STATE OF CALIFORNIA – THE RESOURCES AGENCY
BEFORE THE
CALIFORNIA ENERGY COMMISSION (CEC)

In the matter of,)
) Docket No. 12-HYD-1
Public Workshop)
_____)

Public Workshop Regarding
Approaches for Selecting Locations for the
Hydrogen Infrastructure Network

California Energy Commission
1516 Ninth Street
First Floor, Hearing Room A
Sacramento, California

Friday, June 29, 2012
9:13 a.m.

Reported by:
Kent Odell

STAFF

Jim McKinney
Jean Baronas
Tobias Muench
Amanda Stein

Also Present (* Via WebEx)

Presenters

Robert Boyd, Boyd Hydrogen, LLC
*Paul Staples, HyGen
Garrett Poppe, Hydrogen Frontier
Steve Eckhardt, Linde Group, North America
Norman Ingram, California Department of Food and Agriculture, Division of Measurement Standards
Gerhard Achtelik, Air Resources Board
Christina Zhang-Tillman, Air Resources Board
Dr. Joan Ogden, University of California, Davis
Dr. Tim Brown, University of California, Irvine
*Sharalyn Savin, Plug Power
*Jim Petrecky, Plug Power

Public Comment

Dr. Matt Miyasato, South Coast AQMD
Ron Nies, California Food and Agriculture, Division of Measurement Standards
Larry Watkins, AQMD
Jared Farnsworth, Toyota
*Ed Kiezek, Air Products
Jon Sheers, Center for Energy Efficiency and Real Technology
*Steve Ellis, American Honda
Bill Elrick, California Fuel Cell Partnership
*Peter Ehlers, CSA Group
*Alex Keros, General Motors
*Matt Forrest, Mercedes Benz
*Ghassan Sleiman Hydrogenics USA
*Brandon Jones, Central Coast Clean Cities Coalition
*James Carmichael, Naval Facilities
*James Provenzano, Clean Air Now
*Charles Powars, St. Croix Research
Aaron Harris, Sandia National Labs

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P R O C E E D I N G S

JUNE 29, 2012 9:13 A.M.

MS. BARONAS: Good morning, everyone. Hi, my name is Jean Baronas. I work with the Emerging Fuels and Technology Office at the Fuels and Transportation Division of the California Energy Commission. I'd like to convene the June 29th Hydrogen Workshop.

Thank you all for attending. And I just want to thank everyone who sent in presentation materials, quite comprehensive, quite interesting. They are a part of the public record today.

The next slide, please. Here's our agenda for the day. Planning on welcome and introduction by Jim McKinney, a summary of the workshop, which I will intersperse during the day, and I will also have some opening comments on the June 22nd workshop.

The presentations from the June 22nd workshop are in the public domain and thank you for those.

We'll talk about station performance and technical requirements, followed by lunch.

And, hopefully, I'll take a read on who would like a break in the morning. We can continue right through, have a break, it's all up to you, it's your day.

Other possible elements of a potential future

hydrogen solicitation will also be discussed.

And we'll have a comment period, followed by wrap-up, conclusion and next steps.

We did receive the many presentations, as I commented, and so with your indulgence I'm planning to hold those presentations in A to Z order by organization name.

Is that okay?

Hearing no objections, that's our protocol for the day.

So at this time I'd like to introduce Jim McKinney, Office Manager of the Emerging Fuels and Technology Office.

MR. MC KINNEY: Good morning, everybody and thank you, Jean.

As Jean said, Jean did a great job of moderating our session last week, so she will again be our moderator this week.

Again, Jim McKinney, Manager of the Emerging Fuels and Technologies Office.

I just wanted to say a few kind of comments and observations. First of all just thank you so much to everybody who participated last week, we just found your input invaluable. We've shared that internally, with our Deputy Director, and Commissioner Carla Peterman,

she's very interested in how many people are attending and what the input is. So, we greatly appreciate that.

We know we're asking a lot of you. This is the second of what will be three workshops that we have as we prepare to revise and release our, you know, $30 million solicitation for hydrogen fueling infrastructure here, in California.

Turn the page down here. Can you do that for me?

MS. BARONAS: Are you looking for summary slides?

MR. MC KINNEY: Yes, the one that had our funding summary up there.

MS. BARONAS: Sorry, I don't know that.

MR. MC KINNEY: Did that one get loaded, the slide I sent you guys last night?

Okay, we're good. We're good.

Through the -- okay, so through the end of fiscal year '12-'13, which will start next week, we will have invested a total of $55 million in hydrogen fueling infrastructure, modeling support from the UCI, street team. That also includes our investment with the Department of Weights and Measures, at CDFA, to develop retail standards for fueling.

We have $3 million in the Emeryville AC Transit

bus station.

And just recently a demonstration fuel cell bus project, also connected with the San Francisco Station.

I think there's been a little bit of question, you know, is the State of California still committed to hydrogen given the incident at Emeryville, and given the San Francisco Airport Commission to not continue with a hydrogen fueling station on its property.

The State of California is committed to this. The Energy Commission is equally committed to this. And as I said last time, we are now in a leadership role in the amount of money we have to disburse to those companies that can build the best possible hydrogen fueling stations throughout the clusters in Southern California and Northern California.

One more observation, I think, in regards to the incident at Emeryville, Sandia National Lab is doing the failure analyses and that report is forthcoming. We will ensure that if there are any measures, standards or recommendations from that report, that are appropriate for our next solicitation that we will incorporate those measures into our next hydrogen fueling solicitation.

Most of what we want to do today, as we did last week, and as I think we'll do July 10, at Diamond Bar, at the South Coast AQMD headquarters is listen and have

an active dialogue with you.

So again, we're doing a lot of listening, we're doing a lot of conferring internally, and we'll continue that. I think after July 10 we'll start to dig in and develop some formulations for what the next solicitation will look like.

But for now, again, we're going to listen, we'll ask questions.

Toby is very strong on station performance measures, so he'll be joining the dialogue today.

The main topics today, I think as you all understand, so station performance and we had a lot of good discussion on that last week, renewable hydrogen, and then some other elements around eligibility, market diversity that go into identifying the best possible applications for a hydrogen fueling station.

So, that's pretty much what I wanted to say. So again, thank you for coming, for your participation, we look forward to another full day of active dialogue with all of you.

So, I'll turn it back to Jean.

MS. BARONAS: Okay, thank you for that, Jim McKinney.

So, moving on to the Power Point that's projected, in summary the June 22nd workshop had a very

large number of participants, in my personal opinion. We had approximately 30 people in person and 40 by WebEx.

There were five government agencies in attendance and they are listed, California Air Resources Board, South Coast Air Quality Management District, Bay Area Quality Management District, U.S. Department of Energy, and the California Drug, Food and Agriculture Department of Measurement Standards.

Did I get it right? I didn't.

So, what is it, please?

MR. NIES: California Department of Food and Agriculture, Division of Measurement Standards.

MS. BARONAS: Wonderful, thank you for that.

And then we had two academic institutions present, UC Irvine and UC Davis. And I'm happy to see both representatives here today, thank you very much for coming in.

Three other organizations, the California Fuel Cell Partnership, CEERT, Energy Independence Now.

Five auto makers, Daimler Benz, Daimler Mercedes Benz, correction, General Motors, Honda, Nissan, Toyota.

Seven station developers and technology providers, Air Products, Hydrogen Frontier, Hydrogenics, HyGen Industries, Linde, Nuvera, Power Tec and PhyChip.

And as I mentioned earlier, the presentations are available online.

So, what did we talk about? Here's some very brief remarks from the moderator. We heard you on June 22nd. We heard you say there's no need to start from scratch, to leverage existing processes and knowledge in developing the next solicitation.

We perceive that vehicles cannot be deployed without sufficient stations in the right locations.

We all talked about limited public funds, how precious every dollar is.

We talked about finding deadlines, coverage, accelerated vehicle deployments and network reliability and these all require careful planning.

A general comment was made along this line, "build it and they will come will not be viable."

Station coverage must be adequate until hydrogen infrastructure can be self-sustaining, and this includes the design for redundancy. There was quite a bit of discussion on redundancy, what it means mathematically, what it means to the market, what it means to the consumer.

And then we focused on expanding overall fueling capacity.

What makes a good location? This was bandied

about. It was quite lively, I felt. I'm not sure how you did, you felt about that, those of you who were here.

But we talked about how a good location could be potentially located within early adopter clusters and there was a lot of discussion around this concept. It remains an open question, I think.

We talked about a good location being supportive of nearby stations, but not duplication of a station.

And one, a pretty salient point I remember from the meeting was that we want to provide enough funding opportunity so the customer finds the network appealing.

So, that concludes my remarks on a general summary of the June 22nd workshop.

And so let's swing into the station performance and technical requirements. This is 01, slide 01.

And so, workshop objectives, I'm going to talk about these all day, summarize the input from June 22nd. Please chime in as the day proceeds and comment back if something comes to mind that gives us a perspective today, in terms of what we discussed on June 22nd.

Another objective is to present possible eligibility and criteria requirements for the development of the next hydrogen infrastructure solicitation.

And then, finally, to receive feedback and suggestions on these topics.

Here is potential minimum performance requirements, as a slide, and here are three generalized bullets. Yes, I see three.

And so these are items that were discussed, they've been discussed, they've been around. Minimum nominal capacity per station over a 12-hour period, this is a potential minimum performance requirement.

Minimum 20-kilogram-per-hour peak fueling capacity, including back to back, that's a potential minimum performance requirement of a future hydrogen solicitation.

Both 350-BAR and 750-BAR dispensed -- thank you, correction. Both 350-BAR and 700-BAR dispensing pressures. Thank you, Toby. These are other potential minimum requirements.

And so, if you keep these as possible requirements in the back of your mind, let's then hear presentations from interested parties, who sent in materials.

And as stated earlier, we're going to take these presentations A to Z, starting out with Boyd.

And so let me make a general comment from the moderator, that the presentations are quite

comprehensive. Thank you so much for all the work you did in sending in these materials. Quite comprehensive, many discuss items other than minimum performance requirements, they cross the board.

But the point is to set the state for today and to get everyone to think about what's possible, what's really possible for the next solicitation.

So, kindly pull up the Boyd presentation.

MR. MC KINNEY: And Jean, before we get to that, I would like to add something to these points that we had up here on some of the minimum technical standards.

So one of the other, I think, good points of discussion last week was what does the network look like? And it will be, at some point in time, a combination of what we call the high volume, you know, central cluster stations, high through-put, high capacity.

We're going to have connector stations and those might be, you know, intra, regional intra, within a metro area.

And then we're going to have destination stations.

So, clearly, those are stations with different sizings, different performance standards, different capacities and different costs.

One of the things that we would like to hear from all you today is, you know, are we ready at this point in time to go beyond kind of the high volume central station concept as we come up to -- you know, the 15 to 20 stations we'll get out of this $29 million will put us around 40, you know, give or take some, 40 stations statewide. That's a good number and that's getting close to the magic, the first kind of magic number milestone, 45, as articulated by the Fuel Cell Partnership.

And so, again, we'd like to hear your observations, suggestions, recommendations on how we think about these minimum standards for these three different classes of stations.

MS. BARONAS: Thank you for that, Jim.

So, we have five presentations and so kindly limit your remarks to ten minutes or less. And as the moderator, I will remind you of the three minute out, so to speak. I'm sorry for the interruption in the advance.

The first presenter, Robert Boyd, of Boyd Hydrogen, LLC.

MR. BOYD: Good morning. Can you hear me? Thanks.

You can go to the next slide. Oh, I don't

see -- just a little background on myself and I've been involved in hydrogen fueling since about 2002, and worked for BOC and Linde for a number of years, and developed the -- one of the first stations in North America, up in British Columbia, that was able to do buses, as well as cars.

And I've been active in codes and standards development for a long time in regards to hydrogen vehicle fueling, both at SAE and Compressed Gas Association, CSA, worked on fire codes and MFPA documents.

Next slide, please. So, I put together what I thought were some of the top priorities for where we are right now. And there's -- not all of the slide is on the screen, I'm not sure -- okay, thank you.

And what we see right now is we need the stations to be built and installed. A lot of the stations, as you know, have been -- gotten funding and haven't been built.

And so one of the priorities, I think right now, is to try to identify people that actually can build stations and put them in.

Stations must be publicly accessible, so we're talking about public sale of hydrogen, limited or easy user agreements. We've had a lot of problems with -- we

hear of a lot of problems with user agreements, liability, and so being able to sell hydrogen as a fuel is important.

And then we need to be able to dispense H70, or 70 megapascal, or 700 BAR hydrogen with reasonable speed, roughly in the one- to two-kilogram per minute range, so that the consumer has a pleasurable experience.

And, yes, we need lots of stations and lots of options, and places to fuel.

The next slide, please. I tried to put together a little bit of what I saw in terms of large stations, small stations, medium stations.

With a small station, you know, might be able to do five to ten cars per day, 25 to 50 kilograms per day. And I threw some rough numbers in there just to show, you know, $37,000 to $140,000 a year looks like revenue that you might get from the dispenser, if you're selling at $10 a kilogram. But that looks like a lot of money, but it's not a lot of money.

When, of course, you get to a large station that could do 150 to 600 kilograms a day, then this starts to look a little bit more sustainable. And so for large corporations you'll see this is sort of the sweet spot in terms of what a dispenser could do.

We get a little bit further into the performance, but what I think you'll see is that the maximum one dispenser could do is about 60 kilograms an hour. And if you think, well, maybe we'll be running five hours a day, maybe two or three in the morning, two or three at night, and one at noon, you know, five hours times 60 is a reasonable number that you might expect from a dispenser.

Next slide, please. Oh, so for fueling performance, and this is my opinion, I know Honda is still deploying cars at 350 BAR. I should say H35, I'm sorry..

But 700 BAR service is purely what we need, I think. Most of the OEMs have all standardized on 700 BAR systems.

The dispenser must be able to do what we call back-to-back fills. And that will require some flexibility on fueling time. In some cases the first fill, if the station hasn't been used, the first fill might be a little bit warm and so it might be a little bit slow while the dispenser cools down.

And then if you're doing two, three, four fills sequentially, you might over-tax the station's cooling capacity and you might also find the hydrogen warming up a little bit. So, some flexibility.

Now, we're developing some more flexible standard in SAE 2601. However, all of these fueling protocols are designed to be certified by what we call CSA HGV-4.3. CSA has been tasked to develop a metric, a way of measuring the performance of a dispenser. And in the development of 4.3 we've allowed for some flexibility in measuring the performance so that we can certify a dispenser -- or CSA could certify a dispenser that it would meet 2601.

And 2601, some of the requirements in 2601 are in the process of being more closely identified as either limits or guidelines. And so guidelines would be something you could perhaps break. You could go a little bit slower on a warm day and that would be okay, and not a safety problem.

So, being able to certify stations to 4.3 is the way to validate compliance with the performance requirements of 2601.

The next slide, please.

MS. BARONAS: Pardon me, three minutes.

MR. BOYD: Thank you. The next slide, please.

So, what does the Energy Commission need to put into the requirements? Well, in order to get retail sales first off, again -- actually, these are in three different -- first off you've got fuel quality. And so

we have a good standard, 2719, and there's an infrastructure set up to be able to test dispensers. And so, fuel quality we're pretty good on in terms of defining our standards.

Meter accuracy, there's work being done at DMS and NIST to define the test methods that would validate dispenser accuracy. And the DMS folks are moving forward and actually getting close, have permitted the first station. And so, we're making some progress on that and that's good.

And then the third thing is the dispenser performance in terms of safety and fuel speed.

Next.

MS. BARONAS: Conclusion, please.

MR. BOYD: Yes. Or one, quickly, here, permitting challenges. I can't leave this one go. We've got a lot of fire code issues and problems, and you have to recognize that when you go -- someone goes to permit a station, the fire code doesn't permit hydrogen fueling stations the way we want to.

We've got some targets to have good code by 2015, but until now, up until 2016 you're going to have to reach out to the local AHJ. And that needs to be part of every project and it's less success criteria. If you don't reach out to the AHJ early, you're going to

have problems.

Next slide really quickly and then the conclusion. Renewable hydrogen, I'll let you -- this one here --

MS. BARONAS: We have an extension series of presentations on the topic today.

MR. BOYD: Okay, yeah. I would just submit one comment. I feel like it's unfair to burden hydrogen with a renewable element when you don't have that for CNG, or electricity, or any other alternative.

I know it's a little -- next slide and let's go. Thank you for your time.

MS. BARONAS: Thank you for concluding your remarks. Thank you.

And so I am not certain, is Plug Power on WebEx? Are the WebEx participants self-muted at this point because we have you wide open, we are not muting you.

Okay, so --

MR. STAPLES: Hello.

MS. BARONAS: Hi. Are you with Plug Power?

MR. STAPLES: No, no, I'm sorry. I just walked in the room, my apologies.

MS. BARONAS: Thank you. Is a Plug Power representative on the phone?

Okay, I'm thinking that I'm going to move Plug

Power to the section in the afternoon on bus and non-road projects. Any opposition to that idea?

Thank you. Hearing none, this is what we will plan for. Hopefully, the representative will be there.

Thank you, Mr. Boyd, appreciate your presentation.

And now we're moving on to HyGen. A to Z order here, HyGen.

MR. STAPLES: Yes, I'm here, thank you. My name is Paul Staples, I'm the Chairman and CEO of HyGen Industries.

We've developed the very first, a world first commercially permitted solar hydrogen generating facility, fueling station and vehicle fleet, our team did, in El Segundo in 1994.

We've also developed hydrogen, also developed the Santa Monica program and project which led to about five city programs in Southern California and Los Angeles.

I have to, first of all, comment don't burden, burden the small user with renewable. I don't get that at all. It's not a burden, it's what we should be doing for every one of them, okay. So, there is no burden for the small producer. Okay, the cost, have you taken a look at the cost of the current systems going in by both

delivered hydrogen and on-site generation from our fossil fuels and it's just as expensive as renewables. So, just a quick comment.

The next slide, please. Now, the objective of this presentation is to review the -- part of it is to review what happened on the 22nd and some of the recommendations made. Okay, I'll quickly go through that.

Again, it isn't rocket science. A, as far as locating stations, anyone who owns a vehicle or lives in an area in a main cluster area for a couple of years or more knows where the locations need to be. It's not proprietary, confidential data to locate, no need for that.

Don't over-analyze. Everyone knows where they're supposed to be. They're supposed to be in high-traffic areas in affluent neighborhoods, and along our freeways, so let's just do it, okay, because over-analyzing, it's not that complicated to figure out. There are plenty of consultants out there that could tell you the same thing. So, that's basically it.

And a preference, if a preference is needed, for instance if you have to stations within a couple of miles of each other and you have to choose one, you choose the cleanest one, first of all, the most

sustainable one. After that it's the best location.

And like I said, if it is a couple miles away, there's no reason you can't fund both of them, redundancy is a good thing.

Now, how would be -- what I advise the Energy Commission is the optimal -- choose the optimal locations? Well, like I said, if you need a consultant, there are plenty of them out there that work with them. I'm working with one right now. I'm not going to tell who because I don't want you stealing him away from me.

And they provide excellent data for locating, siting, building and supplying these stations, gas stations. And those are the ones, just check the Yellow Pages.

The next slide, please. Yeah, how would we advise the Energy Commission to choose the optimal, best locations for these fueling stations?

First of all don't change out what's laid in the RFP right now. At least three months before the RFP is released and never after the release because you can't be pulling the line back every time and completely throwing out months, possibly years of work from many, many people who have been seeking and recruiting locations based on what was listed and what they were told in the RFP. You don't get to do that and that

happens.

Approaches for selecting locations in the hydrogen fueling stations for California's infrastructure and network strategy? First, identify preferred areas in the RFP, which you've already done, and go outside and so who's the dog in the fight. No oil companies, no auto manufacturers, nobody with a conflict of interest should be reviewing proposals before they're submitted. Okay. It's just simply unacceptable.

You cannot be doing that sort of thing and having people with a conflict of interest getting in there, and choosing, and picking winners and losers. So that's one thing, first of all.

And some of the other, prior things that we made recommendations was is to form a TAC committee, a technical advisory committee with members of the Sustainable Hydrogen Workgroup at the California Air Resources Board, and one of the members of the CEC Project and Program Management staff, or an outside consulting firm with no conflict of interest, possible candidate. SAIC, they perform the same services for the MSRC down in Los Angeles, at the AQMD.

Auto makers can provide, should be able to provide advice on locations and technical specs, but no

direct view of applicant's information. It's not right to be sharing it with an outside entity who doesn't -- who is not providing the funding. They want to be able to review and approve locations, let them put their own money up and run their own RFP, and they can do whatever they please.

TAC review selection -- I've never heard of a situation where someone who was a partner with an industrial gas company, and other people, okay, who are applicants get to review locations of government funding. It doesn't make any sense.

So, review selections from technical consultants, and auto makers, and location preferences are indicated in the RFP, you vote to approve it and submit it to the overseeing authority, and then it's either all up or all down. You don't get to -- and you start over. You don't get to cherry pick what members on the committee or on the board may want or may not want, okay. It's very crucial for that.

This is important for bringing credibility to this process, otherwise nobody's going to believe it and you're not going to get anybody else to participate, and waste their time doing all the work just to know at the end they don't stand a chance.

MS. BARONAS: Excuse me, Mr. Staples, this is

Jean, the moderator.

MR. STAPLES: Yes. Okay, is it getting long?

MS. BARONAS: What?

MR. STAPLES: I'm sorry, is it getting long?

MS. BARONAS: No, it's not getting long, I just want to build on what you said. Our notes clearly document quite a bit of what you said already, especially about the technical advisory committee, and it was brought up by quite a few people. And the staff's notes cover that.

But what I want to do is direct your attention and shift your focus to some new materials that you submitted, because I've reviewed your presentation you're on now, but I'd like you to shift over to, for example --

MR. STAPLES: Okay.

MS. BARONAS: I mean I really would like -- personally, I would like to hear number four, discussing the market diversity. This is new, compared to what you presented last week.

MR. STAPLES: Okay.

MS. BARONAS: And then to make it even --

MR. STAPLES: Go back one more slide. Go back one more slide, okay.

All right, here's where we get into the other

aspects of it. First of all, technical requirements are for the hydrogen fueling dispensers, just like a lot of what we were talking about. I think we really need to limit or, you know, completely eliminate the 700 BAR requirement. It really is an over-burden for the infrastructure. The cost, it doubles the cost of everything. I mean and it really isn't difficult.

I've done this, so people cannot sit down, talk to me and tell me I don't know what I'm talking about because you can build it into the vehicle. Honda's doing it. There's no reason why any -- all these other guys have to have 700 BAR. You're adding, nearly doubling the cost of the infrastructure by requiring it.

And everybody says the same thing, 700 BAR is not necessary. You can get to 250, 300, even 400 miles at a 350, okay.

MS. BARONAS: Okay, thank you, sir, for --

MR. STAPLES: So, it's really adding to the cost, okay.

MS. BARONAS: Thank you for that, Mr. Staples. So, you've reached the three-minute mark, so kindly conclude within three minutes.

MR. STAPLES: Three minutes.

MS. BARONAS: Thank you.

MR. STAPLES: Three minutes?

MS. BARONAS: Yes, sir.

MR. STAPLES: I thought we had ten minutes.

MS. BARONAS: Yes, each presenter has ten minutes. You started your presentation, in fact, at 9:35.

MR. STAPLES: Oh, okay, I'm sorry. All right. Well, thank you very much. If there are any questions, feel free to ask.

MS. BARONAS: Okay, this is Jean Baronas from the California Energy Commission. Your presentation will be entered into the public record, Mr. Staples, no question.

But I do want to clarify one of your points, under Item 5, where you discuss the Public Adviser's Office. I just want to clarify, for the record, that the Public Adviser acts as a liaison to help the public, to help them understand California Energy Commission's policies and procedures. And that the Public Adviser, at this time, is not involved in solicitation development processes.

MR. STAPLES: Oh, I agree. I understand. But when they bring up an issue --

MS. BARONAS: For the record. Thank you.

MR. STAPLES: I understand.

MS. BARONAS: Thank you, Mr. Staples, for your

input today.

Moving on to the next presenter -- yes, please, Matt.

DR. MIYASATO: Hi, this is Matt Miyasato, South Coast AQMD. I just want to make a clarifying comment, at the beginning of the presentation Mr. Staples indicated that HyGen was involved with the Santa Monica hydrogen fueling station which led to the five cities project that was done by the AQMD and that's just not the case.

That station was awarded by the AQMD to Air Products and has been run by each of the different cities.

MS. BARONAS: May I --

MR. STAPLES: That is true, but we developed the project. We developed the program with the City of Santa Monica. I'm on the menu as far as the header as having done so. There's no two questions about it, okay, that was the case.

My proposal to -- unsolicited proposal to the AQMD was then taken by you and turned into an RFP, which led for the whole program.

I lobbied hard for the program and everything so, please, don't sit there and say that I don't know what I'm talking about or that I'm lying, because I'm

not. It's a fact.

MS. BARONAS: Thank you, Mr. Staples, for that. Both of your comments are now entered into the public record. Thank you very much Dr. Miyasato and, also, Mr. Staples.

Moving on in the agenda, we have a presentation from Hydrogen Frontier. Again, this is A to Z order. And so today we have Garrett Poppe.

MR. POPPE: Hello, my name is Garrett Poppe, I work for Hydrogen Frontier. My job is mostly I take existing technology and make it work a little bit better.

You can move to the next slide. Now, just to summarize what Dan went over at the last meeting is there's a few ideas we have. You want to -- in the future you want to anticipate demand, so how you can do that is with a scalable station.

We can consider centralized generation to augment low-volume stations and we can build twice as many low-volume stations that are scalable up to a high-volume station until we know what the actual market demand becomes.

And this might be more efficient in creating a larger network of stations.

Now, accessibility, he went over that a little

bit. Mutual cost agreements with station owners, that's a difficulty.

Just to comment on what Bob Boyd said, too, earlier, is that he said that the renewable part of energy is kind of a burden. And it is a little bit in the beginning, but we can always move to that in the future until we get a network in place.

Can you move to the next slide, please? All right, there's some optimal technical requirements for hydrogen fueling dispensers.

The duration of fill, a customer wants a short fill time. This is something important, the 700 BAR, that 350 BAR does not have.

Faster fills, they require specialized equipment, chillers, other things such as that. At the moment there seems to be multiple standards for COM, non-COM, cars are using 700 and 350, and everybody's going off of VJ2601 fill tables.

One question that has been brought up is this going to be proprietary, VJ2601? I've heard rumors that it's going to be proprietary.

MS. BARONAS: Are you talking about the SAE standard? So, by definition an ANSI accredited group, like SAE, is totally an open process. Does anyone know any differently on that.

MR. KIEZEK: Yeah, this is Ed Kiezek of Air Products. I think if you read through SAE J26 on you will see that there are citings for four air products patents that apply to that standard and it's well publicized.

MS. BARONAS: Thank you for that.

MR. POPPE: So, if we all have to abide by a standard that's patented, what comes with that sort of thing?

MS. BARONAS: So, in an ANCII accredited process patents are possible. However, they go along with what's called reasonably and non-discriminatory terms, RAN processing. So, it would -- the technology is then in the public.

Does anyone know any different in the SAE case? There you go.

MR. KIEZEK: Well, this is Ed Kiezek again. Just so everybody's clear, we stated categorically that we would make available license terms that are reasonable and customary for those patents so that anyone who chose to can practice J2601, if they such require those patents to do so.

MR. MC KINNEY: Great, thanks Ed. Jim McKinney here, Energy Commission, I'd like to flag this for a point of discussion as we get into the roundtable and

Q&E.

