you think about it like this, like when a big, huge ship comes into the port of L.A. and there's huge amounts of product that have to get out very quickly, and then you have a plant like mine, who's in California, who's running and, you know, running as much as we can, and now I have to price compared to this huge system that came into the port. I have to lower my price and, potentially, lose out because I can't afford

to compete. Because I'm in California, I'm a smaller facility, I have to comply with all the California rules, it makes it a lot harder to operate here and more expensive. So I would have to sell fuel at a loss to be able to compete with some of this fuel that's coming in.

Now if that shipment that came in from the port had more places to go, instead of just having to be forced into the petroleum distribution complex, that fuel wouldn't be discounted so much. So it helps me be able to compete and spend more of my own money investing and making my plant more efficient and making my plant larger so that I can compete with those out-of-state and out-of-country programs.

Does that make sense?

MR. OLSON: Very good. Yes.

So I have one kind of final question. And I'd like to kind of explore this as a lightning round. So within like 30 seconds each, what are the top one or two things you're recommending to the State of California as an action related to this topic today?

Let's start with Aaron.

MR. ROBINSON: Sure. Thanks. I would

say what I'd love to see is a multiplier for aviation fuels, sustainable aviation fuels, such that it helps equalize the price gap with renewable diesel.

MR. OLSON: Very good.

How about you, Annie?

MS. PETSONK: I'd like to see California update the LCFS to take into account indirect emissions so that it's at least the level of environmental integrity that ICAO has developed and move beyond that.

And then I'd also like to see California send its demand for jet fuel in favor of sustainability.

MR. OLSON: Very good.

And Gene? Gene, what's your top one or two things you're recommending?

MR. GEBOLYS: Thirty seconds, huh? That's impossible.

The most important thing is you got to sustain the investment. You've got -- the house is half built. You have to sustain the investment. You have to stay in there over the long haul. And, if you do, you get the economic and environmental benefits that go with the first

mover position. If you don't you start to see a continuation of this everywhere-but-here kind of investment pattern.

I think it's absolutely critical that California stays the course on investment.

MR. OLSON: And I'm going to give the last comment to Jennifer.

What's your recommended action or actions?

MS. CASE: Well, unless you can eliminate CEQA for me, which I'm pretty sure you can't, I'm going to say -- a broken record here -- invest in dedicated renewable fuel terminals outside of the petroleum fuel terminals.

MR. OLSON: Very good. I think we've come to the close. I really appreciate your comments, these are real, lots of deep thought here across the board. And thank you very much for joining us today.

And I'd like to, then, return this back over to Heather and then, maybe, Commissioner Monahan for final comments.

MS. RAITT: Thanks Tim.

So, actually, we'll go ahead and move over to Michael Comiter for -- to help us with

some Q&A from attendees.

MR. COMITER: Hi. Thank you.

So we have two comments so far, one from Tanya, Tanya Kahn (phonetic).

"Could Aaron expand upon the connection between sustainable fuels and air quality? And is this analysis he mentioned published and available for participants to read?"

MR. ROBINSON: Yeah. Certainly. Tim, I'm not sure if I'm able to share my screen or not. Is that allowed? I see a button for it. Tim, I can't hear you.

MR. OLSON: Maybe Harrison can help us in that?

MR. ROBINSON: I will give it a shot. Oh, it's been disabled, but we might be able to reenable it. I'll try it again in a moment.

Yes, so that analysis is available. It's actually, there's been two kind of compilation studies published, as it were. The first was one that was actually part of the process of including jet fuel in the LCFS. And then the second was, essentially, a retread of, really, all the same content. But that was published by the Transportation Research Board at the federal

level. And that was looking at a number of studies conducted by various agencies, including the FFA, NASA, Air Force Research Laboratory.

I will, if I can't share the screen in a moment, I will type out a citation for it so people can take a look and find it on their own.

MR. OLSON: Yeah, Aaron. Aaron, you have authority to share your screen.

MR. ROBINSON: There it goes. So let me maximize this.

So, I mean, here's a look at it. On the left side you've got, of course, your greenhouse gas emissions that we're looking at. But then on the right side, really, are a number of other pollutants, as well, on the local air quality level, so you know, ranging from nearly 100 percent reduction to, you know, for NOx, kind of a ten percent level.

And what we've actually done is we've done, at United, we've done some preliminary look at the social value of this and we think it's in the range of anywhere from $0.10 to $0.40 a gallon, depending on how you quantify the health benefits connected.

And to also show the citation here, I'm

going to zoom in a bit. And then I'll also put it in the comment box, as well, the title of this Airport Cooperative Research Program Report, as well, so I'll paste this in the box.