MR. POPPE: Okay, can you move to the next slide, please? Now, ease of use is going to be very important at the dispenser, the customer must know how to fill a vehicle. I've seen customers come in there and they don't know what's going, or it's different at some stations. So, I think the dispenser sequence must be the same for every station so that a customer can go to any station and know exactly how to use the dispenser.

Displays sometimes have a problem being in the light so maybe we can come to a system where there's buttons, or something, some sequence that you wouldn't have to actually enter PIN numbers in a display, and sometimes that gets a little confusing for people.

The next slide, please. Safety, now the dispenser must be foolproof. Customers will make mistakes, especially with filling with gas, so they must be a redundant system that can't possibly be broken.

We need to increase the safety for non-com fills. I notice that there's not really anything in place if you go -- if you have two dispensers, a 350 BAR and a 700, that if you go -- somebody could fill at the 350 BAR, non-chilled, and then go to the 700 BAR and fill chilled, and the tank could overheat if it's a non-

com 700 BAR. So, we have to have other -- all com for a 700 BAR or all com for a 350 BAR, or something has to be done about that.

I agree with some other presenters, station and dispensers must be certified under a uniform standard, so there must be some kind of committee that can come by and say the station's certified for the safety of all stations.

Next slide, please?

MS. BARONAS: Please conclude in three minutes.

MR. POPPE: Okay. Point of sale, stations will need a method to charge per fill. It's the only way that I think that we can really make profit and make it down to the customer. It must match current charging methods, which I think is very possible.

Back-to-back fills, I think this is something that can be done unlimited. You know, there's technology out there, you can compress directly to the car. I don't see why any customer would have to wait for a fill.

The next slide, please. Now, if we use a scalable design, like I said, we can construct more stations, they'd be cheaper to produce. And 100 kilograms a day seems to be what your goal is, but that would require on-site generation for the most part and

that almost doubles the cost of a station. So if you can take that part out of it, you can build maybe twice as many stations, especially initially. And then when consumer demand grows you can figure out where to focus on maybe adding generation to the station. As long as you've got the right footprint and the site's picked out properly.

Future funding can go towards increasing capacity, while current funding can increase the number of stations.

The next slide, please. Now, there's a question about funding options for assistance in application development. I've got a few ideas, you can design a submission for a prototype and that can get approved for development, just the same way as a bid would.

You can hold a large-prize competition like, you know, X prize or something.

Or you can do milestone funding. You create a series of milestones for the technology you're developing and each time you reach that milestone you can get paid.

The next slide, please. What we need to do is increase priority for destination stations and stations that connect cluster stations because I notice that the people we have now, they don't want to just drive around

town, they want to go someplace.

Let's consider achievements of previous awards, you know, companies that can't build stations on time, or on budget, shouldn't be awarded the next time around.

Let's set specific objectives now and let consumers dictate future objections.

And that's the end of my slides.

MS. BARONAS: Garrett, thank you for staying on time.

Moving on, the next presenter, in A to Z order, is Linde.

MR. ECKHARDT: I'll just wait until they --

MS. BARONAS: Okay, Steve, that's great. Thank you.

MR. ECKHARDT: Okay, you can move on a couple of slides, I believe.

MS. BARONAS: Kindly introduce yourself for the record. We do know who you are, but for the public record, thank you.

MR. ECKHARDT: Hi, my name is Steve Eckhardt, I'm a Program Manager for Hydrogen Fueling, for Linde North America

The first slide is just the summary of Linde Group, which I went through last week, so we can skip on to the next slide.

With respect to cluster station technical performance, to the extent that we provide customers with a fueling experience that matches or is very close to the conventional fueling experience we will succeed in using the infrastructure to drive fuel cell vehicle sales, and reduce emissions in California.

This, combined with cost effectiveness, should be the guiding principles for determining minimal technical requirements. So, it's meeting consumer needs, as well as cost effectiveness.

The SAE fueling protocol should be a minimum for any car fueling to ensure consumers don't face inexcusable wait times or see their wait time compounded when they arrive at the pump and somebody is already fueling.

Fueling capacity should be based on peak fueling hours, which is about 12 hours per day. Obviously, people don't typically fuel at midnight or 3:00 a.m., so we should not use a full 24 hours to calculate a daily capacity.

In addition, this will ensure all stations meet a robust, minimum standard to fuel cars in a reasonable fashion during the peak fueling hours.

With cluster stations the OEMs desire even greater performance than shown above. However, to be

cost effective, these enhanced performance requirements may not be appropriate on every station.

Increased performance should not be punished, but encouraged by the CEC through a funding bonus to ensure some stations include these. And I'll talk more about this in the next few slides.

Higher through-put is not about hoping for more cars, but putting in the assets so that a station can meet consumer demand in the second year of operation. Not in the fifth year or the eighth year, in the second year.

With nearly 10,000 cars on the road in 2015, stations must have the capability to fuel four to five cars per hour over an extended period. On many days this is what's going to happen.

I talked about the SAE specification, which is what we recommend as a minimum standard. However, if it is not, it should be incentivized.

Finally, a dispenser that can fuel two cars at the same time has been requested by the OEMs. And while we don't believe it should be a minimum requirement, it should be encouraged through incentives.

The next slide. So, why is a 300-kilogram or so station needed? This is an example of the Bay Area cluster at the end of 2015, when 2,000 vehicles are

expected to be on the road, supported by 68 fueling stations throughout the State.

If you look in the upper left-hand corner, this is the rough split of stations in the California Fuel Cell Partnership roadmap.

The daily through-put of stations and the clusters will be substantially higher than that for connector stations, or destination stations, which leads to an average cluster station capacity of approximately 170 kilograms a day in the Bay Area, for this example.

Each station will not have the same through-put and I propose that the through-put of stations may look somewhat like a Bell curve, with some stations dispensing very low quantities, or maybe 25 kilograms a day, which is on the bottom left part of that graph, or as high as 320 kilograms a day which is the point all the way to the right on that, which you can't see.

We believe these larger stations, or at least some of them, need to be funded now. Larger through-put stations are usually the best located stations and these well-located sits are likely to be the ones selected earliest in the CEC's solicitation process, as in this year.

Larger through-put stations are the ones better known to consumers and these are the ones likely to have

been operating for longer.

In addition, the longer a station operates, the more the demand is driven in that neighborhood. People see these cars driving around in their neighborhood, people in those neighborhoods are more likely to buy more cars, which puts even more volume on a station.

Finally, it is wise for us to prove out these higher through-put stations so when consumers arrive in high numbers these stations can, indeed, operate reliably at its limits. It proves the practicality, fueling a lot of cars over several hours, the economics and the technology.

This is key to proving the business model and convincing investors this is a viable proposition.

The next slide. This graph comes from DOE-funded study which was based on fueling patterns at Chevron stations in California. This graph shows Monday and Friday fueling patterns, and graphs are available for other days of the week that are relatively similar.

Each dot on the graph represents the percentage of fuel dispensed as a percentage of the entire day in that specific hour.

As you can see, there’s no drop off in demand between rush hours. And if you take the peak 12 hours, it constitutes about 75 percent of the fuel dispensed,

and that's roughly from 7:00 a.m. to 7:00 p.m.

I would propose this is a reasonable proxy to use to predict how consumers might use a hydrogen fueling station.

The next slide. This graph shows the hydrogen fueling pattern for an average day, based on the Chevron data, from the DOE study I just referenced.

It shows several-sized hydrogen stations fueling anywhere from 20 to 200 cars per day. The area shaded in purple shows the peak fueling hours, 7 a to 7 p.

The station which uses fixed -- the station which fuels 50 cars per day, which is the pink curve, would fuel about 38 of those cars from 7:00 a.m. to 7:00 p.m. And during the busiest five hours, it would need to fuel about four cars per hour.

For the 90 cars per day, which is the yellow curve, that station needs to fuel six to seven cars per hour for the peak five hours.

So, it is important to consider and use the peak 12 consecutive fueling hours as a basis for calculating daily capacity. And it is important that these stations can fuel on the order of four to five cars per hour for an extended period of time.

Again, this is looking at 2015 vehicle data, which is only about one year after these stations start

up in 2014.

Thanks for the opportunity to speak.

MS. BARONAS: Thank you, Steve.

Okay, so is the representative from Plug Power on the telephone?

Okay, so as mentioned earlier, that presentation will be used for section non-bus and non-road projects.

So, may I see slide 02? Okay, so we are up to B, equipment standardization.

So, this slide lists some potential standardization activities that may be part of the overall picture of the future solicitation.

And so what's listed here are compliance with a number of SAE standards and also compliance with future Division of Measurement Standards processes.

So, we do have a presentation today. Could we please pull up the presentation from CDFA? Thank you for that.

And so, kindly introduce yourself for the public record and then proceed.

MR. INGRAM: Hello, I'm Norman Ingram, with the Division of Measurement Standards, State of California, Department of Food and Agriculture.

We're here to give you some brief overviews of some of where our requirements are based, and just to

remind you not to forget about us during your process.

So right now we have a tentative code and handbook 44. This is the National Institute of Standards and Technology Handbook 44. This tentative code was derived through consensus representation of regulatory and some industry representatives, as well as representatives from NIST.

Currently, as I mentioned, it's a tentative code and those requirements can be found in Handbook 44 for the specifications, tolerances, and other technical requirements for weighing and measuring devices.

In addition, we have the NIST Handbook 130 that set out the method of sale. California adopts portions of NIST Handbook 130 when we develop our own regulations regarding method of sale and the retail dispenser labeling, street signage and advertising requirements, as well.

Okay, you can go on to the next slide. Now, a little more detail within the dispenser performance requirements, the first thing we have is a type evaluation. That's California State law, that the division requires all commercial weighing and measuring devices, before they even go into service, undergo the process of type evaluation. That's a rather extensive, rigorous testing protocol for performance against

Handbook 44, as well as the other technical requirements related to the device.

Now, once we get approval the device has undergone the type evaluation process, the device will undergo a routine regulatory compliance. Typically, conventional motor fuel dispensers are on a one-year basis. The same thing -- I believe we predict the same thing for these types of devices, as well, will be tested on an annual basis, after they're type evaluated and installed.

Type evaluation assures a couple of things before the device is accepted, to make sure that it does meet all the requirements, it performs and meets the tolerances in the code, as well as making sure the device is correct and appropriate for the installation.

So this also includes, you know, as I mentioned earlier, that it be accurate and correct during use, and appropriate.

And another highlight here in this particular code is that the units of measure for the hydrogen dispenser are set forth to be in the units of kilograms.

In addition, we have the fuel performance requirements. Right now California does plan to adopt SAE J2719 for fuel quality specifications.

And then, in addition, in California we have

relatively strict, compared to some of the other jurisdictions throughout the country, we have relatively strict advertising and labeling requirements. I mean strict to the sense that we even dictate the size of the letters and so forth, things along that nature.

And then, again, the method of sale was to be put at the kilogram.

Okay, you can go on to the next slide. And for additional information, as I mentioned earlier, the two NIST publications, they can be accessed on the NIST website and we do have links of our own website here, for our California Business and Professions Code and the California Code of Regulations.

And then, as I mentioned, we have links to the NIST website, as well. From there we can download those handbooks for free.

And for additional information on fuel pricing, labeling and advertising, you can contact Kevin Batchelor, at the Enforcement Branch of the Division, with his information there as well.

So, that kind of concludes our little presentation. Again, it was just a reminder that we’re in the background here. We have certain specifications and technical requirements that are really outside or separate from your engineering requirements and safety

requirements, and all our requirements deal around the device and the transaction.

So, that concludes our presentation, unless anybody has any questions.

MS. BARONAS: Any questions for the speaker?

MR. MC KINNEY: I've got a question. Thanks very much, Norm, for coming. We don't forget about you, you are part of our process, so don't feel -- at the risk of putting you on the spot, several of our stakeholders have been asking about just your progress to date, you, in developing these standards. You know, as you work, I think, kind of in parallel with our solicitation process as we work to get this next round of stations up and running.

MR. INGRAM: Yes, we do that. That is in progress, as well. Of course, maybe as most of you know, we had -- were awarded some agreements and funding from the CEC to develop particular standards and also help develop some of the analytical methods used to detect contaminants.

So, along the standards front we did go into a separate agreement with the National Renewable Energy Lab to build a particular standard. Actually, it's three standards. We're looking at three different methods of proving for performance.

We're looking at the gravimetric method, which would simply dispense a certain amount into tanks, and then we would weight a tank before and after, and determine the net contents, and compare that to the dispenser.

The other method we're looking at is the pressure volume temperature method whereby we have a known cylinder volume instrumented with temperature and pressure sensors to derive a density, so that we can take that density factor and multiply the volume of the cylinder, and come out with a mass amount as well, or a volume amount.

And then, finally, the master meter, which is basically a one to one. It's another meter, similar to the one in the device, that would be put in line between the vehicle and the dispenser, then the meter would register the amount dispensed in the vehicle. And again, we would compare that to what the dispenser says.

But all three of these methods right now are under development. The standards, the process was relatively a complex, tough process, the parts available, tanks and things like that have changed since we started all this, so we've had to change a little bit of our -- some of our requirements to adjust to what we're actually able to get at this point in time,

although, it's very similar to what we requested, anyway.

We do have the tanks in procurement, now, and that will really be the basis of the start of everything else on the device, itself, the standard, because once we get the tanks then we can go from there with everything else. That will pretty much dictate the scale requirements of the division sixe, and capacity, and such.

But all this is in progress right now and we anticipate -- I believe we were presented with an updated timeline from NREL that said that they could have this device built, possibly, by the end of August and we would start beta trials early September. And, hopefully, conclude that by the end of September.

And then our potential from there is to take the device in the field. Not necessarily to see what the dispensers -- how they perform, but to validate the device in the field.

The first process of this is for us to get the device validated in the lab so that we know that we have consistency, the device functions properly, and gives good results.

And then after that we'll deploy it in the field and validate it there as well.

Again, it's not really to see how the dispensers perform at that point, although that's data we'd be interested in and certainly we'd look at that, but that's not -- that wouldn't be the real purpose to have the device in the field at that point.

So, I hope that answered your question. Any others?

MS. BARONAS: Yes, this is Jean Baronas. So, your output from the NREL studies, your three specifications, could you kindly explain how they fit into the formal standards process?

MR. INGRAM: I'm sorry, I don't -- could you ask me that again?

MS. BARONAS: So, the work you're doing with NREL is there a connection with either an adoption process you're planning or considering on the part of the State of California?

MR. INGRAM: Well, as far as Weights and Measures is concerned it is to determine out of those three methods, the gravimetric, the BBT, and the master meter, which one would be the most cost-effective, efficient method to use for testing in the field, for routine regulatory testing and, perhaps, for type evaluation as well.

Type evaluation's a little different process.

The times involved are usually more extensive and the testing is a little more involved, but that's kind of a separate thing.

I mean we'd really like to make a determination on the best standard to use for compliance testing. So, it's related in that sense that -- to the weights and measures functions as to which standard we would chose to use.

MR. MC KINNEY: Then Norm, if I can build on Jean's question here, I'm fairly ignorant about this part of the business and process, but I imagine there will be some public process for CDFA as you begin to evaluate these different techniques to, you know, assess metering?

MR. INGRAM: That, I don't know if I could really answer. Typically, the development of the code was a consensus development to put the specifications and requirements in the code. But as far as the test method, I don't really think the public would have any input on this. It's basically going to be the research data that we obtain from NREL and to analyze that, and make a decision based on that.

MS. BARONAS: Okay, so this is the moderator. I see two individuals wanting to speak. Anyone else? Okay --

MR. STAPLES: I did have a question.

MS. BARONAS: Okay, Paul, I've got two people in queue and then I'll be right back with you.

MR. STAPLES: Good, thank you.

MS. BARONAS: You're welcome. So, Ron, please, did you raise your hand?

MR. NIES: Yeah. Sorry --

MS. BARONAS: Who are the other questions?

MR. BOYD: This is Bob Boyd questioning Norm. and the output of your NREL project, are you going to have sort of -- is that going to validate the methods that have been in development at NIST or is the output of the NREL contract, say, going to be some actual test devices that can be used to test dispensers in the field?

Or is the NREL contract just to really validate the test method?

MR. INGRAM: It's really for the method but because there's a device involved to establish that method, I think that's an indirect result of what we're doing.

Our tasks were to -- when we entered into an agreement with the CEC, our task was to develop the standard. So, this was our research answer to have NREL develop the device and then we would do studies to

determine which would be the best.

MR. BOYD: So, if I'm a dispenser or a station operator do I have to use that particular device --

MR. INGRAM: Oh, no, no. No.

MR. BOYD: -- or can I use any device that, you know, sort of proves meter accuracy?

MR. INGRAM: As long as the test equipment presented for the type evaluation and/or compliance, as long as it meets the requirements to -- typically, we have a three-to-one ratio of -- in other words, the instrument that we're testing, we prefer the instruments we're using to validate that instrument have at least three times better the uncertainties in performances.

MR. BOYD: Thank you.

MS. BARONAS: Thank you for your question.

Any other questions, I thought I saw an individual? Ron, did you?

MR. NIES: Yes.

MS. BARONAS: Ron, please introduce yourself for the public record.

MR. NIES: My name's Ron Nies with the Division of Measurement and Standards. And I'm not sure I understood the last question, but I think we need to make the point that if you have a device that you want to use commercially, you have to come to the Division of

Measurements and Standards and have that device tested, and prove that it meets the standards.

It's just like the county sticker that's on the gasoline and diesel dispensers at the filling stations, they've gone through type evaluation in our office, first, and then they're tested in the field on a regular basis as well. And that's what these standards that we're developing are to be used for.

MR. INGRAM: Well, yeah, actually I would like to elaborate on that, if I may --

MS. BARONAS: Please introduce yourself for the record.

MR. INGRAM: Oh, I'm sorry.

MS. BARONAS: Thank you, Norm.

MR. INGRAM: This is Norman Ingram again, with Measurements and Standards. And I would like to elaborate a little more on -- I mean you can use other equipment that's provided, provided it does meet certain requirements, so as I mentioned the three-to-one stuff before.

But, as well, we do have traceability requirements that the device that's being used be certified by certain laboratories that have authority to do particular calibrations or certifications of that type.

So I mean it's just -- it's not really that simple that, yeah, you can use anything. You can as long as they meet these other certain requirements that we have, and those being some of them, you know, as far as the laboratory doing the work on that standard.

MR. BOYD: Thank you. This is Bob Boyd again. And just to clarify, when I -- when I say device, I was meaning the device to test the dispenser.

MR. INGRAM: Right, yeah.

MR. BOYD: And when you're saying device, you're thinking of the dispenser, itself, right?

MR. INGRAM: No, and my answers were in reference to your -- I knew you were talking about --

MR. BOYD: Yeah, right.

MR. INGRAM: So that standard we're using has --

MS. BARONAS: Please introduce yourself for the record, Norm, so your response to Mr. Boyd is?

MR. INGRAM: The standard.

MR. BOYD: Yeah, we're -- we're talking on the -- this is Bob Boyd again. We're talking on the same page and the standard --

MR. INGRAM: The standard used to test the dispenser.

MR. BOYD: The standard is used to test the -- yeah, we're talking nomenclature. The standard is

actually a physical thing, not a piece of paper standard. The standard is a standard measure and then the device is the dispenser, so it's a lingo.

MS. BARONAS: So I believe what you're -- this is Jean, your moderator. I believe what you're talking about is standard reference material, SRM, there's an actual code name for that. So, that is the device by which someone references measurements back to a standard reference material.

So, on the phone we have Mr. Staples, please.

MR. STAPLES: Yes, Paul Staples, HyGen Industries. I had a question for the gentleman from Weights and Measures.

It's been referenced to the fact that in Europe there are many stations that have been and are being installed, and they've already gone through certification.

I've talked to many, several dispenser manufacturers. In fact, none of them are in this country, everyone is elsewhere.

But some of them have already had their systems already certified and evaluated on -- for weights and measures. And so what I'm wondering is that if they've already gone through that process, would that quality for the State of California or do you need to do that

testing again?

MR. INGRAM: Well, here in California --

MS. BARONAS: Please identify yourself. Thank you.

MR. INGRAM: Hello, again, I'm sorry, this is Normal Ingram with Measurement and Standards, and I'm going to answer Mr. Staples question.

In regards to that, devices already being certified or type evaluated, do we accept from other countries?

There are similar organizations to ours here in California. In the European community I believe it's the organization of the OIML, the Organization International Metrology Legal, where they have requirements in the weights and measurements community similar to ours, and they perform type evaluations as well, similar to ours.

Unfortunately, we don't have a mutual recognition kind of program for these types of devices at this time.

So anything that would be done in Europe would have to be duplicated here in North America.

We also have some mutual agreements with the Canadian Weights and Measures on certain measuring devices and weighing devices. I'm not sure right now if

this particular device would fall under that. I believe there are motor fuel dispenser mutual agreements, whether or not this would be included in that, I don't really know at this point.

MR. BOYD: This is Bob Boyd, I just want to make a further comment. I have been and still am a co-chair or, actually, chair of the subcommittee of the NIST team that has developed Handbook 44 and Handbook 130. I've been the chair of Handbook 130, sort of team, sub-team.

We have been reaching out, the NIST team, DMS, all of the people that have been on the NIST development team have been reaching out to our European colleagues for about five years, six years now.

It's only within the last six months that the Europeans are starting to look at metrology. There are some tests being done currently. But as of six months ago there were no dispensers that had been certified in Europe for weights and measures accuracy.

Yes, they are selling hydrogen and they have some local agreements, but there have not been any meter accuracy systems developed in Europe.

MS. BARONAS: And thank you for --

MR. STAPLES: And what about in Canada?

MS. BARONAS: Excuse me, please identify yourself. I believe it's Mr. Staples.

MR. STAPLES: Yes, an my apology, Paul Staples again. How about in Canada because that's where most of the ones that I'm aware of in this hemisphere are made?

So, I understand that there's certification there and, you know, from some of the dispenser people that I've spoken to, they've got their systems certified in Canada.

And being that there's such a close similarity to our current systems and needs, I'm just wondering if their certification would qualify here. And if not, they're willing to provide funding for certification here and we'd like to know how much that's going to be. Thank you.

MS. BARONAS: Okay, so I believe Mr. Boyd will respond.

MR. BOYD: Thank you very much, this is Bob Boyd again, and speaking for the NIST team.

Yeah, we have been working with our Canadian colleagues, as well, but there have not been meter accuracy standards, physical standards developed in a sort of a Federal role. Maybe some local -- in fact, the Safety Authority in British Columbia has been very, very involved in all of the stations and, yes, they have been certified, but not for meter accuracy to the type of Handbook 44 requirements.

MR. STAPLES: I see. Thank you very much.

MS. BARONAS: And thank you, Mr. Boyd. I do have a question. Since you're on the NIST team, is NIST planning to develop the standard reference material for the metering accuracy testing?

MR. INGRAM: Well, when you say -- I'm sorry, this is Norman Ingram.

MR. BOYD: Norm, why don't you answer that because you --

MR. INGRAM: When you say standard reference material are you referring to a device?

MS. BARONAS: Yes, I am. This formal process includes SRMs. They have an entire process there, yes.

MR. INGRAM: NIST does supply technical advisers to help develop such things, devices, but they don't particularly develop those devices, themselves, but they do provide input on the development of them.

So, I don't think they have, really, any intentions of creating such a particular device.

MS. BARONAS: Thank you for your comment.

Okay, so moving on in the agenda, please, I took the moderator's prerogative to expand that discussion a little bit longer than the ten minutes. So, thank you so much for the three people here who really helped a lot of us understand the status of this work.

Moving on, now, to slide 03, please. So, this slide lists possibilities for station access and experience, we're on Item c of the agenda.

So, a few people have discussed this, I believe, in the presentations prior. But just for discussion's sake, let's please have an open discussion here about the potential and the possibility of using these characteristics for a future hydrogen station, and infrastructure, and solicitation.

One is open access to current and future FCVs and HICVs, H-I-C-E-V-s. Someone help me with this acronym, how is this properly pronounced?

Would you please state your name and speak into the microphone so that it's a part of the public record today?

If you would like to take a seat at the table, we can --

MR. SHEERS: Sorry, I'm multi-tasking. John Sheers, the Center for Energy Efficiency and Real Technology.

Several of the people at the table could also just explain what that is. That's just referring to hydrogen internal combustion engine vehicles.

MS. BARONAS: Thank you for --

MR. SHEERS: So, it uses the same fuel, but

rather than using a fuel cell you're using standard -- a modified combustion engine.

MS. BARONAS: Okay, thank you for the clarification, it will be a part of the public record today.

And so along the line of open access, one consideration is this concept of no prohibitive, meaning the lack thereof, user agreements to limit the use of the station.

Is there any open discussion on this as a possibility for an element of a future solicitation in the area of access and experience?

Hearing --

DR. MIYASATO: Can I just make a comment?

MS. BARONAS: Please, Matt.

DR. MIYASATO: Hi, Jean, Matt Miyasato, South Coast AQMD. I think what -- it's a good idea to put some requirement for public access. I think you need to define what your interpretation of "prohibitive" means because that could be interpreted differently by different station operators.

Because although as we know now, there are stations that are operational, but not fueling vehicles because of what some would consider prohibitive agreements and others may not think it's as prohibitive.

So, just to be cautious, please define that in your solicitation.

MS. BARONAS: Thank you, so noted.

Please identify yourself, Jared.

MR. FARNSWORTH: This is Jared Farnsworth from Toyota. From an OEM perspective, we want the experience to be consistent with conventional vehicles as much as possible. So, we don't want to put up any barriers that potential customers would consider prohibitive and they wouldn't want to buy the vehicle.

So, our view is we'd want it to be open with no access agreements.

MS. BARONAS: Thank you for the comment.

Any other commenters, perhaps on WebEx?

MR. STAPLES: I have one question to that issue, Paul Staples with HyGen Industries.

MS. BARONAS: Please go ahead, Paul.

MR. STAPLES: Okay. Maybe I'm jumping ahead here but under the next category you have 24/7 access. Can I ask a question about that?

MS. BARONAS: Please, yes. Thank you for helping to move me along here. Comment on 24/7 access.

MR. STAPLES: Yes, 24/7, not every gas station that's out there is open 24/7. Some of them are maybe open from, let's say, 8:00 a.m. to 8:00 p.m., or what

have you. What about them? They're not qualified to be a location, even if they're in a great location? I would think that --

MS. BARONAS: Mr. Staples, let me just reiterate, I'm so sorry I didn't communicate clearly. This slide simply lists possibilities for --

MR. STAPLES: Okay.

MS. BARONAS: -- elements of our future work. It's not saying it shall have, it must have. We're saying these are possibilities to be discussed today by all participants.

MR. STAPLES: Okay. Well, there are some stations that are not open 24/7. Not all stations are 24/7. So, I would like to consider that they're open during most business hours, like 12 or 14 hours a day, that they're not going to be disqualified from participating in this. So, that's my comment.

MS. BARONAS: I think I understand your comment to mean that this element should be broader. Thank you.

Any other comments or questions on the 23/7 access?

MR. ELLIS: Yes, this is Steve Ellis with American Honda.

MS. BARONAS: Okay Steve, thank you. Please go ahead.

MR. ELLIS: Sure, so just a couple of thoughts. One is on the bullet point of open access to all current and future identified vehicles. I think it's important, probably, to also add the word "certified" or "approved."

This will be important, I think. I won't speak for the station operators, but this is a point that has come up in the past.

As to the user's agreements, our view is that this needs to get to a point where it is identical to gas station operation. Reasonable training, whether done at the actual dispenser, as we see with CNG today, would be fair.

But, ultimately, where with a minimal amount of training and due diligence that access to the station would be allowed.

And just a thought on the 24/7, I think if there's a day when if a site is awarded that's not 24/7 that might be fine.

But I would offer that in this early stage when we're really vying for the importance of every station to have kind of unfettered access, in the early days here it may be more important that they be 23/7, but eventually could be not. Just as we live with gasoline stations today.

And I think that words today with gasoline simply because we do have so many options. Hence, if one across the street is closed, the other one on the other side might be open. We don't have that luxury today. So, that's just my comments on that.

MS. BARONAS: Thank you, Steve. This is Jean Baronas, California Energy Commission, and I just have one question about your comments. You started out by saying add "certified" or "approved", but then I missed what?

MR. ELLIS: I'm simply saying that the vehicles, where this bullet says "open access to all current and future FCV and HICEVs" it may be important to add or insert the word "all current approved or certified FCVs."

In other words, you want to make sure that the vehicles showing up for fuel are done in a sound manner and that these are vehicles that won't, you know, cause problems in the market.

Another way to put that is to be very cautious of what someone may just put together in their garage without a lot of good due diligence in engineering work.

MS. BARONAS: Thank you. I'm so glad I asked that question. And here we have Jim McKinney with some comments and questions.

MR. MC KINNEY: Yeah, a couple of things. Going back to the open access agreement, can some of those stakeholders here give us an example of something that is considered prohibitive as an access agreement or a user agreement?

MR. FARNSWORTH: I think, certainly -- this is Jared Farnsworth. I think having a type of agreement that needs to be signed and gone through before someone can fuel can be very prohibitive, especially like a destination station or a connector station. Because someone may be used to what's in their cluster and they may want to make a trip, but they may not be planning ahead enough to realize they need to sign some type of agreement before they arrive.

So, those types of things can be prohibitive to customers, especially if they're stranded now because they can't fuel.

MR. MC KINNEY: And again are there -- so thanks for that. And are there current examples of such agreements in use at the present time?

MR. FARNSWORTH: Yeah, maybe Steve can answer more clearly for that, he has customers down in the Los Angeles area that maybe are experiencing that, now.

MR. ELLIS: Yeah, and the only thing I'll say about that is that I think it was noted earlier that

there are stations, let's say, that are up and running, and ready to deliver fuel that not all automakers or, you know, vehicle drivers can access today.

So, without getting into the specifics and details of that it's, I think, an indication at this early stage of, you know, a difference in how different station operators or fuel providers feel, you know, toward liability and training issues, and things like that.

So, even the point about prohibitive user agreements can be something as simple as pre-use training whereby, for example, we at Honda have been able to go as far as train the trainer at some of the stations, where we can train, literally, an auto dealership sales person to then train that lessee of the car and we were able to train the dealer to do that.

Where another station the only way one can gain access to the station is by training that's administered by that station operator, themselves. So, I think as Jared said, that is an example where a customer could arrive at a station and learn that there's basically no way to succeed in getting fueling, either by calling the automaker or without scheduling training in advance with that station operator.

So, it's a moment of time and I think this

bullet could be expanded to include prohibitive training, whereby reasonable training done in a simple manner would likely be fair.

I think a lower bullet does address it. Where did it say? Well, I think I saw it earlier, where training, possibly at the dispenser or menu driven at the dispensers would be okay.

MS. BARONAS: Steve, thank you so much for your input.

And so Mr. Boyd has a comment.

MR. BOYD: Yeah, I just wanted to follow up on Jim's question. The issue, there's a few, there are actually three issues. The primary issue is authorization to fuel. How do you allow someone to take the nozzle and stick it on their car, and fuel?

The common way to do that is to use credit cards or cash. You could go up to the cashier and give them some money and then they would authorize the pump to actually distribute fuel.

So, one of the problems we have right now is that we don't have a method of sale. So, in order to authorize fueling you then have to have, let's say, a special card, or a PIN number, or some way to access the dispenser.

And then each station provider must decide who

can fuel at their station and then how to recover some money.

So, you might have a user authorization system that's on, say, a company. Toyota would come to a dispenser station operator and say, hey, I want my cars and my customers to fuel there so give me some access PINs, or Mercedes or Honda could do that.

So, it's authorization to fuel that is the issue. And if you have a method of sale that's approved and you can tie it into your cash machine, then, or credit card system, that solves your problem.

Another issue was brought up by Honda just now, and that was keeping unauthorized vehicles away. We all talk about, you know, the bubba factor. Someone says, well, I've got a Honda Civic and it's a CNG car and I'm going to make it hydrogen. And they're just going to tweak things around a little bit and so they've got -- so that would not be an authorized vehicle to fuel.

And so, you know, we need some -- right now what we're trying to say is, okay, OEMs can produce cars and maybe me, in my shop, I can't produce a car that should go out and fuel.

So, how do you weed out those people that shouldn't be able to fuel?

Anyway, I'll leave my -- leave it at there.

MS. BARONAS: Okay, thank you for that. So, is the NIST committee looking at a way to authorize this vehicle type?

MR. BOYD: No. There has been some discussion at California Fuel Cell Partnership and others about an authorization method that might be an RFID tag that would be issued, and managed by -- let's say the State could somehow be involved and then the OEMs could have these little RFID tags that could go onto the fuel door, and then the dispenser could sense the presence of that tag.

And just like that might be the DMV would issue your little stickers that go on the back of your license plate yearly.

So, that has been proposed as a method of identification.

MS. BARONAS: Thank you so much. There's plenty of open standards there that could be applied, in my personal opinion.

MR. BOYD: Yes, that's correct.

MS. BARONAS: Yes, so Dr. Brown from University of California at Davis -- University of California at Irvine.

(Laughter)

DR. BROWN: I already feel bad enough sitting

here as Dr. Tim Brown, across from Professor Joan Ogden. This is Joan.

MS. BARONAS: I am so sorry, excuse me. University of California at Irvine.

DR. BROWN: Thank you.

I just want to make some comments, I think everyone in the room's kind of being kind to me right now.

Bob's points are well founded, but there's some work-arounds to those. The real issue, I think, was being pointed to earlier was the contractual agreements between automakers, and station operators, and providers.

And that's aimed a lot at me, at the Orange County Sanitation District Station, where we had certain user agreements and indemnification language that was appropriate for our UCI station as a research station, back in 2007. We've carried those over to the Orange County Sanitation District Station, which may still be appropriate given sort of the research focus of that station, but is not really appropriate going forward for cookie-cutter retail like station, where we have to have these very onerous agreements between automakers, and station operators, and providers. So, I think that's one of the things that we need to move past.

And I believe that the language in the CEC solicitations in the past, in previous hydrogen solicitations have a good language that got away from that method so that it was successful.

MS. BARONAS: Kindly just focus on the future.

DR. BROWN: The one that was awarded in 2010, the previous stations had some sort of detail about user remittance and that was successful, from my point of view.

And we heard that last week I think when Ed Heydorn spoke about having no user agreements for the stations going forward and that seems like the right model.

MS. BARONAS: Thank you for your input. I hope you're still speaking to me given that I didn't get your organization correct. So sorry.

DR. BROWN: That's fair enough.

MS. BARONAS: Thank you. So, now as a time check it's now 20 minutes of 11:00 and so we're a little bit ahead of schedule. Would you like a break?

DR. MIYASATO: I have a question.

MS. BARONAS: Please.

DR. MIYASATO: Before you go -- so, yes, I want a break.

But the question I have is the CEC -- this is

Matt Miyasato, South Coast AQMD. Are you envisioning that for each of these different characteristics on this slide, for example, you would score station proposals higher if they had more of these attributes or, I mean what's your initial thoughts?

MS. BARONAS: So, in my personal opinion and I can't wait to hear others from the staff say something, we're so open right now, we're just putting these ideas on this slide for discussion purposes. Thank you.

MR. MUENCH: If I may chime in here, this is Tobias Muench with the Energy Commission.

So, I think the idea is that these are all sort of technical minimum requirements of what we're looking for in a station.

Although it is, of course, open. These are just possibilities and suggestions right now that we're discussing today.

I think we're going to move to the scoring criteria on the next workshop. This is more about technical requirements.

Does that answer the question?

DR. MIYASATO: Yes, it does.

MR. STAPLES: I have a quick question.

MS. BARONAS: Just a moment, please, who's on WebEx? Matt, would you respond to Toby?

DR. MIYASATO: No, that's -- this is Matt Miyasato, South Coast AQMD. Thank you for that. Although I am a bit concerned if this is your technical minimum requirements, I think we need to vet that more.

MR. MC KINNEY: And this is Jim McKinney. Matt, are you prepared to expand on that right now or would you like to --

DR. MIYASATO: Well, so for example, credit card operability, that's specific to after a standard developed, a question mark. So, if that's the minimum floor, it seems a bit of the cart before the horse.

24/7 axis, I think we talked about that. That's clearly desirable at this stage, but are you going to disqualify good locations because it's not 24/7? Maybe it's 24/6, you know, whatever.

So, I think you need to give yourselves some flexibility.

MR. MUENCH: Well, understood, understood. I think -- try to see this, please, as points of discussion of how should we handle this? What is everybody's input and suggestions on how to handle this.

We all are aware that there's no retail standards or equipment certification for retail standards for sale of hydrogen per kilogram at the pump, yet.

So, somehow the credit card operability and the access to fuel needs to be handled, or needs to be required, or needs to be described in what we're looking for, so that's what we need to hear from everybody and that's what we're here for.

MR. ELRICK: If I can -- Bill Elrick, from the California Fuel Cell Partnership, just to follow up with what Matt's saying.

I think setting a minimum is good and I think in general, and it sounds like the next workshop might get into scoring criteria and priorities. But from 24/7 -- what I'm hearing is and what we hear in the industry is within 24/7 or some of these attributes is beyond the minimum enabling additional funds, or cost share, in order to make sure there is some way to set a minimum but, at the same time, reward going to -- if we're looking at these stations being online in 2015 or so, being ready for commercial. And that might be a way to do that.

And in that same lineup, we're working so well through the agenda, I did have a quick back step on some of the performance criteria.

Some other things is to look at stations, no stations -- not all stations need to or should be alike. So, looking at the criteria for scoring, such as what a

cluster station might be versus a connector or destination, and what those requirements may be. A cluster may need to have more retail functions, more capabilities compared to something like a connector or a destination, which might be more scalable; it doesn't need to start at such a minimum.

So, you might have different criteria for different station type needs.

And then the last one I just wanted to make a quick comment on, I think it was Mr. Poppe mentioned milestone funding. We're still looking at about a three plus year turnaround on station development through these funding mechanisms.

So, something that might encourage the stations to be developed quicker, such as a Caltrans type public works projects, where you get done on time or you get paid throughout the process instead of all up front. You know, there's obviously some implications to that, but that's intriguing to me.

MS. BARONAS: Thank you, Bill, so much.

So, I'd like to see the slide 01, please. And during that transition Mr. Staples, please go ahead.

MR. STAPLES: Yeah, just real quick, first of all, the problem of certification will solve a lot of these issues. Certainly, if it's certified for weights

and measures you don't need to go through all of that trouble, and you can just sell to whoever comes up with a credit card. And that's, really, what I think the goal should be here, first of all.

Finally, the question that was asked was give me an example of a limited access fueling, okay, or a user agreement. And those are usually commercial fuelers who have accounts with big fleet operators who happen to be in publicly accessible locations. And so long as the fueler is willing to provide open access to anyone utilizing hydrogen or fueling hydrogen I don't think that that should be a barrier.

But that's basically where, like Pacific Pride, they do commercial fueling with various different fleet operators, and truckers, and that sort of situation. They usually have very good locations and convenient locations that make it very, very attractive to put a fueling system in there.

But because they have memberships, where you have to put a card in to be a member, that would be -- yes, but so long as they're willing to open that up, okay, for open access for hydrogen, I think it should be perfectly legit, okay.

And that was basically my comments on that, on commercial fuel, so thank you.

MS. BARONAS: Thank you so much for that input, Mr. Staples, for the public record.

And so now we are displaying slide 01. This area seems as though we need to discuss more based on the input.

If you recall, we showed this slide at the beginning and then went into the presentations, the contributions, which were quite excellent.

But after the break we'd like to start with 01 and have some detailed discussions about this concept.

So, since it's 10:50, please come back at 11:00. The remainder of the morning includes a number of points. First, slide 01, and then a discussion on renewable hydrogen by both the Air Resources Board and also UC Davis.

Thank you, see you at --

MR. EHLERS: Hello, hello.

MS. BARONAS: Yes?

MR. EHLERS: Yeah, this is Peter Ehlers from CSA Group. I was raising my hand through the presentation and was never recognizing, so before we go to break I would like to say a few things on what's transpired.

MS. BARONAS: Oh, please accept my apology, I'm so sorry, I didn't see you or hear you. So, please go ahead.

MR. EHLERS: Yes, back-stepping to slide 02 regarding standardization, it's really important to understand that there is a lot of initiative and a lot of energy outlined by the USD. We road mapped for hydrogen standardization recently and a lot of significant standards are being published, with the expectation by the end of this year they would be recognized by ANSI.

Those are specific to what we're doing at CSA Group specific to hydrogen refueling station equipment, both at the system level, as well as at the component level.

As I mentioned, these are ANSI recognized standards written in the consensus process. They deal with the safety and performance of valves at the station, they deal with safety and performance of hoses, in-line breakaways, et cetera.

And they are all now coming -- becoming available and becoming publicly published.

It's very important that the future consideration that goes into these stations take into consideration the requirements that are outlined for the component performance, that would then need to be incorporated into the system via dispensers, compressors, cascade storage devices and controls.

The other things that are being also published are system level standards. There was comments made by the Honda Group on certification of vehicles, or having vehicles that are certified to meet some minimum performance requirement.

Similarly, there are dispenser performance protocols that have already been published, that do the same for the dispenser to ensure that the dispenser will work in concert with those certified vehicles that the OEMs are now producing.

Those go by the CSA HCV4.3 specification. I see in the slides we keep going back to the SAE specifications. It's important to note that the SAE specifications are written from the scope of the automotive manufacturers, not from the scope of station equipment.

So, yes, I agree that the SAE standards are important, but they aren't the only ones that should be considered for future specifications on the safety of stations.

Really, it comes down to we always want to make sure that we're never compromising the integrity of the fuel source devices on the vehicles. And there's a series of standards that are being developed on the infrastructure and feed side that follow that same

thinking process.

So, as we begin to expand on the specifications and requirements for hydrogen fueling stations moving forward, I think we need to be very careful with what the specifications will be with requirements all the way through the system from the component level on through.

MS. BARONAS: So, this is Jean Baronas. A quick question, is CSA Canadian Standards Association? I'm only guessing?

MR. EHLERS: That's what we used to be known as. We're actually an international standards association. Our office is based in Cleveland, Ohio, actually.

MS. BARONAS: Okay, so then would you please spell your last name?

MR. EHLERS: Sure, it's E-h-l-e-r-s.
And we are recognized by the DOE and the NREL standards road map as having the subject area recognition over components and hydrogen requirements.

MS. BARONAS: Okay, and then you mentioned CSA, was it CSA 4.3 you mentioned?

MR. EHLERS: Yeah, 4.3 would be dispenser performance requirements, so that would be working in concert with the vehicle requirement protocol SAE J2601, they're kind of right hand/left hand standards.

MS. BARONAS: Okay. Thank you so much for

speaking up. And, again, I apologize for not recognizing you earlier.

Have you concluded your remarks?

MR. EHLERS: Yes, thank you.

MS. BARONAS: Okay, and so now it's 10:55, so our break will take ten minutes. Please come back at 11:05. Thank you.

(Off the record for a break at 10:58 a.m.)

(Reconvened at 11:08 a.m.)

MS. BARONAS: Could we please take a seat so we could get started. Thank you. Please have a seat.

Thank you for reconvening. So, I'm really happy -- this is Jean Baronas, with the California Energy Commission, I'm really happy to say we have even more presentations. So, it's wonderful to have such input today.

Along those lines, I'd like to start this session or this portion of the session with a presentation from the Air Resources Board, Gerhard Achtelik.

And then I'm imagining that we move to the discussion of renewable hydrogen.

So, Gerhard has a contribution on the station performance and infrastructure.

And then, when we're done with his, let's

discuss his and then move to slide 01 again.

Here is the impact of this, I'm planning to go until 12:30 before we break for lunch because we do have three presentations on renewable hydrogen, one from the Air Resources Board, one from UC Davis, and the third from University of California at Irvine.

Does this change in the time, is this okay with people, generally? Okay, okay, thank you for your indulgence.

So, please, Gerhard, introduce yourself for the record.

MR. ACHTELIK: Thank you, Jean. This is Gerhard Achtelik, with the Air Resources Board, and appreciate the opportunity to present today.

And I will be covering a lot of the same points that were already talked about earlier today and so I do appreciate just to emphasis -- the opportunity to emphasis those points.

If you can go to the next slide, please? And just some ideas, considerations to follow is that -- and we've talked about some of these is match station capacity with expected through-put or with an ability to upgrade, when appropriate.

And look at your key through-put points on the 12 to -- I'm sorry, 12- to 14-hour period, not a 24-hour

period.

And not directly implying here that the stations shouldn't be maybe 24 hours, but definitely look at your station capacity to dispense on -- you know, that matches the Bell curve. Not a -- well, I guess it was sort of a Bell curve, a curve that Steve showed earlier.

Then the station size consideration, look at considering allowing different sizes for different opportunities of stations. A connector could be the smallest one.

And then a future cluster market would be smaller, that's expandable, with the potential to expand.

And then an established cluster, with high through-put, would be your largest.

So, some of those concepts have been talked about and that's just -- my number are slightly different. But I think it's important to consider three types of stations.

The next slide. The safety, ensure the customer gets a safe, full fill in a required amount of time.

And then we had a lot of discussion today or points brought up that maybe CSA 4.3 might be, you know, a more appropriate reference. It's something it sounds like we all need to -- or at least I need to learn more

about to figure out which reference we look at. 2601 certainly has on the vehicle side of it.

And for filling a car, you know, one point I'll throw out there, do we need to define what a full vehicle means? We just right now throw out 95 percent state of charge, but maybe it's a done issue already with the stations performing the way they're performing today.

A fill time, depending on, you know, a three- to six-minute goal for fills depending on how empty the tank is, not everybody fills with just fumes. Some people come in with fuel in their car, so some kind of range that establishes the minimum.

And there should be -- and then back-to-back I say we might not expect the same fuel speed. And I'll say third and fourth, I think you do need to establish an absolute minimum because the -- your connector station might not be -- might not have to9 be designed to fill a dozen cars in an hour, than where your cluster station needs to be.

And so my point I was just trying to make here, make sure no matter what, a station can fill a minimum number of cars back to back, two, three. You don't want to have a customer waiting a half an hour to fill, before their vehicle is ready.

And where the connector station, now between Northern and Southern California is the one that's not likely to see a fleet of cars come, that could be the one with the less stringent requirements.

The next slide. The other thing is I think we're still at an early enough stage that -- and I just throw some of the partners out that we've had experience with. It's still an early enough stage that with the performance requirements in mind that you look to continue a diversity of participants.

I think that we haven't found the final technology, yet, and so it's important to keep that going. You know, even to the point where, because of some of the renewable requirements and other things, we might still consider electrolysis and things that might not be as cost effective strictly on a per-kilogram basis today.

But I don't think we've seen the final answer, yet.

The next slide. As Jim has pointed out, the Energy Commission has considered, has invested, or will have invested a considerable amount of money by the end of this fiscal year, and a potential $30 million going out, now.

So, I think a lot of flexibility is important

here, an appropriate mixture of station capacity, station performance, station technology.

I think that -- and from my perspective, a single criterion would not be the ideal way to go forward for that amount of money. I think a lot of variety is desired.

And the next slide, which says pretty much the same thing, it just says design -- you know, if you can, design your program opportunity notice to allow a lot of flexibility.

Either, as you had brought up last week, Jim, by allowing, you know, having multiple, simultaneous PONs, or a single one that has flexibility.

And I emphasize flexibility because ideally we get cluster stations, ideally we get connector stations, and ideally we get destination stations. But I think it's important to put out all these stations.

And if you were to get not -- you know, if you designed to get five, or three, let's say destination stations and you only get two bids, I don't want to lose a station. So, emphasize flexibility that there is -- while there might be greater value for that one destination station, if we don't get it, there is still value for that cluster station that makes that market more appealing.

So, that's sort of what I'm trying to say, don't make it absolutely, give yourself all the flexibility you can get.

And, you know, I think that covers a lot of the points that were done before, so that ends my presentation. Thank you.

MS. BARONAS: Thank you, Gerhard, appreciate your input.

Okay, so now we're moving on to the renewable hydrogen.

I'm sorry, please?

MR. MC KINNEY: I'm sorry, Jean, can we have a discussion on -- because I thought the idea was to go back to the performance slide before we get into renewables.

MS. BARONAS: Ah, yes, I'm so glad -- I'm so glad you brought it up.

MR. MC KINNEY: Oh, good. Okay, great.

MS. BARONAS: So, please bring up 01, slide 01. Thank you.

MR. MC KINNEY: Yeah, and if I might, again, Jim McKinney for the record.

There are a couple of themes that emerged from that first discussion that I want to come back to. And thanks, Gerhard, because you just made my job a lot

easier here.

So, some questions for the stakeholders and again, all around the table. In 2010, the scoring criteria that we used really emphasized, you know, high capacity, high through-put, low cost. At that point in time we were really trying to push down the costs of these initials stations to be, again, more cost effective and be more prudent with the government funds that are the public money that's available.

So again, Gerhard, teeing off of what you were saying about, you know, destination stations, connectors, and kind of the core high capacity stations, you know, we have to make some decisions on how we structure the next solicitation and the scoring criteria.

So one simple way to do that would be to have some predetermined categories and I think you were emphasizing flexibility.

But again this is, I think, a key question to the stakeholder group, you know, are we ready to start moving away from core station funding out to include connectors and destination stations.

And I've got some other themes I want to come back to, but why don't we just start with that point of discussion.

DR. BROWN: This is Tim Brown from UCI. In the presentation I gave last week on locations, I showed a rollout strategy of where we're at today and where we want to get to the 68, sort of what the first phase may be or, you know, from here on out, first phase, second phase, third phase.

Those locations were vetted rigorously with the automakers and deemed the next most valuable stations. We'd have to go back and look exactly how many were cluster stations, how many were destination stations, but I think that would provide a good guideline to the distribution for future -- for the next round of funding, which stations should be these different classifications.

MR. FARNSWORTH: This is Jared Farnsworth with Toyota. I agree. And last week we also presented kind of the work flow of process to define those priority locations for those stations.

So, we talked about having kind of a third party, in this case we indicated UC Irvine, with their "Street Tool" to gather information from OEMs, and market data, and others. Aggregate those results and then come out with that priority list, rollout list.

And then I think another kind of natural outcome from that could be capacity with those priority

locations.

So I think we would recommend including that as part of that process as you're looking at priority locations or rollout plan, and capacities for those stations.

MR. MC KINNEY: Anybody else want to comment on this point?

MR. KEROS: Jim, this is Alex, with General Motors.

MR. MC KINNEY: Hi, Alex.

MR. KEROS: And, you know, to answer your question point blank, yeah, I think we are ready for cluster stations, connector stations, as well as destination stations.

Certainly, one strategy to think about that is somewhat tied to the road map is if we're, in these early years, trying to build additional markets. And those additional markets, for example, might be a destination locations, perhaps one of the proposals or those seeking funding from the State would want to try to maximize their potential by, let's say, not competing in this cluster but, you know, going to a destination or a connector location where they feel like their technology can, you know, be maximized or get the most through-put.

So, I think the answer is certainly yes and that, at the same time as well, helps build the market across the board.

So, I think it's very difficult, as we talked about last week, to say here's station number one, here's station number 68, and everything in between. But provided the proposals are, you know, reviewed, I think we can say this location and this technology makes a lot of sense.

MR. POPPE: Garrett Poppe from Hydrogen Frontier. I think if we do split this up into like three categories that it's important to say that, you know, a connector station's not going to take as much through-put as a cluster station, so maybe we should decrease the minimum capacity for each of those stations.

MR. MC KINNEY: Jim McKinney, that's exactly right. I mean that's what we need is to have a hard discussion. And whether we do that today, July 10 at South Coast, or afterwards, but these are the kinds of things that we'll need to incorporate into the next solicitation and the scoring criteria.

MR. ELLIS: Jim, this is Steve Ellis with American Honda.

MR. MC KINNEY: Yeah, go ahead, Steve. And then

we have -- sorry, Jean, kind of stepping in here. And then Bill Elrick will be next in line.

MS. BARONAS: Please.

MR. ELLIS: Okay, so just a couple thoughts. One is very much appreciate the presentation and the comments by Gerhard and generally agree with what he just said.

On that note, I think last week one thing that I had suggested is that you try to implement some type of a feedback loop without regard to the technology or the vendor. And I would put it this way, and that is if posed to us, will this location meet our customer needs? I think, you know, that would provide, I think, good value to the process as far as -- and I emphasize location in that particular point.

As far as the technology and meeting the needs, then I think these points about the flexibility, whether it's a connector or a destination have to be considered because I think that will be critical to the pathway forward.

MR. ELRICK: Bill Elrick, California Fuel Cell Partnership, a couple comments. One, I think we've heard the answer pretty bluntly that industry's looking at now having clusters, connectors and destinations, and the road map does outline and we've seen some of the

previous process pull out some of those priorities, so that's, I hope, very clear.

The other is that while we may see different needs in these different market types, one thing to keep in mind is, it probably requires quite a bit of discussion, for example, a cluster may not -- I'm sorry, a cluster may have a much higher through-put throughout every day of the week, as I think Linde's slide showed, a good 12-hour period where it really is going to get hit hard and so those clusters need to be ready for that.

And while the through-put or the capacity of a destination or connector might be much lower if you think about the use of those locations, they might get hit really hard on a Friday night and a Sunday afternoon.

And so while you might think a different capacity is -- it makes sense to what point, because they may sit almost dormant for a week, you know, for six days and really get hit hard on the weekend.

So, different ways to cut this, just keep that in mind.

DR. OGDEN: Hi, this is Joan Ogden at UC Davis. And I just wanted to say all three of those types of stations add value to a network. And some of the work

we've done, particularly my colleague, Mike Nicholas, has looked at what's the value of adding a destination station or adding connector stations, and they're a valuable part.

So perhaps, I'm not sure exactly how to do this, but a metric or scoring criteria that looked at a network value, in addition to just the individual station value would help. You know, given extra points, perhaps, to adding a connector station, adding a destination station.

And I think, too, one of the earlier points that was made, perhaps by Steve at Linde about, I think, about getting the coverage and then building -- thinking ahead so that you can be flexible to scale things up as the traffic actually evolves and vehicles come. Thanks.

MR. MC KINNEY: Okay, any more contributions?

MR. STAPLES: Yeah, I'd like to comment.

MR. MC KINNEY: Yeah, go ahead, Paul.

MR. STAPLES: Paul Staples at HyGen Industries.

MR. MC KINNEY: Go ahead, Mr. Staples.

MR. STAPLES: Hello? Okay, thank you. Yeah, looking at this on the chart with the -- just going back to some of the thoughts that they had on capacity.

I think 100-kilogram minimum a day is good for across the board, okay.

And then -- and it has to be scalable up. You have to be able to scale it up if demand increases. Because in the beginning, and much of these stations are going to be sitting idle until the vehicles get out there by the automobile makers, until they spit out enough to where capacities will be -- demands would be increased.