MR. OLSON: Very good. Thank you.

MR. COMITER: Thank you for that.

And then next question is touching on some elements that were already discussed in some way before but it's a little bit more specific. And Gary -- this is from Gary Hughes -- Gary Hughes mentions,

> "There was a webinar earlier this year from an expert from Ocean Park that highlighted some of the risks of relying on palm oil and other vegetable oils for aviation fuels and was also critical about the limited prospects of SAF based on new feedstocks, like woody biomethane.
>
> "So one, how can the public be sure that palm oil and other vegetable feedstocks do not continue to be integrated into our global biofuel sector?

And then the second part of the question is,

> "How can the public be sure that the prospects for new biofuel technologies from

feedstocks, like woody biomass, are not being exaggerated by industry stakeholders?"

MR. GEBOLYS: I think Annie kind of spoke to this earlier. I can just say, her point made earlier about getting the rules right is spot on. She referenced that it took six years of development on the project regarding aviation fuel. You know, the economics are going to follow the incentives, and you've to get the incentives right, and it's not easy. And having said that -- and, you know, nobody has -- nobody's perfect. And CARB's not perfect and nobody else is perfect. But -- so there's an exercise in the closest thing we can get to perfect.

You know, CARB has done a better job of trying to quantify getting the incentives right all the way back to the origin of feedstocks than, virtually, anybody else in the world, and they're taking a leading position in doing that. But, again, even regulations, you got to do them and then you got to redo them, and then you got to redo them and you got to keep making them better and better. But the idea that you don't take any action because you might get it wrong

certainly isn't one that is going to lead the change we're looking to have.

MR. OLSON: Michael, Annie had her hand raised, maybe on this other question, too.

MS. PETSONK: Thanks. If I could just add to that?

Transparency is really important here. It's really important that the public have access to information about what fuels are being used, what feedstocks and how they're being used, and what the emissions consequences of them are. ICAO has certain transparency measures built into its system. And I just want to underscore that, in our view, that information should be publicly available.

That raises questions for airlines because one of the things that airlines jealously guard is how much fuel they're using. That's, commercially, very sensitive information.

But when the United States imposed a limit on sulfur dioxide emissions from large coal-fired power plants the electricity companies said, oh, we can't possibly publish the information on how much fossil fuel we're using. That's too commercially sensitive. Congress made

them do it and it has proven to a very important adjunct to the transparency of the system's limiting conventional pollutants from power plants. Transparency can be your friend and it needs to be implemented here.

With regard to the point about sustainable aviation fuels having lower emissions of some pollutants than conventional fuels, we think that's a very important aspect of sustainable aviation fuels. And one of the things that California can do is make sure that those benefits get realized.

When fossil fuel comes into the aircraft, it's got some gunk in it. It is -- there are, often, toxic compounds and other materials that help, actually, make the seals in the fuel lines of the aircraft tight. I'm oversimplifying here. But if you're going to put a very pure sustainable aviation fuel into the aircraft, thus far, ASTM has only certified those fuels up to a 50 percent blend because there's a risk that, at higher levels, some of those fuels could leak out from the way the seals are currently constructed in the aircraft.

Obviously, you don't want the fuels to

leak out. But the solution to that should not be to add more pollution, more polluting molecules to those sustainable aviation fuels in order to get them to be useable in the aircraft. Your solution should be to retrofit the aircraft, creating more jobs, and having both the benefits of lower carbon emissions and better air quality. And given California's particular air quality concerns around large airports and their proximity to disadvantaged communities, I would think that this would be a high-priority issue for both the California Energy Commission and CARB to take a look at.

MR. GEBOLYS: Tim, can I --

MR. OLSON: Gene, you have your hand raised.

MR. GEBOLYS: Yeah. I was looking for how I do that electronically, but you would think we would all know how to do that as this point, but I had to go old school and just raise my hand.

I wanted to follow up, if I might, just quickly on something that Jennifer was talking about earlier? And I think she kind of jokingly said, you know, unless you could do something

about CEQA, you know, she gave a different investment-based answer. And you know that answer has been kind of bouncing around in my head since she gave it.

Look, when we're doing our project, we're treated exactly like any oil refinery is in the permitting process and that's not easy. The fact is, we're doing something very different than what they're doing.

And so if I could just put an appendix on my earlier answer about what can the state be doing? You've to recognize, when Jen's trying to do what Jen's trying to do, or we're trying to do what we're trying to do, the state should appreciate that and make that permitting process different because the products are different, the roles of the facilities, and the overall social welfare of the state is different, and that ought to be recognized.