So, I would say start off with the 100 but you have to -- in the cluster areas you have to be able to scale it up and scale it up relatively quickly. Once you meet your certain capacity, like 60 or 70 percent capacity, you've got to start planning for your expansion. I think if you put that requirement in, I think you'd do well.

Because in the beginning you're going to have assets sitting out there on the ground not really getting a lot of business in the very beginning. We all understand that and know that, and it's something we're really to accept, that's why we have this three-year operating period that is required for those stations to build up market.

So, that is what my recommendation is. I agree with CARB on that and I think that having, you know, stations with lower capacity puts it into the potential for being -- coming up short. And I think that it's

probably best to just go ahead and say, well, we've got a minimum of 100 kilograms a day capacity. If you can put in more, you get extra points. Okay.

And then on the cluster stations, the core cluster stations, those stations that are put in at that capacity will have to show that they'll be able to gear up for higher capacity down the road.

That is the reason, a very important reason because you have to make the case of economic viability in the short run. And putting that much money on the ground without getting a return on your investment in the very beginning would probably be prohibitive from an investor's stand point.

So, you start off with a small one, a lower cost in the beginning, and then you expand on it as long as the capacity -- as long as you can show that that capacity can be expanded.

That's my thought, thank you.

MR. MC KINNEY: Great, thank you, Mr. Staples.

And I think that's a segue to one of the other points I wanted to raise here.

And going back to your presentation, Garrett, where I think you were saying that a 50-kilogram-per-day might be an appropriate minimum for a small station that could be scaled up. Did I get that right?

MR. POPPE: Garrett, from Hydrogen Frontier. I think another issue is that when you look -- we want to eventually make this a private enterprise. And when you look at the overhead required for 100-kilogram-per-day station, nobody's going to want to put that money down right away. They want to start out with something small and maybe build two. And the overhead cost is much smaller if you just split that number in half.

So, I think we should consider that future about -- we want these to turn into profitable private stations, so let's speak about that today.

Let's think about that today, we want it to be profitable and be a private enterprise in the future, so starting out at 100 kilograms is -- I haven't even seen that much traffic, honestly, especially a destination station. I mean do we have solid numbers that there's going to be that many cars for that many stations?

MR. MC KINNEY: Yeah, Bill Elrick.

MR. ELRICK: Two thoughts. And one that comes to me is that when you ask for scalability and you get the information, it's not just what they can scale up to, but maybe it's a cost analysis that needs to come with that. How much capacity increase for how much money and that's a part of the equation.

The other one that looks at coverage, you know,

that is the disadvantage of some of these destinations and connectors are they will have lower through-put almost by nature -- well, by nature of the design. And that's something we have to consider, but it comes down to the fundamental of what we see already is when someone goes in, even in today's vehicles that are available for lease, they ask a few simple questions. Fueling near my home? Okay, check if you have it. Fueling near my work? Check, if you have it. I like to go here on the weekend. And if you don't have that, they go home and say tell me when you have that.

So, we have to recognize that on one hand those stations are much more difficult to get to a profitable on a through-put capacity, so I think this is where you're hearing different numbers come up for that capacity standard in those cases.

But at the same time, if this is going to be a commercial market, the customers are already demanding that so we have to start bringing those into the equation, so that we can say yes to that last question and kick this market off.

MR. KEROS: This is Alex with GM, can I make a statement?

MR. MC KINNEY: Yes, please.

MR. KEROS: Okay, thanks. Just a reminder for

everybody, you know, the road map, when we talk purely destination stations, and I think the way we're talking about destinations, which is something that might only be used on a weekend or infrequently.

You know, the California Fuel Cell Partnership road map, there's very few of those stations that are characterized in that type of manner.

And I'll balance that against, perhaps, some of the "destination stations" but they're also early market stations which are, perhaps, in San Diego, perhaps in Santa Barbara, you know, maybe that sort of blur the lines a little bit.

So, I think the CEC wants to consider some minimum standards for perhaps the location type, but we're also going to have to help each other out defining what those are.

You know, a station in Lake Tahoe is probably going to look a little bit different than a station, perhaps, in San Diego, even though they're both "destination stations."

So, I appreciate it's going to be difficult to create buckets for each of these but, as Gerhard said, I think we're going to need some flexibility to be able to work around those types of different pieces of equipment that really are, I'll say, location appropriate. Thank

you.

MR. MC KINNEY: Thank you.

MR. KIEZEK: This Ed Kiezek of Air Products, can I make a comment?

MR. MC KINNEY: I'm sorry, identify yourself again, please?

MR. KIEZEK: Ed Kiezek of Air Products.

MR. MC KINNEY: Yeah, go ahead, Ed.

MR. KIEZEK: I just want to urge the CEC to really look at a lot of the work that's been done in the past. The NPC Future Transportation Fuel Study, the study that was done by MacKenzie for Germany, and really look at what some of the other countries, like Germany, and the stations and the platforms that they're deploying, Japan and the direction that they're heading.

I mean the KHK has changed their codes and standards to accept certain delivered product platforms. And I think we've learned quite a bit from the DOE and the Tech Val Program of what works and what doesn't work, and I would urge you to take advantage of that as we move forward.

And I think that's important also from the stand point of we need to be commercial now and not experiment and in order to move to 2015, where the automobile manufacturers can put their cars out in the commercial,

out in the showrooms. Thank you.

MR. MC KINNEY: Okay, thanks.

MR. ELLIS: This is Steve Ellis with American Honda.

MR. MC KINNEY: Go ahead, Steve.

MR. ELLIS: Just a couple of other thoughts. One, I think just a guiding principle that's probably important to adhere to is don't let these, I'm going to call it exceptions, those that are the connectors or destinations, which aren't the front of the cluster or network stations, dictate the rules for the majority.

So, I think keeping that in mind, keeping a balance that there may need to be vast flexibility on those at this early stage will be critical.

And Jim, I think just one other point to remember, to put it all in perspective. When we use a 100-kilogram station, and I'll use it in the context of a connector, with an average take, let's say, of five kilograms of hydrogen that would be 20 vehicles per day. And I think we can all kind of sit back and say, wow, in some of these instances this connector station may not even get close to serving that many vehicles per day, the demand for that just may not be there.

So, to Joan's good point, these can have great value for that network. And as Bill described, when

asked the question on the showroom floor, whether the customer is a go or no based on the ability to go somewhere, that's critical.

But when it comes to the metric of this through-put, it's going to be very likely quite different.

MR. MC KINNEY: Okay, thanks Steve.

So, again, kind of -- I think the two kind of end points that I heard in this morning's discussion, so Steve Eckhardt was talking about a sample station of 300 kilograms a day and then, Garrett, you're talking about something quite a bit smaller at 50.

So again, the way we have done this traditionally, going back to 2010, was to really emphasize, you know, these core station, high through-put, high capacity and trying to bring the cost down. So, there are different cost factors with these different sized stations, so we need to be more nimble and I think have different categories, or have different cost-effective criteria going forward if we're going to do this.

And I just want to put out one last time, what I'm hearing from the stakeholder group is that, yeah, now's the time to really start funding these other types of stations. Is that -- yeah, Tim?

DR. BROWN: This is Tim Brown. I just want to

reiterate what Bill Elrick said about the upgrade of stations, this sort of small station with upgrade potential is a great sort of engineering solution to the chicken and egg problem.

We need to understand who would be required to fund the upgrade.

Certainly, if we have a 500-kilogram-a-day station, when that needs to be upgrade that operator's probably making money and will do that himself. A 25- or 50-kilogram-a-day station probably requires more government money to upgrade, so we need to understand the cost to a through-put benefit there.

MR. STAPLES: Can I --

MR. MC KINNEY: Let's see, we had Matt Miyasato first and then you, Mr. Staples.

MR. STAPLES: Okay, great.

DR. MIYASATO: I want to pose a question to the stakeholder group is that -- because I think Jim is struggling here to try to get some clarity on what is prioritized for station roll out.

And my interpretation had been that you want to fund or you want to prioritize the clusters, first, and then look toward maybe a second tier or third tier in terms of connector and destinations. Is that not a -- I'm looking at Bill Elrick because I know he's been

working on the road map, and I'll look to Alex as well.

MR. MC KINNEY: But that -- I mean that has been our strategy and we're hearing something a little different today, so you're right. I wouldn't use the word struggle, but I am trying to get clarification on it. This is a really important issue.

MR. ELRICK: I think if we're looking at an approximate 30 million -- this is Bill Elrick. If we're looking at a $30 million funding, we need to be funding both clusters and the connector destinations at this point.

At what balance, we probably have to look at some of the prioritization that's gone through, and the road map, and the other analysis to figure it out, and I don't have an accurate number.

But yes, I think the cluster is where we need to put most of our focus. We need to really pick out which of these destinations and connectors.

As someone said earlier, you know, San Diego is one we hear is really going to quickly move from a destination to its own market pretty quickly, where Tahoe may do that slower. So, that might give you some of that prioritization.

So, this timing effect is everything. I don't know if there's more to it than that. I'll do it as I

think of it.

MR. MC KINNEY: Okay. And then we had something on the line, was that Paul Staples?

MR. STAPLES: Yes. In reference to that issue of the -- how do you upgrade them and how do you deal with that, I would say if you're going to go with this suggestion here of a 50 kilogram connector station, and expansion of a future cluster station of 100 kilograms, and then the 200 to 400 kilogram, I think that would be fine as long as you do not require the 200 to 400 kilograms.

And if it needs upgrades between -- to the 200- or 400-kilogram process within the three-year period, which means it's moving rather quickly than we expected, which I don't think will happen often, but if it does then the station developer should be able to come back to the CEC and submit a proposal for upgrades. Okay.

To the extent that after the three-year period is up it's all in the hands of the station owner or the station developer to finance the upgrades.

But if it's within the three-year period that is required for you to handle by this RFP, I think that you should be eligible to come back and submit a proposal saying, look, things are going better than we thought and we need to expand a lot quicker than we had

anticipated.

And I think that would be the approach to go. It will save money because you won't have -- you'll have less transit assets for stations that may or may not be working and, you know, less money invested into those.

So, I think that's a prudent approach to consider, just as long as -- if capacity demand increases significantly over the first three years you're allowed to come back to upgrade.

Thank you.

MR. MC KINNEY: Thanks Paul. And I'm looking at Toby for confirmation here, but I believe our 2010 solicitation did allow for upgrades and modifications, right?

MR. MUENCH: That's correct, yes, and we did receive proposals for that as well.

MR. MC KINNEY: Great, thanks.

Bill Elrick and then -- I just want to do a time check here. I think five minutes more, max, on this topic. Jean's looking at her watch so we need to get to the renewable hydrogen.

MR. ELRICK: So the other comment I wanted to make, Bill Elrick, California Fuel Cell Partnership, was really we need to look for this next solicitation to think about the coverage equation. We want to get to

capacity but we need to get to coverage so that we can lead into capacity.

And so that applies both as a network around the State, as we were discussing, it's getting the clusters and some of the key destination connectors so they can start to go further.

But also within the cluster, the five primary cluster markets, themselves, getting some coverage within those. So, we want to see those start to develop, not just a little bit of redundancy within them, but the ability to get -- I'll just call it the biggest bang for their buck. If that's where most of the early market customers are going to be we want to -- we don't necessarily want to see seven stations in one cluster and another gets one or two.

We want to spread this out in a way that we start to see this infrastructure both in the cluster and the statewide network, enable the most amount of customers to come to the market as quick as possible so we can move from coverage to capacity.

MR. MC KINNEY: Right. And I am looking at Garrett Poppe, again. So, I think that kind of the small station, you know, scalable model that you're suggesting, I think one thing we have to be mindful of is that I think a lot of the group discussion is

assuming that the smaller stations would be out in, say, a resort destination, Palm Springs, Tahoe, something like that.

But you're proposing that that model might be appropriate in urban core areas; is that correct?

MR. POPPE: Yeah, that's correct. I mean if you can build two stations at 50-kilograms-per-day for the price of one 100-kilogram-per-day station, then your coverage would be increased. And as long as it's a scalable design, you could always upgrade those as demand calls for it.

MR. ECKHARDT: This is Steve Eckhardt, with Linde. One thing you just do need to keep in mind, there's a fixed cost at every site no matter how big the station is, so whatever that number is, it varies. But there is always a fixed cost to get a station going no matter the size.

MR. ELLIS: Steve Ellis at American Honda, one other time here. Also, I just want to remind you that it goes back to my presentation last week where to your question, Jim about this shift, if it is one, from in-cluster stations to now these connectors and corridors.

One of my points last week was that as an automotive -- as an OEM group, we had identified the need for destinations. Specifically, I pointed out San

Diego.

So when I use that term, kind of heed the voice of the automakers, that's what it was in reference to. But I also wanted to emphasize that this is, again, the voice of our customers.

So, it's not just us kind of -- and I apologize for the visual here, but we're not just throwing darts at a wall. We are taking the voice of the customers, plus a lot of other input, as that criteria.

So, I think you posed it as a question, do you need to begin the shift to connectors and destinations? My answer is absolutely.

MR. MC KINNEY: Great, thanks.

MR. FORREST: I'd like to make a comment.

MR. MC KINNEY: Excuse me, was that somebody else?

MR. FORREST: Yes, this is Matt Forrest with Mercedes Benz and I'd like to make a comment.

MR. MC KINNEY: Go ahead, please.

MR. FORREST: Yes, I just want to echo what some of the other automakers have said with regards to the customers.

You know, certainly, we are here representing them and just wanted to make the comment that as we talk about the station capacities and what size may be

appropriate for a certain location, and what the peak fueling rate for a particular hour should be, please do keep in mind that for whatever number of customers you design the station to meet in a particular hour there could always be one additional person to arrive after that number has done their fill.

And you certainly don't want to make that person wait an additional hour, or something like that, before they can do their fill.

So as you go through and you look at how many vehicles the station should be able to fill in an hour, what the capacity should be, please always keep in mind the plus one. What is the next person going to experience as they go to that station?

You don't want to have the station completely shut down for some recovery period, you want it to be in some mode where it can provide a very good fill, but maybe not as good as the first fill in that peak time.

So, again, please just keep the customer in mind as you go through because they're the ones that are going to be driving this entire process, and their opinion is going to matter the most.

So thank you.

MS. BARONAS: So, Matt, this is Jean Baronas again, would you please spell your last name?

MR. FORREST: I'm sorry, who were you referring to?

MS. BARONAS: You, please, Matt, your last name?

MR. FORREST: Yes, Matt Forrest, F-o-r-r-e-s-t.

MS. BARONAS: Thank you.

MR. FORREST: With Mercedes Benz.

MS. BARONAS: Thank you very much.

Are there any other comments or questions before we move on to renewable hydrogen?

MR. SLEIMAN: This is Ghassan at Hydrogenics. Can you hear me?

MS. BARONAS: Yes, we can. Please state your name again?

MR. SLEIMAN: It's Ghassan Sleiman, Hydrogenics USA.

MS. BARONAS: Please go ahead.

MR. SLEIMAN: I'd just like to add the comment that if there are stations out there that are in closer locations, that have been working, and just need a small amount of funding to be upgraded to meet today's OEM requirements, that they also should be considered.

MS. BARONAS: Thank you for your input.

MR. SLEIMAN: You're welcome.

MR. STAPLES: I would certainly have to agree with that.

MS. BARONAS: Thank you all of you on WebEx.

So, now we're going to move on to the renewable hydrogen point of our agenda. So, Christina.

MS. ZHANG-TILLMAN: Okay.

MS. BARONAS: For the record please introduce yourself and your organization.

MS. ZHANG-TILLMAN: This is Christina Zhang-Tillman. I'm the lead staff on SB 1505, the Energy and Environmental Standards for Hydrogen. And I'm just waiting for my slide to come up.

MS. BARONAS: Okay.

MS. ZHANG-TILLMAN: All right. Thank you and good afternoon. I am one of the staff leading on the SB 1505 and today I wanted to give you and update on where we are.

Next slide, please. Just as a quick overview, so we're all on the same page, SB 1505 establishes the environmental and energy standards for hydrogen that is used for transportation.

What is the legislative intent behind that is that hydrogen that is produced is done in an environmentally responsible manner, which means that ultimately we will move away from fuels that are produced non-renewably.

Next slide, please. Overarching requirements

under SB 1505, there are mainly two. The first one is emissions requirements, so SB 1505 requires a 50 percent reduction of compounds of NOx, basically NOx, nitrogen/oxygen compounds, and reactive organic gases. These are measured on a well-to-tank basis.

There's a 30 percent reduction requirement for greenhouse gases and that is measured on a well-to-wheel basis. And, basically, no increase in toxic air contaminants measured on a well-to-tank basis.

For the energy requirement, SB 1505 requires a 33.3 percent and that percentage must be made from renewable sources.

So I'm sure everybody's aware of that, I just wanted to make sure that everybody was on the same page on SB 1505.

Next slide, please. The applicability, if SB 1505 was enacted today it would apply immediately to State-funded stations. And to all of the stations in California once a threshold is reached, and that threshold is 3,500 metric tons per year, or 3.5 million kilograms.

This is approximately about 10,000 kilograms per day or about 14,000 vehicles in state.

Okay, the next slide. In 2007 ARB actually started SB 1505 development and over the next three

years there were a series of workshops and meetings held with stakeholders. Some of you may have participated and my predecessor, Ben Diehl, was the lead staff on that.

In 2010 we actually developed a draft regulatory package, including the reg language, as well as the initial statement of reason.

So this is what happened for the last three years, so this is the progress to date.

However, that regulatory package was never presented to the Board in 2010, mainly because in 2010 something else came along that included hydrogen, and that was the low-carbon fuel standard.

Some of you may be familiar with the low-carbon fuel standard, the LCFS, which includes all the transportation fuels that is produced, imported, or supplied for sale in California, and it also includes hydrogen as one of the fuels.

Now, under the LCFS, hydrogen is not required to meet the 10 percent reduction. There's a 10 percent reduction in carbon intensity.

But hydrogen is considered an opt-in fuel. And the reason why I bring that up today is there are elements of SB 1505 and LCFS that are in parallel. And so because of that we had to take another look at SB

1505 to make sure that the elements that we're developing are in alignment with the regulation that is existing today, and also trying to implement this as easily as possible.

So the next slide. So, these are the elements that we're going to be looking at to refine under SB 1505. The first two are basically renewable.

What are the sources of renewable fuels and if those sources are not available, what other options are there. So, what are the eligible renewable credits that can be used to meet the 33.3 percent?

We also want to look at some definitions of regulated parties. I think we have work-shopped these throughout the, you know, 2007 to 2010 period, but because when the LCFS came online there was some discussion about who are the regulated parties, how the regulated parties can change based on contractual agreements.

So, it's a little bit complicated under LCFS, but because they affect the same regulated parties, potentially under SB 1505, we want to make sure there is consistency.

Another area that is of significant work that we're going to be undertaking is the lifecycle assessment of the hydrogen production pathways.

Again, under the LCFS that work was done and that specifically targets the GHG portion of SB 1505.

So in other words there are sections of SB 1505 and -- SB 1505 and LCFS that are literally in parallel. And if we were to proceed without looking at LCFS, we would actually be duplicating some of the work.

So with that lifecycle assessment it's very intensive and we're going to be looking at to expand our resources within my team to make sure that, you know, we have enough resources to do this kind of lifecycle assessment work.

The other areas that we want to look at is the 33.3, how do you actually calculate that?

There's a variety of options to do that. I think Ben Diehl has proposed one method. There's obviously other ideas that we can present to the stakeholders, so we want to revisit that as well.

And the last one is the reporting requirements and determination of compliance. So we have stated in the past that there may be some needs for regulated parties to submit their information, their lifecycle assessment, all of that done by themselves.

And we could possibly integrate that with LCFS because there's overlaps within the LCFS and SB 1505.

So, basically, some of the key areas that we

want to look at, we want to revisit mainly to ensure that there is an alignment with existing regulation, and to also just to make sure that the implementation is simplified a little bit.

The next slide. Since we're talking about renewables today, I want to talk about some of our current thoughts on what are eligible renewable sources.

So this is just a preliminary list and we are open to discussion on additional possible sources.

So, there are three primary areas. The renewable feedstocks is one. So hydrogen that is produced by biomass, digester gas, municipal solid waste or landfill gas, those could qualify for, you know, eligible renewable sources.

We also want to expand it to look at electricity as well, so hydrogen that is produced from electricity that is produced renewably, so in other words those by solar, or photovoltaic, fuel cell, wind.

Now, some of that list you have already seen, already, so we want to make sure that we incorporate a lot of the suggestions that were already made by the stakeholders.

The next slide. We also wanted to expand renewable credits. So in the case where there is not enough resources, of feedstocks, or electricity that's

generated renewably, one of the options is to look at credits that are generated by other programs and these credits are generated from renewable sources, such as electricity and biogas.

Another option is also to incorporate LCFS credits that are generated from biomethane, renewable hydrogen, or electricity.

So, again, we are open to discussion on, you know, some of the details of what is considered eligible renewable resources, how do you actually calculate the 33.3 percent.

So right now we are working on the details of that, trying to vet that through internal management as well. But if you have any suggestions, please feel free to contact me. And the next slide is my contact information.

And that concludes the presentation.

MR. MC KINNEY: So, Madam Moderator, I have a follow-up question.

MS. BARONAS: Please, go ahead.

MR. MC KINNEY: Thank you very much, Christina, this is really good. And thanks, Gerhard.

Do you guys have a schedule here? It sounds like you're thinking about resurrecting the ISO and the draft reg, and maybe revisiting a lot of these issues.

Has that been scheduled or is that still a work in progress?

MR. ACHTELIK: This is Gerhard Achtelik. It's still in -- the details are still a work in progress. We're working on it for a 2013 Board meeting sometime, but it's probably going to be in the later half because there's a lot of work.

And this is a very complex regulation, it covers everything from production to vehicles. You know, there's a lot of things in here, a lot more complex than how we typically work.

MS. ZHANG-TILLMAN: Yeah, there's some areas that we want to revisit to make sure that because SB 1505 actually predates the LCFS, so it was designed -- it was designed sort of ahead of that. And now the LCFS is in place and it covers hydrogen and we want to revisit some of the elements that I described up there to make sure that we have consistency with the LCFS.

Now, the two things that could possibly take some time is the lifecycle assessment of the different pathways of producing hydrogen.

You know, people have different ways of making hydrogen. And even though we have four -- I think LCFS has four pathways right now. It could be, you know, very different, there could be variations.

And so looking at individual ways of producing hydrogen, that could cause some time.

The other thing is we want to make sure that when LCFS, for hydrogen producers who are going into LCFS to generate these credits, we don't want them to report duplicate information because, essentially, when they submit information to the LCFS it qualifies for, you know, for partial submission for SB 1505.

So, we want to design a system where information can be utilized across different programs and not having people to duplicate that, so that's another area that we will work on.

So, it could take some time and we will need to have internal teams agree on a set schedule. So right now we don't have a set schedule but, like I said, those are some of the items that we will be looking at.

MS. BARONAS: Thank you for that, Christina.

So, Bill Elrick, please.

MR. ELRICK: Yeah, if I could just ask two quick questions. How do you plan on collecting the data when the trigger is met and are fuel cell transit buses going to be included in that calculation?

MR. ACHTELIK: The best we have right now is looking at the stations that are being rolled out. And the transit buses, the legislation includes transit

buses. I think you asked are we included transit buses and fuel cells, is that what you said?

MR. ELRICK: In the trigger.

MR. ACHTELIK: In the trigger.

MR. ELRICK: Because, obviously, that will impact the trigger timing.

MR. ACHTELIK: I mean it allows an exemption on the transit agencies, so even though they are included in needing to use the renewable requirement.

So will it be included in the volume? It's not a hundred percent defined, yeah.

MS. BARONAS: You had a second question?

MR. ELRICK: The other was more about how -- do you have a plan for how you'll collect the data as the trigger happens? Thinking about this will be an all-stations, you know, all fuel through-put will then be part of that process.

MS. ZHANG-TILLMAN: Right and that's part of the reporting and compliance strategy that we're going to be looking at. So it's probably going to be an automated system, where they will be submitting information there, and that will help us understand how much hydrogen that is being dispensed for transportation use.

And just to kind of give you a feedback, LCFS already asks for that, to require hydrogen producers who

are going into the LCFS to report the number, in kilograms, that they are supplying for transportation use, which means hydrogen quantification comes into play as well.

MR. ACHTELIK: This is Gerhard Achtelik with the Air Resources Board. Just, you know, since we envision, you know, a trigger around 13,000 vehicles or 14,000 vehicles, the absolute hydrogen through-put today isn't critical. But we clearly need to have this piece of legislation in place well before then.

You know, so we have -- while we don't have the absolute value today, we have our timeline in order to make sure we are ready before those cars roll out.

And I'll say that, practically speaking, the number is low enough that, you know, any entity basically has to look at this as a requirement that's in place.

We have to look at it if you're using government funding, but if you're looking at building a major station that you expect to serve the future, if the number's low enough, you need to think of it as being in place.

MS. BARONAS: Okay, thank you Christina and Gerhard.

So, moving on to Dr. Ogden's presentation, Joan.

DR. OGDEN: Thank you. I'm Joan Ogden; I'm a professor at the University of California, Davis. And I'm going to talk today about some results from a couple of studies that we did looking at both near-term and long-term prospects for renewable hydrogen in California.

And this is perhaps background material for this discussion. So next slide, please.

So as you all know there are many different hydrogen supply pathways and, like electricity, you can make hydrogen from a lot of different resources.

And I've shown some of the possible resources there, a number of then are renewable. You can make hydrogen from wind, or solar power, and electrolysis, from biomass gasification, and also from biogases, and so on, as Christina mentioned.

You can also make hydrogen from fossil fuels and even from nuclear power via electrolysis. Most hydrogen today comes from natural gas, in the United States.

Okay, next. This is a graph that was put together by the Department of Energy that shows the well-to-wheels greenhouse gas emissions of hydrogen compared to other types of vehicles, so this is kind of a complex graph and I'll spend a minute on it.

Up at the top there, in the gray area, the top

bar, that's today's gasoline vehicle, and it gives a gram C02 per mile. So, this is the amount of greenhouse gas emissions that would be emitted counting all of the steps, counting the extraction of the oil, the refining process, as well as using the fuel in the car.

And then this is compared to various improvements, some improved internal combustion engine vehicles, hybrid vehicles, like the Prius type vehicles, that sort of thing, with gasoline, and then plug-in hybrids, electric vehicles.

And then at the bottom there, with the little red border around it, are hydrogen fuel cell vehicles. And we see there, the top bar there is hydrogen made from natural gas, and that's pretty much how it's made today.

Roughly half of what you would have with a conventional gasoline car and still quite a bit less than even improved internal combustion engine cars.

And then you see some other bars below that for fuel cells that show what could be achieved with different types of renewables coming in.

This also shows coal, but it show, I think, biomass and wind.

Anyway, the point of this is that you can do a lot of greenhouse gas reductions with hydrogen in a fuel

cell.

The initial, about 50 percent reduction from today's car is largely because of the higher efficiency of the fuel cell car compared to an ICE. And then you can -- by de-carbonizing the fuel source you can bring it down quite a bit lower.

So you can -- with renewable hydrogen you can have very low well-to-wheel submissions.

The next slide, please. This is a slide that shows delivered costs and the ban there that says "competes with gasoline at $2 to $4 gallon", that's on a cents-per-mile basis.

And we cost it out. This was part of a study that was done with the National Academies, and some Way to Work also done through some research at UC Davis.

And we see there are a number of renewable options there when you look at future technologies that kind of get into that competitive range.

And we see wind electrolysis there and so on, and biomass gasification are -- both have the potential of getting down into that range of being competing of a cent-per-mile basis.

This is assumes newer technology and scaled up production.

Next. We did some looking at near-term

renewable hydrogen pathways as part of a study we did in 2009 and ’10, with support from several of the auto companies, including Toyota, Honda, Daimler, GM, as well as Shell and Chevron.

And so we wanted to look at what some near-term options were that might be brought to bear, say, in the next few years and in light of SB 1505.

So, we did some costing and some looking at designs for on-site reformer with using pipeline-delivered biomethane. So the idea being there that you’d put green methane in. You’d could also think about buying credits, if you had a trading machine in place.

An on-site reformer using bioethanol, so a liquid fuel being reformed at the station.

On-site electrolysis using green electricity by the grid, that is you’d pay extra to have renewable electric credits that you would by. And there are programs like that available throughout California.

And then, finally, on-site electrolysis with solar PV at the station.

So the next slide. So, these are just some rough-cost numbers and don’t hold me to three-place accuracy on those.

But what we did was to look at a couple of

cases. One was an on-site reformer with 33 percent biomethane. We assumed a cost for biomethane based on some supply curves for California that we'd seen. Plus, 33 percent green electricity assuming you have a three-cent premium for green electricity.

And that electricity is used at the station for compression and that sort of thing.

And we found that this increased the hydrogen cost by about half-a-dollar-a-kilogram compared to a natural gas reformer, which is not a huge amount. It's maybe a 10 percent, you know, increase in the cost.

If we went to a hundred percent biomethane and a hundred percent green electricity, under those conditions we found an increase in cost of about $1.5-a-kilogram compared to an on-site natural gas reformer.

And looking at on-site electrolysis with 33 percent green electricity, at that same premium we had an increase, again, of about half-a-dollar-per-kilogram.

And with on-site electrolysis, with PV electricity, which was more expensive to produce, we had an increase of about $5 a kilogram.

So the overall message here is that meeting the 33 percent renewable, at least for these rough calculations, certainly doesn't double the cost of hydrogen. It looks like it's -- it would increase it

somewhat, but according to at least these estimates it wouldn't be -- it wouldn't be that much more than using the fossil alternative, natural gas as the source, or using regular electricity as well.

So the next slide. We also have looked at some long-term resources for hydrogen production within the State of California. And this is an ongoing study that my colleague, Chris Yang, and I are working on right now.

And we look at a number of different cases. We looked at some supply curves for renewables within the State. For biomass we used the "Western Governors' Association Study," and we looked at kind of a range of a possible biomass supply that could be brought to bear.

We looked at some fraction of that being available for hydrogen production.

And we find that the biomass, it could fuel something, like we estimate, between 8 and 25 million fuel cell vehicles in the State.

And looking to projections, say out to 2035, 2050, this might be somewhere between 20 and maybe 60 percent of the fuel cell vehicles that could be out there, say, in 2050. If you look, for example, some of the CARB scenarios that looked at some of these.

Renewable electricity is a huge resource and we

looked, again, at making renewable electricity -- or making hydrogen for renewable electricity is a bit more expensive because the electricity cost is higher, but you could easily fuel millions of fuel cell vehicles with this.

And so the point of this slide is really that the resources are large, renewable resources are large within the State.

The next slide, please. This just shows a high biomass case for California, and this is an amount of hydrogen over time, the supply building up rapidly beyond 20/20.

A little bit of initial hydrogen made from on-site natural gas, which we think will be the least expensive and most well-known way to do it, but then phasing in biomass hydrogen with pipeline delivery over time.

And the supply mix is shown in colors there, the orange is biomass, the blue is natural gas. And the black line shows the carbon intensity per kilogram of hydrogen over time. It comes down rapidly as you phase in renewables.

The next slide, please.

Here’s a case where we limit the biomass and we say we’re not going to do coal. We do have natural gas

and here we have a supply mix that has a fair amount of natural gas in it, about two-thirds and one third biomass. The GHG emissions are less than they are now per unit fuel, but they're a bit higher than the all renewable case.

Next slide shows a case where we don't have biomass and we say no fossil fuels. And then we have renewable electrolysis coming in as our -- these supply mixes were based on kind of least-cost options under these constraints.

There we have still a fair amount of biomass and we have a lot of -- on-site electrolysis is the red bard coming up there, and this is gives you a very low carbon signature by 2050.

So next slide. This is just estimate of costs. The case there that sort of angles up, that's the case where you bring in a lot of electrolytic hydrogen and we see the costs are on the order of a few dollars, maybe three dollars a kilogram greater in that future, where you do have a lot of reliance on wind and solar power, and electrolysis.

The other cases, all the costs estimated in this study are, you know, quite reasonable, they're in the $3 to $4 kilogram range and maybe up at around $6 with the renewable electrolysis.

So next slide, I think that may be the last one. That's my last one. Okay, so this is an ongoing study. We're continuing this and we're refining these estimates. These are kind of first-cut estimates, but I think the message to take away is that renewable resources are quite large within the State that could be made to make hydrogen.

The renewable hydrogen is somewhat larger higher cost, but not outrageously higher cost in these kind of looking at this mature point of view for those technologies. And you can accomplish a fair amount of greenhouse gas reduction with these. Thanks.

MS. BARONAS: Any questions or comments for Dr. Ogden?

MR. ELLIS: Yes, this is Steve Ellis at American Honda.

MS. BARONAS: Go ahead, Steve.

MR. ELLIS: Joan, just a quick question. If you were to go back to I think one of the original slides that showed the array of technologies and their fuel to reduction in grams per mile -- the next one. There we go.

In this particular case it doesn't show, for example, a fuel-cell electric vehicle ever getting to zero as it does for a battery-electric vehicle. Is

there a case that that would be true? Because in this case it shows zero all to low carbon renewable.

I think of some other options that would allow this such as, you know, entirely renewable electrolysis. Because this graph does not make reference to the economic aspect of it, so would that be the case that could be added?

DR. OGDEN: Yes, that's a very good point. This is a graph from the Department of Energy's website and, really, the reason I pulled it is because it had such a wide array of vehicles on the same basis.

However, as you point out, there are other pathways for hydrogen that are not included here, that should be. I would say the biomass gasification pathway could even be brought pretty close to zero. I think the reason that in this study that it wasn't was it was assumed you were still using fossil fuels for cultivating and trucking biomass around.

But certainly with wind or solar electrolysis you could bring this down to zero. There are even some studies that have said you could go negative if you had the biomass hydrogen, captured the CO2 and sequestered it.

So there are many other pathways and this is not meant to be a comprehensive list. And in fact we've

done some studies looking at these others and you're right, there could be essentially zero.

MR. ELLIS: Okay and then just one follow up and that is that I think at times there is, I'll say misinformation, or a lack of understanding and I think this graph does convey it very well that all things should be relative to what we're doing today. Hence, at the top today's gasoline vehicle.

And that at times we'll see articles written or hear presentations where a reference is made to how hydrogen is made in the majority, which is from methane or natural gas, and then it will simply say but there are significant CO2 emissions.

Without kind of the next statement which is, however, in average and I know speaking from our stand point, with the Honda, this would represent a 60 percent CO2 reduction compared to a comparable gasoline vehicle.

So simply saying that there's this sense that if you make it from natural gas it may be negative when, in reality, it's a significant and very, very large contribution toward the reduction of CO2.

DR. OGDEN: So I think that's a very important point, Steve, and I would certainly agree.

MR. ELLIS: Okay, thank you.

MR. STAPLES: I have a comment.

MS. BARONAS: Oh, please go ahead Mr. Staples.

MR. STAPLES: Yes. First of all sequestration is a myth, it doesn't exist and it can't be done in any kind of a large commercial scale. Okay, so that's a myth, okay. It's never going to happen. And even in Texas they will not permit such activities by the oil companies because they're afraid of the possibility of leakage into people's underground, you know, garages and houses.

So, that's not going to happen or at least they won't give you indemnification, okay, and that's the problem with that.

As far as on-site electrolysis, I would have to say that I disagree with the numbers that you're stating there because our CFO has done a very extensive projection based on these possible options. And we start off with an $8-a-kilogram cost, okay. Retail cost and that includes profit, okay.

And it drops down by the end of the three-year period to almost $5 a kilogram, with profit, and so I do not see where those numbers jive, okay, in the short term.

That's with an expansion system, an expansion system that would bring it up to 350 kilograms a day.

MS. BARONAS: Okay.

MR. STAPLES: Outside SMR will increase the CO2 and it will increase in cost and demand as fossil fuel is fossil fuel. So I do not see how those situations pan out the way that you're talking about.

MS. BARONAS: So thank you Mr. Staples, in the interest of time, Dr. Ogden?

DR. OGDEN: Yes, I'd be happy to send you my spreadsheet with all the costs if you want to look through how the calculations are done on this.

As far as CCS, there are industrial scale projects going on all over the world so it actually does exist and can be done. And we'll see how well it works. Not saying that's a panacea, but I do think we need to look at it.

And in terms of the cost numbers, the fact that -- I mean most studies would say that renewable electricity, at least for the near term, can be somewhat expensive. There are certain circumstances where you might have time and date pricing, or different valuations on electricity that would be spilled, otherwise, and there are lots of ways to do those calculations.

So I think in the interest of time, you know, if you'd like to we can talk about that offline.

MS. BARONAS: Thank you so much Dr. Ogden.

MR. STAPLES: I'd be glad to.

MS. BARONAS: And in the interest of time I'd like to move on to Tim Brown of UCI. Dr. Brown will talk about renewable hydrogen.

DR. BROWN: Luckily, in the interest of time, pretty much in my presentation has just been said between the two presentations prior to me, so I'll go very quickly.

I want to talk about renewable hydrogen and SB 1505. So, two motivations for renewable hydrogen within the State, there's California regulations and there's environmental benefits, both of which we've just heard about.

To speak about the California regulations, first, SB 1505, these five points were just made previously. The one thing I can add here is that my numbers come out to 10,000 vehicles statewide, I kind of rounded down.

One thing I'd add that the 50 percent local emissions of NOx and reactive organic gases that's required is quite easily met with steam methane reformation of, you know, natural gas from a pipeline. So, basically, the go-to strategy for hydrogen production today easily meets this requirement.

Also, easily meets the 30 percent greenhouse gas

reduction because of the efficiency of the process and the efficiency of the fuel cell vehicles. And also easily meets the zero toxic increase of air pollutants, air contaminants with steam reformation from natural gas from the natural gas pipeline.

The one burdensome point of this standard is, of course, the one-third production of hydrogen from renewable sources. Easily accomplished with mature technology today, but it adds a cost.

Just to talk about the environmental benefits, this is quite different from Joan's graph because it's straight up and down instead of sideways.

My vertical bars --

MS. BARONAS: You don't have to rush, we have time for you.

DR. BROWN: Lunch started 15 minutes ago.

(Laughter)

DR. BROWN: I'm rushing for myself.

MS. BARONAS: No, we value what you're saying so --

DR. BROWN: So I have a graph here showing greenhouse gas emissions of CO2 equivalent grams per mile. My numbers are a bit higher, so about 540 grams per mile for a current gasoline vehicle fleet. This comes from the ARB. They project that by 2020 we're

going to get down to around 400. And by 2025, a gasoline vehicle fleet can get down to 350. We can go a little lower than this, but not a lot lower with gasoline.

In comes hydrogen and today, at the USI station, our calculations show that we're at about 250, a little below 250 grams per mile today with our current fuel cell vehicle fleet and our current hydrogen station. So this is over twice as good as current gasoline cars and even better than what's projected for gasoline cars in 2025.

This is doubly impressive when we look at our hydrogen station, which uses liquid hydrogen which, of course, has a high electricity generation footprint.

We also include a 435-mile delivery route from a facility in Sacramento down to Irvine, and of course the route back using a diesel truck.

And the most important factor here is a low-capacity air station. We serve 35 kilograms a day on average and so that means that all of the electrical loads at the station, the lighting, the controls, the safety standards or the safety controls, the refrigeration unit that cycles on and off all night long, all of those are distributed over a very few number of kilograms leading to a higher greenhouse gas

footprint.

So we can do much better, then. This is almost a worst case for hydrogen stations and, yet, it's very good using natural gas and this includes no renewables.

ARB's projection for fuel cell vehicles is much lower than this, about 150 grams per mile, and this is due to the 33 percent renewable standard, so this is easily achievable.

But as we progress to greater quantities of renewables we can really bring this down quite low. And apologize to Steve Ellis for not making it quite zero, but we could achieve quite zero with rigorous implementation.

So what are potential sources for renewable hydrogen? We've been through this as well, biogas, renewable electricity, or direct biological process.

For the biogas, the traditional method would be steam methane reformation. We also have the tri-generation process, which I'll talk about in a minute, and through that process we get renewable hydrogen.

For electricity it would be done through electrolysis, putting water into hydrogen oxygen. The hydrogen is then renewable hydrogen.

And direct biological processes rely on bacteria or algae to produce renewable hydrogen. Today we don't

think this is viable in the near term, shouldn't be considered in any sort of solicitation today. The costs are prohibitive, if the potential exists there for it to work at all, although, biogas and renewable electricity are certainly matured enough technologies to be used.

To look at biogas, first, steam methane reformation, we'll take methane, CH4, combine it with high temperature steam to yield hydrogen and CO2.

If we're using biogas, that CO2 is in a closed cycle, such as the CO2 is captured out of the atmosphere by the biogas material, it's then converted into CO2 and release during steam methane reformation. It's a closed cycle so it's essentially a zero CO2 footprint.

To look at this for biogas, there requires a clean-up step before it can be used in an SMR facility. That biogas can come from wastewater treatment facilities, landfill gas, dairy farms, or gasified biomass.

And today the best way of doing this would not be to site the SMR at the biogas, but would require a pipeline injection. So you would inject this cleaned-up biomass into the existing natural gas pipeline, then route it to the steam methane reformation unit and this is, of course, called directed biogas.

The problem exists in California, however,

though, that the AB 4037, the Hayden law, precludes the injection of landfill gas today.

Out-of-state landfill gas is perfectly acceptable, but in state it's not.

Although waste water treatment gas and dairy farm gas can be injected with the right clean-up procedures.

Talking more about tri-generation, this is where we're using a stationary fuel cell to produce heat, electricity, and hydrogen. So the biogas would be cleaned up, injected into a large stationary fuel cell to produce heat and electricity, as fuel cells are apt to do. It could be used in commercial buildings or industrial settings.

But then the third product of hydrogen is generated by injecting additional biogas into the fuel cell and using the inherent reformation capabilities of that fuel cell.

And this is an extremely efficient process, it turns out to be actually the most efficient process for creating hydrogen from a gaseous fuel.

Here's a photo of the Orange County Sanitation District, where we are doing just this. You can see all of the components here, the fuel cell, and the electrical equipment, and the gas clean-up equipment.

This project has a number of partners, many of whom are in this room. Of course, Air Products and Fuel Cell Energy, but also ourselves, the Orange County Sanitation District, the USDOE, the ARB, and the AQMD. And this is a successful project. It's been years in the making but we are actually fueling some vehicles now, and we're pushing through the contractual issues.

Just as a map here showing the available landfill and waste water treatment plants in Southern California, there's quite a few. We've done extensive mapping of where these are located and their actual potentials of using biogas.

You see the outline, the gray of the South Coast Air Basin. There's actually about 10 million cars in this region. Biogas potential from these sites, just waste water treatment and landfills, not including any biomass, or dairies or any of the other things, there's enough potential to fuel about 20 percent of the cars in this region.

However, 90 percent of this biogas comes from landfills, which can't be injected in the pipeline, which makes it very difficult to use for hydrogen production.

So, if we look at these two supply chains here of biogas and renewable electricity -- I want to go into

this one, first, I forgot about that, renewable electricity using electrolysis.

Here's a snapshot of the California grid system showing some average days in spring, showing the amount of megawatts in the State, and the types of generation used to supply the load.

You see the base load on the bottom, which is coal and nuclear power plants, and then see the geothermal. And then you see a screen in light green, which is the wind and solar.

And up at the top right you see this is an 14 percent RPS renewable standard, so this represents 14 percent wind and solar today, maybe a couple of years ago. You see it's quite intermittent, not predictable from day to day.

The black represents load following, it's a single-cycle and combined-cycle gas turbines.

The blue is hydro-electric power plants and the red are the peakers that just make up the very tip-top high ramp rate generators.

As we move forward in time and you see here that there's about 40 percent capacity factor for the wind. So we're installing this wind and we're using 40 percent of its nameplate capacity, that's pretty darn good.

As we step forward to a higher renewable

portfolio standard, this is 20 percent, we're still using a lot of the wind, we're using 38 percent of its capacity factor. And you'll see that the green increases dramatically and it still has this variation, this intermittency, you know, there are some days when the wind doesn't blow.

And this is sort of the peak where the load following in the hydroelectric power plants can really keep up.

If we go beyond this, they can't keep up with these intermittencies and we'll see that here as we step forward to the 33-percent renewable which, of course, is the requirement for the year 2020.

The wind becomes so dominant that the other power plants can't adjust quickly enough and you end up with all of this excess electricity wind power, shown here in the orange. This is curtailed wind.

It turns out that for annual -- on an annual basis 27 percent of the renewable generation can't be used and this is 12 and a half thousand gigawatt hours over the course of the year.

So in comes fuel cell vehicles and we can use those cars. If we produce hydrogen through electrolysis, using just the curtailed power, we can supply a fleet of 1.2 million fuel cell vehicles. This

would be, you know, projected for the year 2020, when we have 33 percent renewable power.

If we impose a seven-and-a-half-cents-per-kilowatt hour on that curtailed renewable, which would be a great deal for the grid, which would otherwise not be able to sell that electricity, that could generate hydrogen at $3.50 per kilogram.

This actually jives well with Professor Ogden's numbers. This is a per-kilogram for generation, only, it doesn't include transportation or amortization of the equipment, or anything like that.

So you can see it can be produced quite economically if the electricity generation is there.

So these two pathways, certain drivers here, drivers for biogas would be a policy and perhaps some sort of incentives structured from the 118 program.

These are most likely in the near term, but there is a cost premium over natural gas because of the desire for this fuel source for a variety of reasons, not just hydrogen, but also meeting renewable portfolio standards for electricity generation.

And for renewable electricity, again, drivers SB 1505, RPS standards and potentially incentive from this program.

To use it, this curtailed amount of renewable

energy, don't see that happening in the near term, it's more mid or further off, and it requires more infrastructure.

For the biogas we could use existing SMR facilities and simply inject biogas, as opposed to methane.

Whereas with the renewable electricity we have to install new equipment, electrolyzers and whatnot.

That's all I have. I guess I just want to add that I think that, as it's been stated earlier today, but the -- it's more important to get more stations out there, natural gas being used for hydrogen today is still a huge environmental improvement over gasoline and we shouldn't put the renewable standard in front of getting more stations out to get us down this pathway of reaching the environmental goals.

Thank you.

MS. BARONAS: And thank you so much, Dr. Brown. So at this time I'll open it up to questions and comments.

MR. MUENCH: Just a quick comment.

MR. STAPLES: I have a comment.

MR. MUENCH: Tim, just a quick comment. I really like your picture of the Orange County Sanitation District Facility, but I want to point out that's the

Tri-generation plant that you showed. The actual fueling station is much more user friendly --

DR. BROWN: Absolutely.

MR. MUENCH: -- and less industrially looking.

DR. BROWN: The fueling station's about, oh, a thousand feet away, something like that.

MR. MUENCH: Since we'll be talking about user friendliness and retail-like experience.

DR. BROWN: Yes, that's not a good picture to represent that.

MS. BARONAS: Any other questions or comments for Dr. Brown?

MS. ZHANG-TILLMAN: I have a question. So, in your graph, when you showed that the gasoline number's going down, is that just due to the vehicle efficiency or is that due to existing regulation, such as the LCFS?

DR. BROWN: That's a good question. I took those numbers from ARB Statement of Reasons for Clean Cars, I believe.

MS. ZHANG-TILLMAN: Okay.

DR. BROWN: So, you may know better than I do. My guess is it's efficiency numbers.

MS. ZHANG-TILLMAN: I think in that particular case it's just the vehicle efficiency that was considered.

DR. BROWN: Okay.

MS. ZHANG-TILLMAN: The reason why I ask is we just had some recent activity with the CFO, the Clean Fuel Outlet, and in that we also looked at hydrogen pathways relative to gasoline, obviously to look at the benefits of hydrogen.

And in that analysis, which I did that, we also looked at the LCFS impact, because LCFS requires gasoline to reduce carbon intensity value over the 2010 to 2020 period, and so that has an effect.

And if you take that into account, plus the vehicle efficiency, SMR, you know hydrogen by SMR, with liquid, especially, may not necessarily have that positive. So that might come up slightly negative.

DR. BROWN: Yeah, it certainly depends on where the electricity's coming from.

MS. ZHANG-TILLMAN: Right, exactly. And we're assuming existing -- you know the existing pathways already released in the LCFS, that's what we went by, and that looks at the -- well, if you look at the liquid pathway, that was not something very positive that we -- you know, it did not come out to be 100 percent positive, as everybody was thinking.

So, that's just kind of out there. I don't want people to think that, you know, because hydrogen, it's

very clear, that obviously everybody's going to agree to this and it's the cleanest technology out there.

We have done some numbers, as well, and in time frames that are far -- you know, maybe beyond 2017, when the LCFS pushes gasoline to have ethanol contents that are much, you know, lower in CI, that could also have another effect, that's what I'm trying to say.

DR. BROWN: Maybe, I mean it depends on your numbers, your calculations, I haven't seen them. Ours certainly point to hydrogen being an excellent carbon reduction regardless of the use or not of liquefaction.

We also need to consider all the other aspects of hydrogen as well --

MS. ZHANG-TILLMAN: Right.

DR. BROWN: -- such as domestic fuel source, whereas we're trying to reduce the carbon intensity of gasoline using ethanol, and the ethanol comes from overseas, then we're moving away from, perhaps, the domestic resource that we're trying to --

MS. ZHANG-TILLMAN: Exactly. And again, this is why we have to coordinate as much as possible with the existing regulation that takes into effect the fuels that we are going to be looking at and comparing to.

MS. BARONAS: Okay, this concludes our morning discussion. Would you please take a lunch and come back

at 1:30. Thank you.

MR. STAPLES: Is it possible to comment about the last presenter?

MS. BARONAS: So, Paul, can you join us after lunch, please?

MR. STAPLES: So I'll be able to comment then?

MS. BARONAS: Yes, thank you.

MR. STAPLES: Thank you. Thank you.

(Off the record for lunch at 12:22 p.m.)

(Reconvene at 1:40 p.m.)

MS. BARONAS: Would the people on WebEx please mute their phones. Thank you.

Hello, this is Jean Baronas with the California Energy Commission and we're going to continue our June 29th workshop.

So this afternoon I'd like to continue the renewable hydrogen discussion and move into other possible elements of a future solicitation, those being market diversity, bus and non-road projects, and then project readiness.

So, if we could please continue with our discussion of the renewable hydrogen. Sorry for the lunch cutting that right in half, but I think people were hungry.

So, let's think about what we heard. We heard,

I think, Dr. Ogden, we heard Tim Brown, and we heard ARB. Not in that order, it was ARB, Dr. Ogden and Tim Brown.

So, let's reconstruct where we can go with that because is this -- that's the open question is, is this a part of the vision for the State? How is this a part, if it is, for the vision of the network of hydrogen fueling stations?

MR. STAPLES: Can I --

MS. BARONAS: Okay, so Mr. Staples go ahead and finish your thought because I know we cut you off earlier.

MR. STAPLES: Well, you didn't, it was just getting late and you all needed to have lunch, and I get it.

I just wanted to respond to the UCI presentation. There are projections on renewable hydrogen really, probably, are nearest, closest to what mine are, as opposed to Davis's, because I think there's some consideration there thinking that we're not just going to be buying, you know, energy or putting on photovoltaics at the station, or wind at the station. And we're going to be actually be buying it from power producers, which is the method that I have chosen and I have made contact with power producers willing to

participate.

Won't get to that 7.5 cents per kilowatt hour at the very beginning, but we can anticipate that as the market grows and as the purchase guarantee increases, because you have to guarantee a certain amount and it's kind of hard when you're not really sure what the capacity needs are going to be.

However, when you start getting these vehicles rolled out those prices are going to come down significantly. Expansion is in our plan and it's not nearly as expensive as the original system.

So, I just wanted to comment on that and well, you know, say thank you, UCI, I enjoyed your presentation very much.

MS. BARONAS: Okay, thank you Mr. Staples.

MR. STAPLES: That's it.

MS. BARONAS: Thank you very much.

And so, Jim McKinney, please help me reframe the question for renewable hydrogen.

MR. STAPLES: Did you hear me?

MS. BARONAS: Yes. Thank you, Mr. Staples, we did hear you, yes.

MR. MC KINNEY: Yeah, so for the renewable hydrogen question and, again, thanks both to Joan, and Tim, and Gerhard with ARB, on those presentations. And

I was kind of pleasantly surprised to be reminded of how much ARB has done already on the 1505 standard and regulation.

So kind of part of what we're going to start doing this workshop and then the July 10 workshop is kind of going from, you know, background and concept to some things that we can measure or require in the solicitations.

So, SB 1505, it is a statute, we see the need to comply with it. And so since we're offering public money ergo that needs to be one-third renewable hydrogen in the mix.

And so a couple of things I wanted to say, one is that there -- I guess in our view, at the staff level, there are kind of three basic ways to get at this. I mean one is a direct physical pathway, so that could be on-site production or some pathway within state, biogas, renewable power, et cetera, you know, feeding into the hydrogen manufacturing process.

Another option is some type of in-state credit trading system and to me, personally, the thought of linking that into the LCFS credit markets makes a lot of sense because that market is up and running now. They've done all the heavy lifting on how you -- who is an eligible party, how do you track credits and all

that. I think that's a very interesting option.

And the third is some type of out-of-state credit trading system or documentation system.

And so we will be deciding between, you know, some combination of those, or one or the other. And in a minute I'd like to ask for comment on those because I think there's definitely pros and cons all the way around.

Another thing that we've kicked around at the staff level is perhaps some kind of set-aside for a demonstration, you know, on-site renewable hydrogen production system, so something like that.

And lastly I just want to say, in terms of, you know, policy intent for the AB 118 program we do have sustainability regulations in our regulations. And I think there's been some concern about, say, burdening a new market that's struggling to get off the ground with an additional sustainability or renewable hydrogen measure.

We heard all the exact same concerns with biofuels production several years ago and we continued to require the market to have sustainability aspects to their projects and the market responded, and we've had a lot of really innovative proposals over the years on how you can develop next generation, you know, ethanol,

biodiesel, renewable diesel, biogas, you know, with alternative feedstocks, or cellulosic processes, or gasification, et cetera.

So there is a precedent there and, again, it's a question of degree and measure at this early point with the hydrogen industry.

So, that's what I wanted to put out. And again, we're looking for specific comment, you know, either today if you want to have preliminary discussion, or written comments later.

But again, what kind of makes sense? Again, so in-state direct pathways, in-state credits, out-of-state credits, some type of set aside for demonstration renewable hydrogen projects.

MR. JONES: I actually had a question.

MS. BARONAS: Okay, would you please identify yourself?

MR. JONES: Sure. My name is Brandon Jones; I'm from the Central Coast Clean Cities Coalition. This is a question for Dr. Brown.

What source of energy, whether it's biogas, renewable, or conventional electricity that's used to make hydrogen do you see as like the best balance between providing like a return on investment and emission reduction?