So I know it was a little off topic but I couldn't get Jen's answer out of my head.

MR. COMITER: All right. Thank you.

And with that, I'll turn it back over to Heather.

MS. RAITT: All right. Thank you,

Michael. Thank you, Tim. And thank you to all the panelists. That was really helpful.

And so now we'll just go on to move to the public comment period. And we have RoseMary Avalos from the Public Adviser here to help us.

And I'll just remind folks to go ahead and use the raise-hand function in Zoom to let us know that you'd like to make a comment. And if you're on the phone, use -- just press star nine and that will raise your hand virtually from the phone.

So go ahead, RoseMary.

MS. AVALOS: Thank you, Heather.

I will first call on attendees using the raise-hand feature on Zoom. And please state your name and affiliation and spell your first and last name. And, also, do not use the speaker phone feature because we may not be able to hear you clearly.

Robert -- Rob McGinnis, your line is open.

MR. MCGINNIS: Hi. This is Rob McGinnis. My affiliation is I'm the Founder and CEO of Prometheus Fuels. And my name is spelled R-O-B M-C-G-I-N-N-I-S. And I want to say thank you for

the opportunity to speak.

The thing I wanted to comment on is direct air capture-based fuels. So I think it was mentioned briefly but, for the most part, not really discussed. And this is the technology where you use direct air capture of carbon dioxide from the air. And you use solar and wind power to convert that into renewable gasoline and jet fuel that have a carbon intensity of zero.

And so this is something that we've been working on at Prometheus Fuels. And I think the key to this is being able to do it on a price which is competitive with fossil fuels because, although we want to electrify transportation, we might want to move to alternative fuels, like hydrogen, those things are going to take a while. But if you can make a renewable gasoline and jet fuel that can drop in directly without any modifications to existing infrastructure, and you can do that in a price competitive way, you can do that faster than, really, almost any other solution to decarbonization of transportation. And this is our thesis and this is what we're working on.

And so our intention is to actually offer

gasoline next year, this time next year, retail. Our target price is $3.50 per gallon for, you know, carbon intensity zero fuels made this way, and then to introduce jet fuel the following year. We're not announcing that price yet but, once again, intended to be price competitive.

A couple of comments on this approach generally that also apply, obviously, to our approach is that there are no feedstocks for this in terms of like a bio feedstock or a waste feedstock or some sort of industrial feedstock. This is just carbon dioxide from the atmosphere. And it uses only electricity, right, from solar and wind, for example, and so there is no need to use fossil fuels in its production. And it can be distributed. And the systems we're designing are designed to be intermittent and demand responsive so they can operate when the sun is shining and when the wind is blowing.

And this combination of features allows us to roll out pretty quickly. So if we were to take, say, a Gigafactory approach, we think it's possible to replace a substantial portion of the fuels in California in a five-year time frame.

And a little bit of time left, and I know

there's no opportunity for questions, but I was invited to write a paper on the subject of -- which I wrote for Joule, published by Cell Press. And that was the cover issue in March of this year. And that's available on our website at PrometheusFuels.com. And in the article I talk about why we think that it's now possible to compete with fossil fuels on price, what's happened, what's changed, and what's going forward.

And I think it's also important to say that, although we plan on benefitting from LCFS credits, we think that we're going to be able to compete without them in a three- to five-year time frame. And so there should be no restrictions on our ability to grow in California and without.

Thank you for your time.

MS. AVALOS: Thank you, Mr. McGinnis.

I want to give a reminder to those on the phone to dial star nine to raise your hand. And are there any other comments?

Okay, seeing there are no raised hands, this concludes comments.

And I'll turn to you, Commissioner

Monahan.

COMMISSIONER MONAHAN: Great. Well, I want to thank everyone for participating, especially our panelists and speakers. It's been, really, a fascinating set of workshops today.

So we have our next workshop that's going to be August 4th and 6th on electric vehicle charging infrastructure, plugin-electric vehicle charging infrastructure, I should say, so we welcome you all to come back the beginning of August for our next set of workshops.

So thanks everybody. Have a good evening.

(The workshop concluded at 4:14 p.m.)

CERTIFICATE OF REPORTER

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

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

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

MARTHA L. NELSON, CERT**367

CERTIFICATE OF TRANSCRIBER

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 transcribed by me, a certified transcriber and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

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I certify that the foregoing is a correct transcript, to the best of my ability, from the electronic sound recording of the proceedings in the above-entitled matter.

MARTHA L. NELSON, CERT**367

September 29, 2020