DR. BROWN: That's a difficult question. So I guess I can try to answer it -- pose it a little bit differently and it's sort of where's the -- in terms of renewable fuels what's the best use of the fuel? Or even in natural gas terms, what's the best use for that fuel in reaching our greenhouse gas benefits, for example?

So, if we're going to use natural gas for vehicles we have a lower carbon footprint if we use the natural gas through an SMR unit, in a fuel cell vehicle, than if we were to combust that natural gas in a combustion vehicle.

So if you want to use natural gas or -- so there are a number of supply chains there. Another one would be burning the natural gas in a combined cycle power plant to produce electricity for electric vehicles.

Of any of those pathways, the hydrogen fuel cell vehicle is the lowest greenhouse gas impact.

Similarly, because biomethane is essentially methane and it would undergo the exact same processes. If you're going to use biomethane, the lowest carbon signature for that, for transportation is to use it in a fuel cell vehicle.

For renewable electricity it's the opposite, it's actually, it's much more efficient to use that

renewable electricity in an electric vehicle. That gets to other questions as to whether the market's going to accept electric vehicles en masse, et cetera.

But so, the bottom line is if you have gas, it's best to use it as the gas in a vehicle. If you have electricity, it's best to use it as electricity in a vehicle. Though, of course, you can flip flop those two with different technologies in between.

Does that address your question?

MR. JONES: Yeah, thanks a lot.

MS. BARONAS: Okay, thank you Dr. Brown.

So, back to the options laid out by Jim McKinney, could we have an open discussion on maybe pros and cons of the various options, or strengths and weaknesses of the options.

Yes, please, Steve.

MR. ECKHARDT: Steve Eckhardt with Linde. The options you listed, Jim, the in-state trading, in-state or out-of-state credits, direct physical pathway, those all seem reasonable to us.

You know, we're trying to meet a pretty high hurdle, you know, higher than what other fuels need to. So I think we need to consider -- you know, be flexible and consider all sorts of options that are considered elsewhere.

You know, for example, in terms of biogas credits the SGIP program, accept in-state/out-of-state credits. Utilities, in meeting their requirements, they buy out-of-state or in-state biogas and the rules should really be no different for hydrogen.

So, flexibility to allow as many viable and appropriate sources as possible is -- I think is appropriate because we are trying to meet a high hurdle.

With respect to some of the costs of renewable hydrogen, I'd like to have a chance to look at and comment on what Dr. Ogden had presented. Those costs look pretty aggressive or, say, low so I'd like to just understand where those came from.

But it would be our view that, you know, renewable hydrogen, that adder, it's not an inexpensive adder.

MS. BARONAS: Thank you Steve.

So are there any other comments? Bob Boyd.

MR. BOYD: Yeah, this is Bob Boyd. You know, in looking at Professor's Ogden's slides, it really seemed to me that she was talking about large-scale production methods and the numbers that she was really looking at were what would be the cost of adding a renewable component to large-scale hydrogen production methods?

And I use the "large" word over and over again

because when we're talking about hydrogen fueling stations of 100 kilograms a day, or 200 kilograms a day, or 300, those are not large SMRs. That's not -- so, trying to burden a small project that's going to be doing 100 to 300 kilograms a day with a renewable requirement is really unfair to the expectations that these projects are going to succeed.

The focus on renewability really should be down the road, ten years from now, when we're out at thousands and thousands of tons a day. Thank you.

MS. BARONAS: Okay, thank you for that.

Any other comments along this line? Hi, please.

MR. STAPLES: Yeah, I do.

MS. BARONAS: Just a moment, please, we have an in-person comment here.

MR. STAPLES: Okay, sorry.

MR. ELRICK: Okay, Bill Elrick, California Fuel Cell Partnership. I think I would just echo what I heard a minute ago from Linde on the source of the hydrogen and the process, or the credits, you know, being the most flexible that gets -- if the goal is to get the appropriate and proper, to allow that to be flexible, however that might need to happen.

To go to the set-aside question, I think that's a really interesting approach. I think in the last pond

there was some production funding listed, before it was pulled back, and maybe something like that could be considered, a broader range.

MS. BARONAS: And couch that in more of a futuristic solicitation, please.

MR. ELRICK: Okay, sure. I think maybe if you look at production specifically for renewable, a set-aside is an interesting thing, trying to especially both encourage, because we all want to get further down the renewable stream faster, but knowing that it incurs a cost, a set-aside is one approach.

Another might be to -- and this is an arbitrary number but if you went, instead of 33 percent, if someone showed through the proper process and credit that they could do a hundred percent in any way that's appropriate, maybe there's either a set-aside or an incentive of additional funding, so you might have some extra money that allows that to happen.

MS. BARONAS: Are there other questions or comments?

MR. STAPLES: Yes.

MS. BARONAS: Okay, just a moment, please. On the WebEx, would everyone please mute their telephone set?

And then, Mr. Staples, go ahead.

MR. STAPLES: Yes, in reference to the last presentation -- I've got to turn down my speaker volume otherwise I'm getting feedback.

In reference to the last -- my name is Paul Staples, I'm Chairman and CEO of HyGen Industries.

If an SMR, on-site generator, or any on-site generator, or any generator of hydrogen needs credits to offset the pollution that they're creating, well, so be it, it's just like any other stationary source of pollution, they have to be treated the same. Okay, no different.

They can change by basically going to renewables.

And if there is to be some credits purchased there should be a requirement that a portion of the credits, because it's from a renewable generator who is generating credits, because they're doing a 100 percent renewable offsetting air pollution created by fossil fuel.

And so, I mean that just seems to make sense, okay, if we're going to go this route. It helps the renewable end of things and it also gives the incentive to go to renewables for those who are choosing an easier option. That's all, thank you.

MS. BARONAS: Thank you. Thank you for your

input.

So, this is Jean Baronas at the California Energy Commission. Jim McKinney outlined, at a high level, five different approaches, so if we could just review, tell me if I have it right? Four? That's like a catcher's sign for the Giant's, okay, fast ball, fast ball.

Okay. I was told you could put jokes in this transcripts, actually, the court reporter told me it's okay so -- in the last meeting.

So for on-site generation, okay, and then credit trading linked to LCFS. And then out-of-state credit and then a set-aside.

MR. MC KINNEY: Set-aside, yeah.

MS. BARONAS: And that's it.

MR. MC KINNEY: Oh, you're right. And then, Jim McKinney, some other demonstration of physical pathways within the State, you know, say from in-state biogas directly linked to kind of the volume metric hydrogen production facility. So, you were right.

MS. BARONAS: Okay.

MR. MC KINNEY: I think Steve Eckhardt has his hand up.

MS. BARONAS: Please go ahead, Steve.

MR. ECKHARDT: This is Steve Eckhardt with

Linde. The other -- Jim, you had made another comment about the potential for demonstration projects, I guess you had said.

MR. MC KINNEY: Uh-huh.

MR. ECKHARDT: So a project to demonstrate some new method of renewable hydrogen production, is that what you were referring to?

MR. MC KINNEY: Well, for example, with our current EVSC or electric charger solicitation we've got some money set aside for level three chargers, with kind of different features. So, you know, stuff that's not quite at the point of market standardization, but we see it coming rapidly.

So this is not my strong technical area, by a long shot, for renewable hydrogen but, you know, some -- I guess the Fountain Valley Station, with the DOE funding; is that right, Toby? I just want to make sure I got my facts straight here, is that --

MR. ECKHARDT: Yeah, I mean that's one of the comments I wanted to make was that the DOE does do funding for a demonstration type project and you should just, you know, consider that the DOE, and I don't think anybody's here from the DOE, oftentimes will subsidize the demonstration portion of it. The, you know, hey, we're trying to introduce something new, it hasn't been

proven. Oftentimes it's a good way to get DOE funding and they come into a project, to where the CEC doesn't need to risk the money on something unproven.

MR. MC KINNEY: Okay.

MR. ECKHARDT: So something to consider.

MR. MC KINNEY: Yeah, yeah, I mean it's my general understanding that, you know, the cost of on-site renewable SMR is quite a bit higher than some of the other industrial sale approaches. So, again, looking for a way to perhaps incorporate that in, perhaps not, and it's something we're putting out to the stakeholder group.

MS. BARONAS: So, if I may --

MR. SLEIMAN: This is Ghassan from Hydrogenics.

MS. BARONAS: Okay, Ghassan, could you hold your question just a moment, I want to build on a question raised in the room.

MR. SLEIMAN: Sure.

MS. BARONAS: Okay, thank you.

So, Steve, just building on what you've said, it makes me think that some of the ideas in the room are not demonstration, is that --

MR. ECKHARDT: Which ideas? I mean in terms of do you mean technologies or --

MS. BARONAS: Yes.

MR. ECKHARDT: I mean nothing in terms of, you know, SMR, or use of biogas, electrolysis, none of that's demonstration, that's all been proven. So, no, I wouldn't necessarily classify those as demonstration, but we'll have to comment on maybe a specific -- understand the specifics better to make a better comment.

MS. BARONAS: So you were saying earlier that this idea of a set-aside to demonstrate renewable hydrogen or make a proof of concept was kind of interesting. And then you said that, you know, you'd heard, or you'd see, or witnessed DOE actually funding this kind of work.

So then I went to is it correct to assume that by considering that in a future solicitation that we would in fact be considering demonstration?

MR. ECKHARDT: Well, like I said, most of what's being discussed here I wouldn't classify as demonstration. I mean I -- and people should comment. I mean, like I said, electrolysis and SMR, using wind for an electrolysis, using biogas for SMR production of hydrogen, it's all proven, so wouldn't classify that at all as demonstration.

When I mentioned demonstration I was thinking of it as, for example, what was done at Fountain Valley.

That was demonstration, nobody had done that before. That was a classic demonstration of something new that needed to be proven, that had a lot of uncertainty around it.

MS. BARONAS: So back to Jim's point of four options, does anyone have an opinion of the strengths of one over the other, or are they all equally weighted?

MR. SLEIMAN: This is Ghassan from Hydrogenics.

MS. BARONAS: Ah, Ghassan, thank you so much. I forgot, I'm so sorry. Please go ahead and then Gerhard is next.

MR. SLEIMAN: Yeah, I've been trying to talk but I didn't realize that I had both mutes on my laptop and on my WebEx at the same time.

Yeah, so on the four points I think that, you know, keeping it in California makes a lot of sense, so interstate credit trading -- credit trading within California makes a whole lot of sense. It just adds more cars and just helps us in that aspect.

But the tenders, the overall hydrogen infrastructure, I can see reasons for flexibility.

From our point of view, we continue to meet demands with off-site generation. And I do agree -- well, we do agree that a portion for on-site generation does make sense.

If we go with one technology, then that would be then we wouldn't have -- it would be dictated the way forward in the future, and people will just have a lot of examples of the projects that are currently being used, and that's going to be the way of the future. So we need the difference by as much as possible, without changing the infrastructure a whole lot.

MS. BARONAS: Okay, thank you for your comment. And, again, I apologize for not acknowledging you earlier, even after you went off double mute.

So, Gerhard, you had your hand up?

MR. ACHTELIK: Yeah, this is Gerhard Achtelik with the Air Resources Board. And I was just going to support -- at least the top, the first four items that Jim mentioned. I'm not sure about the fifth one because I wasn't sure if I followed it a hundred percent.

But I think what we've heard in the room is the options, there's enough demand for renewables that we need to keep all the options open, you know, for in-state, out-of-state, and direct production.

And some thoughts would be just to -- is to allow additional funds for the most expensive. I think the direct production is the most costly.

And then I like the idea of the set-aside. I mean the Fountain Valley, Orange County Project is

unique. There are potential opportunities for other ones that I think could still be classified as demonstrations, especially if you get different technology providers involved.

For landfill, a landfill project, even though in concept it's similar, it certainly would have a lot of new challenges because landfill gases are a lot less predictable than waste water treatment plants.

So, you know, that clearly to me would be a new demonstration. I guess to me, but there's probably people here who already know more about it than I do. Tim, we should talk.

So I think I like all four of the concepts and the fifth one I'll just say I'm not speaking for or against because I wasn't quite clear if I got the distinction on it.

MS. BARONAS: Thank you for your comments. Dr. Brown?

DR. BROWN: Yeah, this is Tim. I just want to say that I think you should support any renewable sort of supply chain for hydrogen fuel.

By incentivizing one versus the other it's really almost dictating the equipment, the suppliers that can meet the solicitation. Different technologies rely on a different renewable pathway.

And then on the topic of research or demonstration stations being, you know, intimately involved in the Orange County Sanitation District Station, I think it's absolutely necessary to do those kinds of things and move hydrogen and fuel cell vehicles towards the sustainable future that we really want it to get at. But I don't know that that needs to be done through the CEC funding.

Again, as Steve said, DOE can support those kind of maybe research aspects. Right now the crux is to get to this threshold number of network of stations needed to get these cars on the road, not to reinvent the wheel and try new things, necessarily.

MS. BARONAS: Yes, Bill, please.

MR. ELRICK: Bill Elrick. Yeah, thinking about this I do think our goal is to get this market going and so coverage and the fuel locations really should be our priority, and looking at meeting customer needs, and getting those stations out there.

So I think, thinking further about this demonstration set-aside, I think on one hand it has to meet the minimum retail needs. Otherwise, we're going in a very different direction than this and there might be other, better funding pots to that.

And then putting that into the set-aside,

perhaps instead of -- because you could get in the same trap when you might set some money aside, and either it isn't pursued and it might sit on the table.

But instead, if the goal is to really get more renewables into the system, looking at it as a percentage base and if we go back to some of the slides Joan showed, and she had some numbers on how much it costs to go from 33 to, say, 100 percent, or maybe there's a middle ground of 50 percent, to look at a funding process where 33 is the minimum, that's the requirement. And those that get to 50 percent, if we've got enough information to say it costs, and I'm making these numbers up, but 20 percent more to get to 50 consider that as part of the incentive approach.

And if somebody's offering 100 percent and we know it costs them 45 percent more in costs, then offering that as an incentive. And that way we're incentivizing more renewable into the system, we're allowing it to happen, and we're actually giving them the promotion and the incentive to do it, instead of really making it a cost economics where they can't.

MS. BARONAS: Yes, Steve, please.

MR. ECKHARDT: My concern on this, the renewable hydrogen item, I mean we're already being held to a higher standard on the 33 percent. And we need to meet

33 percent, that's law, so that's fine.

But my concern is if we focus on it too much, try incentivize people to make it as green as possible, why are we further handicapping hydrogen? Why are we doing that when we could be trying to put more stations in, or putting in better performing stations, or putting in another dispensing and giving consumers what they want.

Consumers want stations that work, they want enough stations.

And to fund a lot of money to throw in even more renewable hydrogen, I just would ask the CEC to consider the value created, how we're meeting customer needs and do we need to further, I'll say handicap hydrogen, by adding to the cost by making it even more renewable.

I think we need to meet the needs of the consumers so people buy cars, because if that doesn't happen, then we'll have failed.

MS. BARONAS: So noted.

Mr. Boyd?

MR. BOYD: Yes, thank you, Bob Boyd. I wanted to just reiterate what Steve was saying and that is that we should be funding the development of stations and not funding new hydrogen pathways. Hydrogen pathways will follow the cars. If the cars

come out and the demand is there, then renewable pathways will follow. But right now we need to get stations out there.

MS. BARONAS: Okay, so noted. Thank you for your frankness and guidance, it's very, very much appreciated. And so now I --

MR. STAPLES: One more comment?

MS. BARONAS: Yes. Please hold on sir. And Toby, do you have --

MR. MUENCH: Just a quick note here about the set-aside and the demonstration idea. I mean a lot of these on-site technologies have been done before and I just remembered -- I remembered right, Larry, your station was a -- the old station was an electrolysis driven by solar PV, I believe.

Maybe you can say a few words about the experiences with cost, and with that station, with the technology, how much demonstration, how much reality, how much, you know, deployment this is.

I mean I know it's being converted to a different type of technology, but I think the past experiences could be interesting.

MR. WATKINS: I can't really comment on the -- the costs are skewed. We had four, five, ten hydrogen vehicles, now we have one. And the cost of producing

hydrogen via sunlight is expensive at the outset. If I could load the station up, it would be lower on a dollar per kilo basis. And it's an old technology. It's, what, Ghassan, if you're still on, it was 2005 I believe it was commissioned. We still have it, it's still up and running, still doing a good job. We haven't converted it, yet.

Does that answer your question, yeah?

MS. BARONAS: So kindly give your name again and your affiliation for the record?

MR. WATKINS: I apologize, Larry Watkins, AQMD.

MS. BARONAS: Okay, so --

MR. SLEIMAN: It was 2004.

MS. BARONAS: It was 2004.

MR. WATKINS: Okay, thank you.

MS. BARONAS: Thank you.

MR. SLEIMAN: And the technology, he's correct, the technology is obsolete, actually.

MS. BARONAS: Okay, thank you for that.

MR. WATKINS: There's a story that goes along with that.

MS. BARONAS: I'm sure. So can we then move on to the next topic? Okay, thank you for that.

MR. STAPLES: I'd like to make one more comment on the last comment.

MS. BARONAS: Okay, Mr. Staples, kindly be brief.

MR. STAPLES: Yes.

MS. BARONAS: Thank you.

MR. STAPLES: Yes, I'll be brief. When Dr. Zlie (phonetic), when I called Dr. Zlie to join me on this he made me promise that we were going to do it renewably, and only renewably, and I promised him I would never do anything else because that's where it's at.

And if we get entrenched in a -- and it killed him. He had a stroke and he shows up the next day at the AQMD to argue for it

So, that's one of the things that drives me. And the thing is here is that however we start it now, that's the way it will be in the future, that's what the entrenchment will be. Infrastructure doesn't change overnight, it doesn't change without a fight, and that's what we're going to be doing here in ten years, 15 or 20 years is fighting this fight again.

Stop the fighting and give the incentives for renewables because that is the only way that this paradigm survives.

We've been doing gasoline and petroleum for a hundred years and they're still fighting the change. Thank you.

MS. BARONAS: Thank you, so noted, Mr. Staples.

So at this time I'd like to bring up slide 06, please, if we could please talk about market diversity.

So these are simply concepts and ideas for discussion and we could have new ideas, other than what's here. But if we look at this slide, wondering about possible mechanisms in the future solicitation to promote market diversity. That's the general tenor of this discussion.

And so there are numerous ideas, I'm sure. But if we look at number of stations per proposal as a possible cap, number of awarded stations, and then total funding awarded as potentially thresholds.

Could people here please give comments about these ideas?

MR. MC KINNEY: Jean?

MS. BARONAS: Yes, go ahead.

MR. MC KINNEY: Jim McKinney here, let me just build on what Jean introduced here. A lot of the feedback that we've heard over the years is that there is a strong desire to have kind of a good, robust market, with lots of players on the fuel provider side, station developer/station operator side, and we concur with that.

And so some of the things, to put a little more

flesh on some of these ideas, for example the ARV Clean Vehicle Rebate Program, in order to drive market diversity put a 50 percent cap on the total dollar amount, I believe, or on a voucher level. So, 50 percent is a maximum that any one manufacturer could get in one calendar year.

That's been somewhat controversial but, again, it's helping to maintain or create market diversity. So, that's what we mean.

So, we don't have any numbers up there but, again, just wanted to give you a better idea of the kinds of stuff that we're considering here.

And we don't -- we don't want to inadvertently use these, you know, large dollar amounts that are coming through the Energy Commission ARFET Program right now to create, you know, a de facto monopoly early on in the game for what will be, I think, a pretty high revenue business opportunity going forward.

MS. BARONAS: Maybe you're new to some of these questions, but the staff has been mulling over these options.

So, do you have a comment, Garrett?

MR. POPPE: Yes, Garrett Poppe, Hydrogen Frontier. I think if you're going to put caps on stations why limit the number of stations. Instead,

limit the awards, the total amount awarded and that way people can be competitive for building more stations. And that's about the only thing I have to say about that.

MS. BARONAS: Thank you for your input. Any other comments?

MR. STAPLES: On WebEx.

MS. BARONAS: Oh, hello, Mr. Staples, please go ahead.

MR. STAPLES: I'm sorry, I'm trying not to monopolize this, but there are so many great ideas, and so many great things being discussed here, so please excuse me for being here.

But I wouldn't put any caps on anything, as long as it's 100 percent renewable. That's my choice.

Naturally, if I was going to put a cap on anything, it would be on fossil fuel generating stations, and awarded stations.

But I don't want to put any restrictions on how many we can get out all at once. If you've got a good price and your price is very, very low and very competitive for the systems that you're putting out there, and you've got really great locations, you shouldn't put a cap on it. It's as simple as that, okay, that's the way I feel.

But everybody needs to have a chance to present, and be reviewed, and be considered, that's the only thing I want to make sure. I do not want gatekeepers keeping me out or keeping anyone else out.

Okay, if you qualify in the areas that you're looking for in the RFP, and you have the resources and your proposal is good, and you've got 20 stations that will fit within the budget, and it's the best of all options, then that's the one you should choose. Thank you.

MS. BARONAS: Thank you for your input.

Any other commenters? Please go.

DR. BROWN: I'll just mention -- this is Tim Brown, I'll just mention what I said before about the renewable options, I think you need to keep that as open as possible to allow as many applicants as possible.

And also, within the station performance criteria, of course there need to be sort of maybe minimum boundaries on those kind of things based, I would say, primarily on automaker input.

But you can't have a hard and fast rule, perhaps, because that may dictate one technology versus another.

MS. BARONAS: This is Jean Baronas with the California Energy Commission. So I'm curious about how

you define station performance and if you include mean time between failure in performance?

DR. BROWN: I have not. Generally, when I said performance, I'm thinking of length of fill time, back-to-back fills, these sort of things, capacity.

Mean time between failures, it would be nice if that information was robust and available to help judge one station versus another. I'm not familiar with it enough, the station technologies, to know if that information has been developed and if it's reliable. If it is, that would be an additional, that would be a very valuable criteria to judge stations on.

MS. BARONAS: Thank you.

Yes, Steve.

MR. ECKHARDT: Steve Eckhardt with Linde, two comments on the caps. One is if you consider caps, certainly need to consider it with respect to the totality of what's submitted. If you have a lot of diversity, obviously, you have more ability to do that because you have more to choose from.

But if you only have a couple of people then that can get problematic.

So, ultimately, if a cap is used and it ends up limiting the number of stations or funding that goes out, that would be very bad.

As far as -- I think I'll just stop there, I think that really is the crux of what I want to say for right now.

MR. MC KINNEY: Hello, Jim McKinney, I have a follow up to that. So I think what you're suggesting is that we need to structure the process where we get the maximum possible number of applicants coming in and they're not inadvertently, you know, dissuaded or screened out due to some other factor, whether it's station performance or, say, you know, non-congruence with where some of the car target markets might be, and that kind of thing.

MR. ECKHARDT: I mean I made some comments last week about ensuring that there are certain minimums, and today, certain minimums in certain geographic focus areas. So that, to me, is still the most critical thing is to make sure we stay within certain geographic focus areas.

From what I can understand, from the last solicitation, it seems like there's more than enough parties who are participating.

MS. BARONAS: But we need to think in terms of a future solicitation.

MR. ECKHARDT: Well, again, I think the geographic focus, I think, is more important than caps.

I think minimums are more important than caps. You know, awarding money to somebody who comes in with a 5-kilogram-a-day station, that has a 15-minute fueling, just to get diversification that, I don't think, would be a good thing.

I think to the extent that, you know, if there is a great deal of diversification in the number of submittals you have, certainly it does aid in creating great diversification.

But as I said the last time around, from what I understand and what I know of what's been submitted, I don't think that's an issue. It seems as though there's plenty of parties who are interested in submitting proposals.

MS. BARONAS: Thank you for that.

MR. FORREST: I'd like to make a comment.

MS. BARONAS: Yes, please, go ahead and identify yourself.

MR. FORREST: Yes, this Matt Forrest with Mercedes Benz. And I just want to point out that with respect to the upcoming solicitation and the diversity, please don't lose sight of the value of experience.

Certainly, with some of the setbacks with respect to the previous PONs that we've seen in the past, the delays with those stations, we need stations

that can be executed from beginning to end in a year or so, so that we can make our 2015 deadline that's outlined in the CACP road map.

And if we have a disproportionate balance among respondents who have never built a station before, or don't have a satisfactory -- or, you know, enough experience to be able to provide a station as soon as needed then, you know, I don't know that there's -- I think we have to be careful about the balance and I'm just trying to point that.

And not to say that I want to discourage anybody, but we need these stations to arrive on time and I think that's more important than the diversity at this point. Thank you.

MS. BARONAS: Okay, Steve.

MR. ECKHARDT: Yeah, I would agree with that. I think that to the extent that you consider caps, I think it needs to be kind of at the bottom of the list to some extent. There are other -- a whole lot, in my view, a lot of other things that are a lot more important, like making sure we get the stations out there.

MS. BARONAS: Okay, thank you.

Please mute your phone.

MR. SLEIMAN: This is Ghassan.

MS. BARONAS: Ghassan, hello, please go ahead.

MR. SLEIMAN: Yes, in terms of caps I'd like to just make a comment. I'd like to see a cap on certain technology in a single geographical area so that we don't have the same station in the same geographical area where there's a quality issue, or with a station then that whole area is shut down.

So that can apply to Santa Monica, the area, so that you have a diversity, just like Matt said, of experienced operators or station providers that can provide fuel in that area.

And in terms of how much money to give an applicant, that is really up to the CEC to decide, but I can see a 50 percent share for a single ST over and over again, that can --

MS. BARONAS: Okay, thank you for your input.

In the interest of time, I'd like to move on to the next discussion topic, which is bus and non-road projects. I'd like to see slide number 7.

Yes, please go ahead, Tim.

DR. BROWN: This is Tim, I just want to make one quick comment about the previous discussion. Hydrogen is very dependent on transportation and so by limiting geographic areas you would perhaps be limiting technologies as well.

So, I understand Ghassan's point, and it's a

good one, that we want diversity. We also have to be careful not to place geographic boundaries that may, you know, incentivize one technology versus another.

MR. SLEIMAN: Let me just answer that. What I mean -- this is Ghassan again, from Hydrogenics. Limit the number of technologies in a geographical area. So, you have ten stations and that was the number that was selected, put in ten stations but make them technology that -- you know, that works technology-wise.

MS. BARONAS: Okay, Ghassan, thank you so much.

And so moving on to slide 07, here the topic is about bus and non-road hydrogen projects.

And so, here are some open questions; possible funding for stations that serve more than the light-duty vehicle market.

Potential benefits of ways to increase the market viability of proposed stations and how to demonstrate a broader market viability of hydrogen.

Looking at existing policy where funds are intended for stations that serve transportation purposes.

So, is the writer of this slide in the room? I hope so. I don’t know.

So, if you could think that through, under existing policy, is what’s meant in the first hyphen

under existing policy up on the board, does it mean transit applications? I can't tell.

And then stations serving non-road projects and including bus projects.

Dr. Brown?

DR. BROWN: This is Tim. I think it would be an excellent opportunity to combine both, although if we go back to the location, if we think of location as being the top criteria, the no/no-go criteria. We, in our research, have looked for these types of sites and haven't found any.

So, if there's a site within the correct, you know, geographic areas where these stations need to go that can serve either light-duty vehicles and mass transit, or light-duty vehicles and forklifts then, by all means, that would be an excellent way to increase the loading of the station and utilize the hydrogen and bring the cost down. But we haven't been able to find those sites. It's just not -- you know, forklift operations aren't usually located near the affluent neighborhoods where fuel cell cars will be purchased.

MS. BARONAS: Usually located where?

DR. BROWN: Near the areas, the high -- the initial market interest regions.

MS. BARONAS: Any other commenters? Go ahead,

Bill, please.

MR. ELRICK: So I think your last slide, with the existing policy, has some very good verbiage there in that the AB 118 is built for light-duty vehicles and that should be the focus.

Where a bus or non-road application can complement that is great, it's really difficult to find. to find a transit yard that is in the right location and, for all the other various reasons, works for both sides is difficult. But where you can find it is fabulous because it promotes many things. The same with it being a forklift or other project.

So, I don't think you should rule them out but I think it's very important to make sure the focus is on the light duty where AB 118 is developed.

And in that I think going a step further, looking at, again, the different types of stations, a cluster versus a connector, for example, might give you some of that, might reinforce this need for flexibility in that a station in downtown Santa Monica, or downtown Irvine, where it is a very heavy used cluster station and you're looking to get tens and hundreds of vehicles into these areas, and more, that could be a disruption if it's not developed right. So that's one side of the equation.

On the other hand a connector, say something that connects Northern and Southern California, you might see that a forklift project, for example, could be a great complement. And as long as you did have access, because somebody might be driving through in the middle of the night, so you really have to consider that the access is there and they don't have to sign up ahead of time, or any of this, that might be one where you're a little more flexible in order to make that work and make this market really get where it needs to be.

MS. SAVIN: Hello, this is Sharalyn Savin, calling in from Plug Power.

MS. BARONAS: Hi. Carolyn?

MS. SAVIN: I don't know if this is the appropriate time to contribute our thoughts or not.

MS. BARONAS: Yes, it absolutely is. Would you please spell your last name?

MS. SAVIN: Yes, and I'm here with a colleague, I'll do both for you. My last name is Savin, S-a-v, as in Victor, i-n.

MS. BARONAS: Yes.

MS. SAVIN: And my first name is Sharalyn, S-h-a-r-a-l-y-n.

MS. BARONAS: Okay.

MS. SAVIN: I'm associate counselor and director

of government programs.

I also have with me Jim Petrecky, P-e-t-r-e-c-k-y.

MS. BARONAS: Okay.

MS. SAVIN: He is the director of product management.

MS. BARONAS: Very good. Thank you so much for calling in and interjecting at exactly the right time. We mentioned earlier this morning we wanted to have your presentation, now, but we didn't hear back from you on the phone, so I wasn't sure you were still on the phone.

Could we please bring up the Plug Power presentation?

MS. SAVIN: Yeah, actually, I know that your time is running a little short and you've run over a little bit, but if you want to advance to slide 9 in this presentation, we can keep this pretty succinct.

MS. BARONAS: Okay, up to slide 9.

MS. SAVIN: I'm first going to allow Jim to speak to what you're looking at and then I'd like to follow with some of the difficulties we've had regardless of technically being eligible to participate in these types of applications. Jim.

MR. PETRECKY: Hello, everyone. What you see here is the proposal for the hydrogen highway, as

proposed by NREL. What we've done is overlaid the current Plug Power customer base, there's about 30 sites that are in the United States. And when you overlay those site locations with the hydrogen highway, you'll see that we are becoming notes along that hydrogen highway.

By definition, the distribution centers that we have our fuel cells in are along major trucking routes. So, by extension of investing in our technology, the government would be investing into the hydrogen highway.

If you go to the next slide, I focused in at California and we currently have five customers, with six locations.

There are clusters in the north, around the San Francisco area, and in the south at the Los Angeles area.

What you'll see is that investing into Plug Power's technology, customers of the fuel cell vehicles would be able to refill their hydrogen cars along several locations within those major cities.

And the last slide I want to show you, if you go to 11, is what we are doing within our product catalogue. As you know, right now we are concentrating on forklift trucks and you see the types of numbers in terms of the hydrogen costs for a dollar per kilogram.

So, our fuel cell customers at distribution centers usually have about $8 or $9 per kilogram.

We are looking to expand our product catalogue into on-road applications, which is the TRUs, the refrigerated trailers.

And by having a customer have both forklift trucks and TRUs, we would increase the volume of hydrogen consumption to the point where the all-in costs of hydrogen drops from about $9 a kilogram down to about $6 a kilogram.

And so people that have fuel cell vehicles would also enjoy that cost reduction because of pushing out the volume versus cost curve.

MS. SAVIN: Now, unless there are any questions about those three slides, I wanted to speak to the present situation and the push and pull we seem to have right now with our customers in trying to engage in these solicitations, at least for the last two years.

Are there questions or may I move on?

MR. STAPLES: Well, I have some comments on the previous --

MS. BARONAS: Pardon me, if I may -- if I may interject. Sharalyn, this is Jean Baronas in the California Energy Commission, could you please frame your next comments as those that would be important to

us going forward in the future?

MS. SAVIN: Sure. Sure, no problem.

MS. BARONAS: Okay, please go ahead.

MS. SAVIN: Okay. Moving forward, since you have noted that there is an eligibility for our application so long as we serve the purpose of wanting to have fuel stations for fuel cell vehicles.

We've had many customers, including Sysco, ask us why they're -- why people aren't seeking out to just do simple extensions of the hydrogen infrastructure already on site for outdoor dispensing stations for vehicles.

This investment already has been made by the customer in the major infrastructure, they've already laid out the $800,000 to a million, in some instances, to put the hydrogen infrastructure in, and we'd simply be adding a pipeline dispenser to an outdoor dispenser for vehicles to use.

It would not be a full retail station, they would have availability of assistance, if it was so required, and they would have the availability of reduced cost hydrogen because it is coming at such a volume at the site.

But there seems to be a misunderstanding that because we are allowed to participate we have been able

to do so with the types of restrictions and minimum requirements set forth such far.

That's why moving forward we have a very, very excited customer base that wants to be better able to leverage their technology. They're very comfortable with hydrogen refueling, they've been doing it. They really want to help promote it more globally.

And the major expenses had been laid. We are talking, as compared to building ground up a regular hydrogen gas station, if you will, you have the majority of the investment already made and we're just simply looking for an extra funding from the State to facilitate another dispenser for cars.

We strongly believe that if the CEC better understands our customers' flexibility, where they can move and where they can't move in making this available in an unrestricted way, that you would have a number of stations at a very low cost along the thoroughfares that seem to be targeted for international hydrogen highway, and in California as per NREL. I'm not sure if this group agrees with that.

But we are very interested and we'd like to know how to best complement -- how to best complement your desire to have this done. We have customers who are more than willing to be partners and there seems to be

some type of gap and misunderstanding on how to have it happen.

But it seems to be quite an economical solution for all parties involved.

MS. BARONAS: So thank you so much for your input and I'm calling on Larry Watkins, from the AQMD, to comment.

MR. WATKINS: Hi Jim, Hi Sharalyn, this is Larry Watkins.

MS. SAVIN: Hi Larry.

MR. WATKINS: Hi. I happen to agree with Plug Power's comments so far. They're correct, there's a lot of infrastructure that they are laying. There's the hydrogen stations that they're putting in for their customers are tried and true, and they work day in and day out.

I don't -- I stepped out of the room for just a moment, I don't know if Jim mentioned how many tens of thousands of fills you've done last year. Can you comment on that, Jim, real quick?

MS. SAVIN: I don't know that we have those numbers in front of us.

MR. WATKINS: Okay.

MS. SAVIN: But I can certainly provide them to the CEC.

MR. WATKINS: Andy can always say those, they're always on the tip of his tongue.

But in any event, earlier, just before you came on to the phone, Sharalyn, we were talking about appropriate market diversity and siting of these kinds of stations. And we were talking about the cluster groups and there's not necessarily large warehousing operations, per se, in and around the clusters that have been identified by the OEMs and the Fuel Cell Partnership.

However, from a connector station stand point, Bill, you mentioned this directly, it makes a lot of sense. And that's where, oh, companies like Sysco, that you had up on an earlier slide, I saw it fleeting, it makes a lot of sense.

And, yes, I believe that you could have a lot of more hydrogen fueling stations but without the "retail experience" that's being required by the PONs.

Now, having said that, having learned something from the CNG world, a lot of those stations weren't, in the early days, shining examples of a retail fueling station.

In fact, the one in Glendale was famous as a high through-put, it looked like a -- well, it looked like an empty lot, say, for a dispenser.

Sand Canyon, that's not a -- that's the highest through-put private station, I believe, in the State, if not the nation, and it's basically unmanned and it's nothing pretty, there is no convenience store, but they're providing fuel to a tremendous amount of people.

So, I don't know that you necessarily need a C-store or the entire retail experience. Although, if we're targeting the high-end consumer that's what they're used to.

So then is a station down in Torrance really the kind of high end station that would cater to the folks coming off of the P.V. Peninsula?

It's just a question. It's a question.

But, anyway, I'm agreeing with your statement that you could have more hydrogen fueling, at a lower cost, building upon these kinds of stations, these kinds of sites that you're providing hydrogen to. And it's not just you, it's others as well.

MS. SAVIN: Yes.

MS. BARONAS: This is Jean Baronas from the California Energy Commission.

Is the retail-like experience one of the major characteristics that differentiates the station from what we've talked about thus far today, or are there other characteristics?

MR. ELLIS: This is Steve Ellis with American Honda. Can you hear okay, Jean?

MS. BARONAS: Please go ahead, Steve.

MR. ELLIS: Okay, thanks. I think what we've just seen is a great potential that does need to be explored and there's some opportunity there. At the same time, we've been posed with this question for, I'd say, at least five years, and I think it was good that4 Larry brought up some of the CNG experience.

And I'll just weigh in on a couple of these points, but I also want to make sure that I leave it in a very positive way, and in the context of your point, Jean, about everything toward the future.

When I say exploring the opportunity, I would say someone should maybe look at all the potential sites that Sharalyn is proposing and maybe try to find one or two that could best serve that -- the value of customers. And it would probably require some integration through the partnership with us automakers on the front end just, you know, from a location stand point.

At the same time, as I presented last week, we do represent the voice of our customers. And, you know, while we hold certain things close to the vest, we're willing to share for these purposes that we do focus

groups with the customers. We ask them about what they expect of a station.

So, I'll be very specific, some of our Clarity customers actually are also ex-drivers of CNG vehicles and have used some of those same stations that Larry mentioned, and they are differentiating. They are saying that that type is what they do seek to avoid seeing developed over the future, that they do appreciate the value of a well-lit, easy ingress/egress station, without mixed vehicle types, hence, medium, heavy duty.

And, of course, I know the discussion came up earlier about 24/7, without gates and access to get through.

At the same time, I think when it comes to like a connector or even a destination that might be lightly used, then they're going to be less judgmental. So, it comes down to what could be called their primary station, their primary use versus an exception.

So, what I'm offering is that in the beginning here one way to approach what Sharalyn's proposing would be to look for some of these in an area that typically is industrial, but could be leveraged as a connector or a destination.

But to your question, Jean, the customers are

clearly weighing in that they expect an operation very similar to what they do with gasoline today. And even the Irvine, Sand Canyon CNG station is what I would call unacceptable as a pathway forward.

MS. BARONAS: Thank you, Steve, so much for your candid --

MR. ELLIS: Thanks.

MS. BARONAS: -- candid input.

So, I'm so sorry to put you on the spot, Bill, but Steve mentioned something and it kind of got garbled with the transmission, but something about how the Fuel Cell Partnership members would have to be consulted, or weigh in, or get more consensus from.

Can you speak to that? Did you hear that, too, or --

MR. ELRICK: I'll look to Steve to see if I caught it right, but I think he was -- in part he might have been referencing the group. But I think he might have been specifically referencing the OEM workgroup. Is that right, Steve?

MS. BARONAS: Hi Steve, we're waiting for your response on WebEx.

MR. ELLIS: I'm sorry, I had my phone muted. That is absolutely true, Bill, in reference to the OEM workgroup or at least automakers because, again, we are

the voice of our customer. And if we wanted to work closer with Sharalyn about looking at some of these potential sites, no different than we have in the past looked at potential sites and how it might align with our customers and the market needs, I think a good way to do that would be through the Partnership.

MS. BARONAS: Thank you.

MR. ELRICK: And if I can add, this is Bill, you know, that's what the road map was trying to identify, and all the research and process that went into that was to outline that pathway.

And the one thing that strikes me right now, as we deal with this and everything we have, and last week, is it makes your job harder but it's -- none of this is very black and white, and there's a lot of balance and flexibility, and finding enough guidance and criteria to give people the same understanding of where to go forward.

But at the same time, that flexibility to see when something like this might be an amazing fit and when it might have some restrictions on it, just as an example.

MS. BARONAS: Okay, thank you for the input, all of you.

Any other comments?

DR. BROWN: This is Tim.

MS. BARONAS: Go ahead, Tim please.

DR. BROWN: Just to add one thing, the forklift sites are generally 350 BAR. The incremental cost to add 350 BAR vehicle fueling would be very low. The incremental cost to add 700 BAR for vehicle refilling may be higher, I don't not know, but that would be something to consider when looking at these. What seems like a very easy opportunity might be more challenging when you add the performance restrictions.

MR. PETRECKY: I agree, there is 350 BAR at the material handling distribution centers. But a booster, with a compression ratio of 2 to 1, to bump it up to 700 BAR would be a relatively low expense compared to, you know, a full site.

MS. BARONAS: So, please identify yourself and your organization, who just spoke on WebEx.

MR. PETRECKY: Sorry, this is Jim Petrecky from Plug Power.

MR. ELLIS: Also, this is Steve Ellis. Jim and Sharalyn, once again appreciate your thought into this. And I also was just thinking maybe we consider turning it around another way, which would be if we identified these locations to you from a connector and destination stand point, whether you'd be interested in looking at

an opportunity to find a customer there that aligns with your side of the business, so to speak, and if those two dots could possibly be aligned.

MS. BARONAS: Please identify yourself and your -- excuse me. Please identify yourself and your organization. I believe it was Steve who just spoke, but I need your first and last name, and your affiliation.

MR. ELLIS: Yep. Sorry, Jean, yeah, it was Steve Ellis with Honda.

MS. BARONAS: Okay, thank you.

Go ahead, Sharalyn.

MS. SAVIN: Yes, I wanted to say that we are very, very open to having any conversation at all about this, to try to facilitate a pathway moving forward.

We are very cognizant that there is not going to be a one-size-fits-all station. I think the discussion relative to having connector sites makes a lot of sense in light of what the focus group conversations are saying.

But at the end of the day we offer, comparably, a much lower-cost solution that provides the same type of hydrogen.

And relative to the 700 or 750 BAR, to the 350 BAR, our customers are aware of that and they do know

that there's going to be some extra expense associated with putting in a dispenser that can meet the needs of an on-road vehicles.

Nonetheless, they're still very enthusiastic and I have gotten frequent calls, particularly from Sysco, relative to what and who they can engage to try to be a partner in this.

MS. BARONAS: Okay, thank you.

MS. SAVIN: So, thank you for at least being willing to consider where we fit in this puzzle, because I think this entire group believes that the faster we can make this available, in whatever form, the faster we'll promote this technology and fuel cell vehicles.

MS. BARONAS: Thank you, Sharalyn. So, again, I'm going to put Bill on the spot and just say no, or do this, if it's no-no. But is there an action item on the part of your organization to follow up?

MR. ELRICK: With -- yeah, I would say that the road map was our first effort to make sure it was a very clear, public, transparent pathway of where industry is trying to head to get to this commercialization stage.

And Plug Power or any group out there, to make this work, you know, we're beyond our membership. We are trying to make this work.

So I would just say I can make my contact

information available, I'm findable on the web. But in this case, to match locations versus what's been in the road map and where we're going, I'm more than happy for me or our staff to find the complementary efforts.

I'm not sure if that's what you were asking but I'll --

MS. BARONAS: Yeah, it is.

MR. ELRICK: -- I'll put my name out there, yeah.

MS. BARONAS: Okay. And to the extent that I can personally help, or maybe Larry, I don't know. It just seems like we need more time to flesh this out and to understand it better.

MS. SAVIN: Yes. This is Sharalyn Savin and I think, ultimately, it comes down to softening retail expectations for connector station applications, if you are looking for a direct input for an action item.

And if you need more specifics on what that looks like, we are available any time to have that conversation.

I am sorry but, Bill, I did miss where you were from and your last name.

MR. ELRICK: Bill Elrick, E-l-r-i-c-k, with the California Fuel Cell Partnership.

MS. SAVIN: Thanks very much, Bill, I'm sorry.

MR. ELRICK: No problem.

MS. BARONAS: Glad someone is following protocol here and it certainly wasn't the moderator this time. Thank you, Sharalyn.

MS. SAVIN: Oh, no, I didn't mean to say it like that.

MS. BARONAS: No, it's good. It's actually good, actually. We're happy over here, we're good.

MS. SAVIN: Okay.

MS. BARONAS: Okay, so if we could please -- oh, Tobias Muench from the California Energy Commission.

MR. MUENCH: Just a quick question to the Plug Power folks, Sharalyn and Jim, can you give us an idea of what your typical capacity of peak fueling through-put, with these existing stations, these Sysco type forklift stations, what they provide?

MR. PETRECKY: Currently, the liquid cryogenic storage tank holds about 20,000 gallons. So, a lot of times there's about 200 kilograms a day, 150 to 200 kilograms a day that's being used by the material handling equipment. And the tanks will be refilled, generally, every one to two weeks.

So, there's plenty of capacity, if that's the question.

Additionally, there can be changes to the liquid

hydrogen infrastructure that's on site to accommodate more consumption if, you know, there's high traffic to an outside dispenser, then there can be changes to the liquid hydrogen infrastructure on the site.

MR. MUENCH: Is that hydrogen stored liquid or gaseous on board the forklifts?

MR. PETRECKY: On the forklift, itself, it's gaseous. So, in the liquid hydrogen infrastructure that's on site it is transported and stored in liquid form due to the energy density efficiency. And then it is vaporized to gaseous form and compressed using centrifugal and then dispensed at 350 BAR.

MS. BARONAS: Thank you very much.

MR. MUENCH: Thank you.

MS. BARONAS: And, Larry, please identify yourself.

MR. WATKINS: Larry Watkins, AQMD. I was prepared. I was going to say, if Matt Miyasato was here, he was going to volunteer my services, anyway, so I'm happy to provide whatever help I can. Not only to Plug, but to the others that aren't here today.

Nuvera was here last week, they have a very interesting business model, the same with Hydrogen Frontier and, well, all of the rest of them. We're in the game to help as much as we can. Thank you.

MS. BARONAS: Thank you so much. This is Jean Baronas of the California Energy Commission.

So, Sharalyn, I'm curious to know if your sector is using near-fill communications or RFID as part of your user interface?

MR. PETRECKY: This is Jim Petrecky from Plug Power. The hydrogen infrastructure has telemetry for 24/7 remote monitoring. I think that's the question that you're -- or the answer that you're looking for, is that right?

MS. BARONAS: Part of it. I'm also looking for the user interface, this retail-like experience. There's so many standards available to usurp the retail-like experience with near --

MR. BOYD: This is Bob Boyd, I'll take just a quick stab at that. And the indoor fueling, forklift market is using 350 BAR and it's a standard, relatively standard SAE interface, but it's not fast fueling the way vehicles are fueling. The typical forklifts are two kilograms content each and they fill in maybe two minutes, something like that, so that's roughly one-kilogram-a-minute fueling.

They would not use IRDA, they would not use 700 BAR, they would not use --

MS. BARONAS: I'm going to another angle on

this. There was discussion about retail-like façade, experience, appearance, retail-like. And I'm asking if your market sector uses any communication standards to either identify the user, charge the user, any of the commerce-centric points.

MR. BOYD: The model is really, typically more than the industrial gas company supplies liquid to the tank and bills on a tank load that they drop off. And then the compressor pressurizes the hydrogen to a series of dispensers that are around the building, and then the dispensers tend to be fairly dumb and people are opportunity fueling.

And, now, there are some vendors that are using RFID tags to identify the vehicles as they fuel, but that's optional, that's nothing with the fueling protocol.

MS. BARONAS: But it is happening a little bit, at least, in this sector that we're talking about now?

MR. BOYD: Yes.

MS. BARONAS: Okay, thank you, that's all.

MR. PETRECKY: This is Jim Petrecky from Plug.

MS. BARONAS: Okay, Jim, go ahead.

MR. PETRECKY: I'd just like to add it is correct that the dispensers -- I guess they don't have the types of dials, or electric -- or electronic

displays that show, you know, number of kilograms and that kind of thing because it is being used within the distribution center, and the invoicing from the merchant hydrogen providers is on a gross, or aggregate scale instead of, you know, on a user-by-user or forklift-by-forklift basis.

But those types of dispensers, I mean that's just one element of the total liquid hydrogen infrastructure, so it can be, you know, swapped out for something that's a little smarter.

The fuel cells and the forklift trucks do have IDs and so when they communicate with the dispensers there is an exchange of information and the dispenser, itself, can recognize forklifts or fuel cell systems.

MS. BARONAS: Okay, thank you for the input.

Do you have more?

MR. ELRICK: I think they covered it. This is Bill Elrick. I think the biggest change and it would probably be addressed through an upgrade system is it's a single user, essentially, in these environments versus multiple automakers, or multiple customers, so that's -- but that would be addressed in an upgrade process.

MS. BARONAS: Okay, thank you for the input. So, I'd like to move on. Yes?

MR. ELLIS: Just one last point on this, this is

Steve Ellis once again, with American Honda.

I think there could also be a model here that could be looked at and I started looking at some of the locations that Sharalyn and Jim showed, and one example is Oxnard, at a Proctor & Gamble plant there.

Now, if I'm correct, I think some of the same fuel providers that are supplying fuel to our vehicles today are also providing kind of inside-the-building hardware to supply the material handling equipment.

So it makes me wonder, again, if the synergies align properly, these makers already have experience doing both, the vehicles, the light-duty vehicles that we know as automakers, and also that equipment.

In this particular location it appears that the plant is, you know, within a half-a-mile on the 101 freeway on what some of us have described as a route up the coast toward Santa Barbara and things like that.

So I'm just putting it out that on the CNG side we have examples where all the compression and, let's say the hardware, are what's called inside the fence or inside the gate of a gas, like Southern California Gas, PG&E. And then what they do is they provide a cutout, outside the fence, where a dispenser is placed, along with a payment system and kind of a well-lit open area.

Most of those serve fleets today. But I think,

once again, if we differentiate this as, you know, a connector station and understanding that the requirements for that may be less stringent than a station inside the cluster, or especially in the community where the customer lives, this could be an example of how that would work well.

MS. SAVIN: Yes, this is Sharalyn Savin from Plug Power. That is exactly what is being proposed.

MR. ELLIS: Okay, thank you.

MR. STAPLES: I have a comment. Hello.

MS. BARONAS: Yes, this is Jean, please go ahead.

MR. STAPLES: Okay, yeah, this is Paul Staples from HyGen Industries.

I have to say I agree with the Honda's analysis of the situation. If the situation exists in a commercially easily access location, without restriction in and out, I say great, okay, that's fine.

But the purpose of this is to get commercial fueling stations out there for the commercial public to purchase and fuel vehicles.

And for that, and particularly in cluster areas, I think that that's going to be critical.

Connector stations, you know, when you're in a tight spot and you need the fuel, you pretty much will

bypass the whole commercial fueling experience in order to get fuel, and that's true. And they should be available for that and if there's any funding that could be provided for that, to be able to provide that kind of emergency fueling, and local fueling, I think that's great.

But I think, basically, our main focus has to be on commercial fueling stations.

One other issue, someone mentioned experience is critical. Yeah, experience is critical, but this is all new for all of us. There aren't a whole lot of people out there that have installed, you know, 20, 30, 10, 15 fueling stations all at the same time, all in a year or two process. So, this is all new for all of us.

MS. BARONAS: Thank you, Paul.

MR. STAPLES: And there's no one here that can claim that kind of experience because it's never been done before. So, from that perspective, I thank you for the opportunity to comment.

MS. BARONAS: Okay, thank you, Paul, for that. In the interest of time --

MR. CARMICHAEL: Hello, this is James Carmichael, may I make a comment, a brief one?

MS. BARONAS: Yes, please. Please go ahead.

MR. CARMICHAEL: This is James Carmichael with

Naval Facilities. I'd just like to echo Plug and Play's interest, maybe in future solicitations, for reducing the retail experience requirements for connector stations.

In terms of the fueling station, hydrogen fueling station we have at Camp Pendleton, we would -- we can't really provide a full retail experience, so we would like to see for, maybe in the future, a possible reduction in that.

And then also, for future solicitations, we would also be interested in possible funding for stations that will serve bus and non-road projects. We are looking into hydrogen buses for Camp Pendleton, so that is an interest for us. And I just wanted to echo what Plug and Power said.

MS. BARONAS: Thank you so much. Would you please spell your last name?

MR. CARMICHAEL: James Carmichael, C-a-r-m-i-c-h-a-e-l.

MS. BARONAS: Thank you so much.

MR. CARMICHAEL: And I'm with Naval Facilities.

MS. BARONAS: Thank you so much for your input.

Okay, so we're going to --

MR. SLEIMAN: This is Ghassan from Hydrogenics.

MS. BARONAS: Yes, please, Ghassan. Go ahead,

please.

MR. SLEIMAN: Can someone mute that line? Thank you.

This is just to add to the discussion, reducing the requirements for a retail station, for a connector station, I fully agree with that.

The value in a station, generally speaking, connector stations are upgraded commercial stations or have the majority of their fueling occur on weekends or on holidays.

So, if that same station can have a good through-put during the weekdays that should add to the value or the scoring of that station. If they have a shuttle bus, they have forklifts on site that can use the hydrogen.

And I would like those to be considered as a high a priority as other stations and will be useful. Thank you.

MS. BARONAS: Thank you so much.

MR. KIEZEK: This is Ed Kiezek from Air Products, can I make a comment?

MS. BARONAS: Yes, please, go ahead.

MR. KIEZEK: Yeah, Ed Kiezek from Air Products. You know, obviously, we work with Plug and we've got somewhere around 20 of these material handling station

opportunities that are running.

I just want to be clear that, you know, the user interface there that would apply to J2601 doesn't exist. You still need to add a considerable amount of equipment, like cooling, storage and compression.

So, the capital, and we've looked at this, is not necessarily insignificant.

I will say that the 350 BAR that we have -- all of the stations that we have run 100 percent on, and I'm sure would never shut anybody down. But I'd like also like to add that if you open to the material handling sites, there are other industrial gas companies -- industrial gas customers in California that you would almost have to open this up to, as well, because they obviously have significant amounts of hydrogen on site.

MS. BARONAS: Thank you so much for your very valuable input.

Would all of you please mute your phones on WebEx? Thank you.

Okay, so in the interest of time I'd like to pull up slide 08, kind of our last topics for the day.

So, just making notes here. Okay, so here talking about some ideas, and please chime in, for the future solicitation in the area of product readiness.

And so, one idea is about the station developers

being ready and committed to their proposed locations and that they should actually document the commitments with their applications.

So, why is that? Well, we want thorough, thorough input to make good decisions. And so that would include letters of commitment from site owners and station owners about the plans to provide hydrogen fuel at the retail station.

Proposed addresses being clearly documented, I mean, literally, street address clearly documented, zip code, nothing left open or wondering about.

A letter from the CEQA lead agency that includes documentation reflecting advance discussion with the local CEQA lead agency, for example, do they concur that the project would be exempt, either categorically or statutorily, and/or a mitigated negative declaration, or is it even a project.

And then, finally, demonstrated proof or evidence of regional and local first responder in fire protection expert's involvement and their outreach.

So, these are simply concepts today that we'd like to talk about with you as potential parts of the future solicitation.

So, I'd like to open it up for comments. Jim McKinney.

MR. MC KINNEY: Yeah, Jim McKinney, let me expand on what Jean has put on the table here. Across the board, in our solicitations and proposals, we are seeing an increasing number of issues, problematic issues with getting documentation of CEQA compliance with the local lead agency. And we are building these project readiness concepts into all our solicitations.

You know, we thought it would be most acute on, say, bio refineries, where you've got a major industrial facility that you're siting.

It's actually been more troubling on things like CNG stations. So, given that there may be some ramifications from the Emeryville incident and, say, some increased level of questioning from local lead agencies or permitting authorities, CUPAs, local fire marshals, et cetera, it's really important that our applicants get a jump start on these issues.

And one that's just critical is initiating that dialogue with the local lead agency before the proposal is submitted, so we have documentation of that, and so that that local lead agency is queued up and knows what to expect, and knows that they need to make a determination if they want to be lead agency, or defer to the Energy Commission, which also can assert lead agency jurisdiction if the local lead agency chooses not

to do that or cannot do that. So that's what we mean here.

And, again, this is something that we've got issues across the board on fuel categories, vehicle -- not vehicles -- fuel categories and solicitations, so some version of this will be in the future solicitation.

MS. BARONAS: So are there any comments or questions?

MR. STAPLES: I do.

MS. BARONAS: Okay, Paul, go ahead.

MR. STAPLES: Paul Staples with HyGen. Yeah, I have a question for the CEC folks at this juncture, on this issue, on CEQA.

The renewable generated hydrogen that I'm proposing is one hundred percent renewable. Is, you know, made from solar, wind, wave, whatever, through a power purchase agreement. There's absolutely no carbon involved in the process and none being released, even in the vehicles. So, can we just get a -- can you guys just get an exemption for that kind of an approach, rather than having to add to the workload?

It's just that's the way it was done when we did the Clean Air Now Project, it was no CEQA, we were exempt, okay, because of the way we were doing it.

And if that is the case, why not just go ahead

and make that determination so that you can avoid that problem. That would be an incentive that would be very helpful to anyone proposing that kind of an approach.

MR. MC KINNEY: So, Paul, this is Jim McKinney and thanks for raising that. I've invited staff counsel, Amanda Stein, to join me here at the microphone.

CEQA doesn't really care if it's renewable hydrogen or not. It is what is the footprint and the potential for adverse effect from the trenching, from the increased traffic, potentially, from anything that goes with installing a new portion of a station, an existing gasoline station

So, everybody who applies for our program really needs to be familiar with this part of CEQA. Many a qualified applicant have stumbled on this issue over the years.

And, Amanda, do you want to add anything to this?

MS. STEIN: I guess I would just add that -- again, Amanda Stein, staff counsel, that we can't opine on general categories. Each project has to be individually analyzed under CEQA. Thank you.

MS. BARONAS: Thank you very much Amanda and Jim.

Any other comments or questions in the room on this topic?

MR. STAPLES: Thank you.

MS. BARONAS: Go ahead, Steve.

MR. ECKHARDT: I think it's been discussed before that CEQA oftentimes is processed by the local municipality. Oftentimes, those local municipalities won't do anything until it's a project, which means you have funding, everything's been sorted out.

So, to say that CEQA designation is required prior to funding in some localities would be an issue. In some localities, it may not. Every locality is going to consider it differently, though.

So, to the extent that significant hurdles are in place for CEQA up front, it may just eliminate some localities that will say I'm not looking at this until you file all the papers for permitting and everything.

MR. MC KINNEY: And so Jim McKinney. Yeah, thanks for adding that and I welcome other station developers to add their experience in, as well.

We're not looking for completed CEQA documentation at the point of proposal, so sorry if there was miscommunication on that. But we are looking at evidence that that discussion has been started with the appropriate local lead agency.

Again, because when it -- when nothing happens until the point of a NOPA or even an executed agreement, we lose a lot of time in getting these things up and running and going to construction.

MS. BARONAS: Yeah, thank you, Steve, for that. I think the bullets one and two, under the letter from CEQA lead agency there might have not led you right there. But documentation should reflect advanced discussion with the lead agency, not necessarily their final, their final, final.

MR. ECKHARDT: Really, the governments will not give an indication of anything. They will only give you a formal declaration when you follow all the rules. They won't give you an indication of, yeah, I think it's exempt. Because then they've put themselves in a position of where if they don't exempt you, you know, they could be in trouble.

So, oftentimes you get one response from them, whether it's for a permit or for anything, a city will typically just give you one response, and that's the final response.

MS. BARONAS: Thank you for your input. So, I just want to, if Dr. Brown can bring his laptop up, during the break he found, he showed me one of his charts from last week's presentation on kind of a, lack

of a better term, triage effect on the concepts of clusters, and connectors, and destination.

And so could you show us that table you presented last week? I think it's kind of an interesting way to kind of close this session. We do need public comment period, too.

Can you bring it up here?

DR. BROWN: I may be able to.

MS. BARONAS: Possibly.

Okay, while we're waiting for the hookup, please, Bill, give us some comments on project readiness.

MR. ELRICK: Okay, a few things. One, I think CEQA's a good example of even with the best intentions not everything can be done up front. And I would turn it around and say this is a point where CEC, or any funding agency, my advice would be you're going to have to bird dog them.

Whether this be the comment, earlier, about possibly having milestones or different ways to keep things moving, it is my opinion that to make these stations go faster, to open, you're going to have to call them constantly and ask where they are. Don't wait for the station developer to come to you where they are in a permitting process at CEQA.

Looking at the history of all the different stations, the ones that were the fastest to opening day where ones where someone literally bird dogged everyone, every minute they needed to be and were on the phone constantly.

MS. BARONAS: Bird dog? Bug?

MR. ELRICK: Bug.

MS. BARONAS: Okay, bug.

MR. ELRICK: Be a pain in the --

MS. BARONAS: Okay, who are you saying should bug who?

MR. ELRICK: I think in this case I think it would be most valuable is the CEC, as you fund stations, to be bugging the proposals, the winning proposals on a very constant basis, where are you, why haven't you gone faster, what's holding --

MS. BARONAS: The proposals, they're paper.

MR. ELRICK: Well, the bidders, the winning bidders.

MS. BARONAS: Okay.

MR. ELRICK: It's just something we've seen historically through stations, the ones that go the fastest were the ones that had, essentially, a project manager from, we'll call it the funding side, bugging everyone down the line to make sure it was done on time.

Because I know everybody has, we'll say, many other day jobs, and many other programs, and projects, but that's probably what history is teaching us is bugging more people.

MS. BARONAS: So noted.

MR. ELRICK: The other two comments I had, one of them was as far as having a street address, I think it's very important to have as much concrete information as you can.

But something to consider is any number of factors could cause that address to go haywire. And we've seen this in the past and I'm wondering about a ability to have some flexibility. If CEQA failed or something happened to where, instead of seeing a project go away and worst case scenario, the money disappears, could they try to renegotiate across the street or within a reasonable location proximity to get what was expected, which is a station in that proximity demand location, even if it does mean that exact address isn't the one that it turns out to be.

Just a consideration for the future PON.

MR. MC KINNEY: Bill, can I respond to that? yeah, I think that's a good point, Jim McKinney, again.

And, you know, after the point of award our grant process does allow for that. So, if there is some

need to switch sites -- I'm looking to Amanda, she's not shaking her head no. Okay.

So, it's comparable to, say, switching out a subcontractor, something like that, there is that flexibility in the process.

And again, I think especially for that scenario that you just laid out.

What we're trying to get away from are those situations where we've got, you know, maybe some proposals that are less well developed than others, so that's what we're --

MR. ELRICK: You want as much concrete up front, I agree.

MR. MC KINNEY: Yeah.

MR. ELRICK: So the last comment I wanted to make was the emergency response officials, just want to make a little plug. The Fuel Cell Partnership, for years, has been doing emergency response outreach. We have a very well-established program that we've been going out to most all the locations that are currently on this priority list and we'll continue to do that, that's part of our work.

But we -- I raise that so that there's awareness out there that we'll continue that and we want to work with all the potential bidders and proposers that we're

always trying to educate the ER and the emergency response folks so that they are ready, and the permitters are ready as much as they can be. So that the first time they see a proposal, or they see a vehicle, or a station, they were a little more aware than waiting until the first day it appears.

MS. BARONAS: Should the -- this is Jean Baronas from the Energy Commission. Should the future solicitation possibly include text requiring some kind of proof that there has been communication with first responders and that there's publicly available information about how to respond?

MR. ELRICK: I don't know if that's necessary as much as, obviously, it would help everyone if they've done that. We're trying to do that, regardless. We're needing to grease the wheels to make sure everybody's ready and that's something we think we can do to help the industry across the board. I don't know if it needs to be a PON requirement, but it might be -- not only behoove the situation, but show that they've done more legwork, kind of like reaching out for CEQA information, if they can get it.

MS. BARONAS: Okay, thank you. Yes, Bob?

MR. BOYD: Sorry, Bob Boyd. Yes, I just wanted to reiterate what you were saying about reaching out to

the local authorities who have to permit the station. And, yes, you should put some requirement in the PON to make sure that people are reaching out to the local fire authorities and communicating closely with them.

MS. BARONAS: Thank you very much for your input.

And Garrett, please?

MR. POPPE: In dealing with these companies, trying to get the CEQA approved, I'm going to have to agree with Mr. Eckhardt that it's -- they don't want to approve anything right away, and they don't want a say in it.

So, I mean a clear discussion with them in the beginning would be great, but maybe there should be some period of time afterwards that you have to have your CEQA done by, or after you're awarded your money.

But in regards to that, it's very difficult to get it before you actually have your project done and permitted.

MS. BARONAS: Okay, thank you.

MR. ECKHARDT: This is Steve Eckhardt from Linde. With respect to the other points that were on there, in terms of letters from station owners, for example, that to me seems very reasonable, especially if you get into -- or especially if you do leave open the

option for changing the location down the road.

And I say it for two reasons; one, you should have reasonable confidence that you've got a station owner that is interested, and wants to do this, and has signed something that says, yeah, he intends to do it.

And, secondly, you don't want to encourage people throwing a site out knowing full well that the site won't work, just figuring they'll figure out another site later, which is obviously not a -- not something you want to incentivize at all.

But it's not that hard to get station owners to proceed, necessarily, so getting those letters is not over the top.

MS. BARONAS: Okay, thank you very much for your input.

Okay, so Dr. Brown has graciously given us his slide, which he did show last week, too.

During lunch I went up to my desk and I put Post-It notes around clusters, and then connector, destination, and I said to myself how many times do I repeat that, where, what's the benefit? I don't know.

But Tim has done this work already and so what we're looking at is, I guess, a very orderly way to plan a network and --

DR. BROWN: This is Tim, if I can just walk

through this.

MS. BARONAS: Please, go ahead.

DR. BROWN: I would have liked to have seen the Post-It notes, that would have been --

MS. BARONAS: No, that's okay, they're in draft form but --

DR. BROWN: So, I can take some credit for the 68 number, I certainly helped contribute to that. But for the rollout to get to 68, that primarily came from automaker surveys, we helped prod them a little bit to get to that number.

But you can see here we list, in the very first column, existing stations prior to any CEC involvement in hydrogen.

The next column includes the CEC stations that were funded in 2010. I show seven here, and CEC funded more than seven stations, but there are seven new sites. The other ones were upgrades.

And you can see that those sites were all in the top three areas there, which are the main cluster areas.

So, if you look at this table, the top five locations, the first five rows are the main cluster areas, Santa Monica, Torrance, OC, the Bay Area, and Berkeley.

Below that, the next sort of section of cities

or areas are what we're thinking of as new clusters, bridging the network into new clusters.

And then the bottom segment are the sort of true destination or connector stations.

So, you can see what's this third column, proposed phase one, as I called it here, would be sort of the automakers first -- next 12 stations they would like to see.

You can see there's a heavy concentration in the cluster areas, but they also begin to bridge into these new markets.

As you see, Pasadena, San Fernando Valley, San Diego and San Francisco.

And then the proposed phase two would be the next round of, I think, yeah, 15 stations will be the next on the list of priority.

And here you see that there's actually -- it begins to bring into play the true destination and connector stations, the Lake Tahoe, Palms Springs, Kettleman City to bridge between North and South California.

And then proposed phase three is another 22 stations across the board, in various areas.

I think it should be noted that the 22 number is more vague, it depends on what comes first. Each of

these phases sort of rely on what comes previously.

But I think if you look at the phase one and phase two as a total of 27 stations, that somewhat aligns with the $30 million or so that's available. Certainly wouldn't be able to fund all of those stations, but it would certainly be a good start.

So, I think from the information that I have from automakers and our own research, the phase one, those 12 stations, those would be the highest priority for the next round of funding, followed by the phase two, the next 15.

MR. KEROS: Yeah, this is Alex with GM, Alex Keros. And thanks, Tim. Just to one highway, for the record, is that this is an automaker's sort of exercise that we went through.

I think walking through it we would want to -- I know even right now that some information has changed, right, so we might have to adjust that based on some changes that happened even in the last couple of weeks with different stations.

But I also, just a caution, let's not use this table as sort of the planning effort for the next 68 stations, but I think it can help prioritize the near term and that maybe we would want to do this type of exercise again down the road.

MS. BARONAS: So this is Jean from the California Energy Commission. Alex, just so I understand, when you say exercise, you mean some kind of aggregated discussion, an output into a table that has more current data; is that correct?

MR. KEROS: Yeah, I mean that’s exactly what you’re looking at right now, Jean, is the OEMs sort of took it upon themselves to go through that exercise which was, you know, how would you -- you know, phase one, if you will, what’s the next priorities, and that’s what you’re seeing right now.

So, yeah, I would say I think we would want to do that each time we revisit, you know, any type of proposals.

And, too, I think we also -- I think, and correct me if I’m wrong, Tim, I think there’s some new information. For example, we know the Bay Area has lost a station, right, or at least a very specific address, so we might have to reconsider that in sort of the updated version.

MS. BARONAS: Okay, thank you for that. Any other comments or --

MR. FORREST: One additional comment?

MS. BARONAS: Yes, please, go ahead. Identify yourself.

MR. FORREST: Yeah, this is Matt Forrest, with Mercedes Benz and I want to add to what Alex is saying. And that is to identify the -- that the 68 stations was targeted at the beginning of 2016. And as we get closer to that date we don't have time to do three phases anymore, and so these phases are beginning to run together.

I would assume, personally, that phase one and phase two need to merge in order to stay on a timeline.

And so, again, with what Alex said, this is -- this table needs to be updated. That's my comment, thank you.

MS. BARONAS: So noted, okay.

Yes, Garrett, did you --

MR. POPPE: Thank you, no, I don't, the comments were said already. Thanks.

MS. BARONAS: Okay.

MR. POPPE: I was going to say the same thing, that those phases are shrinking together.

MS. BARONAS: Okay, thank you.

Okay, so --

MR. STAPLES: I have one comment.

MS. BARONAS: Just a second, we've got a person who raised his hand in person, so sorry, Paul.

Go ahead, Bill.

MR. STAPLES: Okay.

MR. ELRICK: This is Bill and I may reiterate, just to say it another way, is that this -- as one piece in the puzzle shifts, obviously then we have to reassess. And I think what the goal of this is to do is to try to figure out where in the PON you want to focus the first effort, knowing that if -- and again, this is a static moment in time right now, this table, and it gives you where at this point the focus should be in the phase one. You get as many as you can there, you might not get all of them.

And you get what you can into phase two with whatever money remains, knowing that once that happens then you have to do a reset and say, okay, what is the first priority now?

And it may be you pick up the first phase ones that didn't happen or it may change, some of those may drop further down, or some of the phase three may work up. Each time you have to start with what's existing.

And what was referenced now is there might have been a station or two in that first, existing column that has changed and, therefore, it has a reverb effect into the system and you have to do a reset.

MS. BARONAS: Okay, thank you. That's good input and we note that.

So, at this time I'd like to call for public comments, slide 09.

Oh, so sorry, while we're transitioning, Paul, please go ahead with your comments on the chart we displayed.

MR. STAPLES: Well, on the chart that we displayed, that was displayed, I do have concerns that you're limiting just to that one area there. I think that along the coast, between Santa Monica and, say, the South Bay, I think it would be good to expand that area right down through there because that's a very good strip there.

However, I did want to comment on the CEQA thing, one last thing real quick, and it was in response to the bird-dogging comments. Yes, you definitely should bird-dog the developers, but you really need to get on to the agencies.

You guys can exercise your clout with these agencies, you and ARB, to get their determinations in. You don't have to influence them to go one way or the other, but you need to get on them to get their determinations in because you have a time frame on this that you're trying to achieve, as well, and you could use your State clout in order to do that.

So that's just my two comments on that, so thank

you very much.

MS. BARONAS: Okay, thank you, Paul, appreciate your input.

So, now, please pull up slide 09. At this time I'd like to call for public comments.

If there's any individual who would like to give us a comment from the public, please come forward. Anyone on WebEx?

MR. PROVENZANO: Hi, good afternoon.

MS. BARONAS: Yes, please give us your --

MR. PROVENZANO: This is James Provenzano, I'm President of Clean Air Now. Clean Air Now is one of the State's oldest air quality public advocacy organizations.

And, first, just a big picture comment, I think we can all agree that we are marching towards an economy that utilizes carbon-free energy carriers, and at least the test cases sector on land and sea is free of combustion technologies.

This is going to afford us the ability to protect the public's health from the detrimental impacts of toxic air contaminants.

Renewably generated hydrogen used in fuel cells is the gold standard that allows us to meet those noble goals.

We should all -- we all should continually strive toward that end. The sooner we get there, obviously, the better. If we have that mindset, we will naturally do the right things.

And I want to thank the Energy Commission, and the California Air Resources Board, and the South Coast Air Quality Management District, and all the automakers that are working on fuel cell technology for doing the right thing.

This is very exciting. And, now, I actually want to make -- I have one question at the end and I'd like to make one additional comment. This is from my personal -- these are personal comments and coming from my experience as an actual paying customer, who has incorporated hydrogen-powered fuel cell electric vehicles into my life.

And I have to say that Steve Ellis has listened very carefully to his customers. And Bill Elrick accurately conveys the needs of the industry.

And I know you will, I just hope you take their comments seriously and consider them closely.

I also appreciate Dr. Brown's and Dr. Ogden's, UC Davis's and UCI's contribution to today's discussion.

I know this has been said in several different ways today, but I want to stress the need, even in the

early stages, to install connector stations and destination stations. As a customer, and from talking to scores of potential other customers, there is great value to us in just knowing that if we choose this technology for our transportation needs, we will not be limited -- it will not limit our current behavior.

Even if a station doesn't get used that much in the early stages of getting these vehicles out, just the perception of ubiquity will go far into expediting the market penetration of these vehicles. That's key.

And I'm not a marketing person, but I would think that the marketing groups of all the OEMs, I think they -- my guess is they would agree with that.

And maybe the -- and my last comment is actually a question. And maybe, I think this question is for Joan and Tim.

What is the impact of the delivery pressure on the cost of hydrogen to the customer? In other words, if I choose to purchase a Clarity over a -- you know, the other manufacturers that are using 700 BAR, because I know my hydrogen is going to be less expensive, that's a decision the customer's making and that's going to impact what the OEMs are doing.

So, first of all, what is the impact of the higher pressure and the cost of the blue bred hydrogen?

And, also, I'd like to put forth that I know things are set for probably the first go-around here, but can we -- can we pick 500 BAR and call it a day, and everyone uses the same pressure and -- and so I just wanted to get some feedback on what you guys think about that, if we could go to a -- maybe not 750 BAR, but go to some compromise between 700 and 350. Thank you.

DR. BROWN: This is Tim. Just to address your question, I agree, it would be great if we could go 500 BAR, but I think that train left the station a long time ago and we've come to the conclusion that these other two pressures are standardized.

And there's good reason for it, the longer range for the 700 BAR.

As far as cost, it's easy to calculate the incremental amount of electricity used. For example, for compression from 350 up to 700 BAR is actually quite small. The electricity cause to go the additional pressure is not high.

I think the real cost would be on the equipment side for the station and I'm not prepared to address that. Perhaps somebody, an equipment supplier could address that side of things.

MS. BARONAS: Thank you, Mr. Brown.

MR. STAPLES: I could do that.

MS. BARONAS: Okay, so at this time I'd like to turn it over -- oh, so sorry. Another person for public comment period, please identify yourself.

MR. HARRIS: My name's Aaron Harris, I'm from Sandia National Labs. And I just wanted to comment on the inclusion of data collection from the stations that get awarded for this.

I would like to highlight the fact that the conversation that we've had today, which has been great, has been facilitated by the data that was collected previously. And so, if we expect to have positive results going forward, collecting good data from these stations, from safety to reliability, and both qualitative and quantitative data, the more quantitative the better, but qualitative is especially relevant.

And in fact, null data, particularly from a safety stand point, is extremely important, understanding that there have been no failures in X number of refueling is an important data point to characterize how safe the systems have been.

And so I think making sure that data collection is part of that PON I think will be important.

MS. BARONAS: So noted and thank you for your comment. So at this --

MR. STAPLES: I have an answer for that

question, the previous question, Paul Staples.

MS. BARONAS: Okay, Paul, go ahead, please.

MR. STAPLES: So, yes, yes, the question was about the actual cost of the system. The cost of the system is anywhere between 100 percent more to 300 percent more for the compressor, 100 percent to 300 percent for the dispenser, and about 100 percent for the storage, for doing 10,700 BAR dispensing.

The actual generator is not affected at all. But the actual dispensing, and the storage, and the compression is significantly more, almost doubling the cost.

I could have a system in for under a million dollars right now, that could meet 100 kilograms, if I did not have to comply with the 700 BAR. But because of that my costs are right around $1.3 to $1.5 million per system. And that's something I can confirm with exact data and quotes. So, that should answer your question, thank you.

MS. BARONAS: Thank you for your input.

Steve Eckhardt?

MR. POWARS: May I make a comment?

MR. ECKHARDT: This is Steve Eckhardt, Linde, I can only comment for our company. I don't have facts right now, I have them somewhere. I know they're not

anywhere close to what was just stated in terms of what we can do for 700 BAR. On an incremental cost over 350 it's not nearly that great. But I don't have anything directly here in front of me to comment on that.

I think another thing that does need to be considered in the whole thing is what is the cost of the station as the total percentage of ultimately what that delivered hydrogen price is? That's something that needs to be considered as well, and what's the ultimate benefit to the customer?

No doubt, 700 BAR's more expensive, but what's the added value for it, and that's important to consider that.

MS. BARONAS: Thank you for your input.

So, the open comment, public comment period is now closed.

MR. ACHTELIK: I think we may have someone on WebEx.

Oh, thank you, Gerhard. Please identify yourself, a commenter on WebEx?

MR. POWARS: Oh, this is Charles Powars, may I make a comment?

MS. BARONAS: Yes, of course.

MR. POWARS: Okay, Powars, P-o-w-a-r-s. I'm with St. Croix Research. And I'd like to just

underscore the point made by the gentleman from Sandia. I was about to make the same point, so I'll be very brief.

I think it's very important, as I think most of staff knows, to include very specific and very quantitative requirements for reporting performance data in the solicitations, not only in a final report, but also on progress reports.

That data is necessary, for example, as most of you noticed, the AB 118 EMNB Program, it's going to be useful for UCD and UCI to kind of calibrate their models with real world data.

I think it will support some of ARB's planning. And it may seem obvious for that, but as some of you are aware, for prior stations that are ostensibly a lot simpler than hydrogen stations, the quantitative data on amount dispensed versus amount delivered, so you can do simple math balances, have not always been forthcoming.

So, I would place a strong emphasis on that requirement. Thank you.

MS. BARONAS: Thank you for your input.

And we have one more commenter here, in the room.

MR. ELRICK: I'll make this real quick, Bill Elrick. Just upon that, you might want to reference the

national labs, NREL, specifically, has done data collection through the Tech Val Program and has quite the experience and the templates developed. And I'm not sure if you've looked at them before, but you might not have to reinvent the wheel and the consistency of understanding -- both understanding the data and getting what they've learned into the system, as well as their ability to aggregate and scrub so that proprietary stuff isn't there, yet, you can share this publicly, is just something to consider.

MS. BARONAS: Great. Okay, so Jim, I'd like to turn it over to you for some closing comments, please.

MR. MC KINNEY: Yeah, so Jim McKinney. So, again, just on behalf of the Commission and all of our staff here today, we just want to thank the stakeholders.

I know we're asking a lot of you to sit, basically, you know, allocate three business days in just a little over three weeks to this series of workshops.

We really appreciate your dedication and the technical expertise, the business expertise, academic expertise that you all are bringing to the table, so thank you very much to everybody.

A couple of things that I wanted to just

highlight from today; I thought we had a really strong discussion on station performance and technical standards. We had a really good status report from CDFA, Division of Weights and Measures, on their progress to date in retail standards.

And I think we had a lot of good input on work being done at the national level, elsewhere in North America, and then in Europe and Asia, too, so I think that's something we need to continue to get up to speed on at the staff level.

One item from my notes, that I see that we didn't follow up on was that I think it's the J2601 standard and the potential for some proprietary issues around that. Do I have that right?

Okay, thank you. So, I'd like to flag that for an agenda item on the July 10 workshop.

Very good discussion on station sizing and costs, and these ideas around variable minimum -- variable minimums for technical standards and size conforming to the station function.

So, again, kind of core cluster, destination, connector, building out the network. So we think our staff has a lot of work to do to try and figure out how to operationalize that, if I can use that kind of clumsy word there. But that will be fun to work on.

Great presentations on renewable hydrogen so, again, thanks to Dr. Brown, Professor Ogden, and the Air Resources Board. That was a great lesson there, so we also have some work to do on that one.

And looking forward to the Diamond Bar workshop on July 10, our intent is to try to pull in some of the local station owners, so CIOMA members, perhaps the Partnership can help identify some of those folks.

I think that was a great set of comments from the first workshop is, you know, we can't do this without the local station owners, so I think that will be a good chance to get them involved, get them on the record, see what the world looks like from their perspective.

We also plan to dig more deeply into our current scoring criteria. I see a lot of work ahead for us to modify those to meet some of this evolving information. you know, as the market evolves, and the technologies evolves, the business climate evolves, revamping some of those scoring criteria, so that will play a big part in the next workshop.

Is there anything else we had queued up, Jean or Toby, for July 10?

MS. BARONAS: Yes, I think we're considering talking about the economic considerations of stations,

their through-put versus their cost. Looking at the potential for sustainable -- sustainability from a business-centric point of view is another topic.

And then general topics will be funding and possible incentives.

MR. MC KINNEY: Yeah, great, thanks for adding that, that's exactly right.

So I think, in closing, we have not -- sorry?

MS. BARONAS: Sorry, I'm feeling happy.

MR. MC KINNEY: You're happy because we're done, yes.

I really want to acknowledge Jonah, and Andre for manning the WebEx, and I think Charles has been helping, too.

It's been a tremendous effort on the part of our staff here, at the Commission, to pull these workshops together. We've got one more to do.

So, again, thanks Tobias, Charles, Amanda, and Jonah, Eric, and James has been hanging out all day as well.

And especially to Jean for moderating and increasingly getting up to speed on this complex topic area.

So with that, again, thanks very much and we hope to see many of you in Los Angeles on July 10.

(Thereupon, the Workshop was adjourned at 3:47 p.m.)

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