BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

In the Matter of:	)	
	)	Docket No.
2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program	)	09-ALT-1

ELECTRIC DRIVE VEHICLES

STAFF WORKSHOP FOR THE 2010-2011 INVESTMENT PLAN

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

21865 COPLEY DRIVE

AUDITORIUM

DIAMOND BAR, CALIFORNIA

WEDNESDAY, SEPTEMBER 9, 2009

9:00 A.M.

Reported by:
Troy Ray

CALIFORNIA REPORTING, LLC
52 LONGWOOD DRIVE
SAN RAFAEL, CA 94901
415-457-4417

STAFF PRESENT:

Leslie Baroody, AB 118 Investment Plan Project Manager

Peter Ward, Energy Commission

Tim Olson, Energy Commission

Charles Smith, Energy Commission

Pilar Magana

SPEAKERS:

Gerhard Achtelik, California Air Resources Board

Matt Miyasato, SCAQMD

Ron Gremban, CALCARS

Dave Barthmuss, General Motors

Paul Scott, Plug-In America

Linda Nicholes, Plug-In America

John Shears (WebEx)

Ehab Youssef, Green Vehicles

Mike Ryan, Green Vehicles

Ben Werner, Revolution Motors

Kathy McDugall, Aptera

Doug Moorehead, A123 Hymotion

Paul Beach, Quallion

Paul B. Scott, ISE

Tom Fulks, Bosch

Ben Ovshinsky, Efficient Drivetrains, Inc.

Joe Calavita, Air Resources Board

SPEAKERS (CONT.)

Darren Gosbee, Director of Hybrid Strategy
And Execution

Wayne Eckerle, Cummins

Joe Dalum, President, Odyne

Mark Aubry, Vice-President Sales North America, Smith
Electric

Bill Van Amberg, CALSTART

Jeff Fisher, (WebEx)

Chris Cannon, Port of Los Angeles

I n d e x

I N D E X (Cont.)

9:00 A.M.

MS. BAROODY: We're ready. I just want to welcome you all to Diamond Bar and the California Energy Commission's first in a series of workshops for the 2010-2011 Alternative and Renewable Fuel and Vehicle Technology Investment Plan.

We really appreciate you taking the time to be here with us today, and we also want to welcome those of you who are online.

I want to thank the South Coast Air Quality Management District for the generous use of this very nice facility.

We have quite a bit to cover today, but before I begin I would like to introduce our team from the Fuels and Transportation Division in Sacramento.

I'm Leslie Baroody, Project Manager for the 2010-11 Investment Plan.

And with me is Charles Smith, right here, he's our Assistant Project Manager, and he will be collecting those blue cards if you have questions during the public comment phase.

Peter Ward and Tim Olson. Peter Ward, Tim Olson, they're experts on alternative transportation fuels and technologies, and they were involved in the investment plan last year.

Peter will be speaking shortly and Tim will be moderating our panel presentations and discussions.

Pilar Magana, right here, she happens to be our propane fuel specialist, but today she's assisting us with audio/visual and the WebEx.

This meeting is being publicly broadcast via WebEx and the transcript and audio will be posted on our website.

Before I get into the purpose and agenda for the workshop let me go over a few items. We will be taking a few breaks between panels. We'll be having lunch either here at the cafeteria, or there is a Chile's down the street, if you need something to eat.

And as I said before, if you have those blue cards, if you can give them to Charles.

So the main purpose of today's workshop is for Energy Commission staff to acquire information about electric drive transportation vehicles and technology. This will provide the basis for the allocation of $100 million AB 118 funds.

We need updated information on electric drive vehicle technology, vehicle deployment and costs, marketing incentives, manufacturing capabilities, and customer costs.

This workshop is just the beginning of the data collection process and we will continue with the review of docketed materials, subsequent dialogue, and additional

input.

We have a full agenda and we want to have time for questions at the end of both the morning and the afternoon sessions for those in the audience and on the WebEx, so we'll allow about 15 minutes for each of those sessions, with two minutes for questioning.

Our introductory speakers will be Peter Ward, who will describe the AB 118 investment plan background and activities to date.

Gerhard Achtelik, from the Air Resources Board, will discuss the zero emissions vehicle mandate.

And we also have Matt Miyasato, from South Coast Air Quality Management District.

And Ron Gremban, from CalPers.

If you refer to your agenda that we've handed out, the morning panels will be for light duty vehicles, with a conversion and demos panel at 11:45.

And then at noon we'll have the public comment period, and then we'll wrap up for lunch about 12:15.

And the afternoon session will be about one o'clock and that topic will be electric vehicle component parts and battery manufacturing.

At 2:00 we'll move onto the medium and heavy duty vehicle panel.

And 3:15, the electric truck/fleet customers panel,

followed by one more public comment session.

We will adjourn at 4:30 today, and some staff will be available until 5:00 for questions.

As I mentioned before, this is the first in a series of workshops in September.

I'm just working with the audio/visual here, hold on. Thank you, got the audio/visual set.

All right, just reviewing, we have a series of upcoming workshops. We have a two-day workshop for biofuels in Sacramento, this coming Monday and Tuesday, the 14th and 15th.

We have a one-day workshop on natural gas propane vehicles, and that will be in Long Beach, at the City Hall, on September 18th.

And then we're planning on having an electric drive infrastructure workshop in San Francisco later on in September, as well as a hydrogen workshop in Sacramento. And, actually, that date is still to be announced.

If you would just continue to check our website for the dates and times of the workshops, that would be great.

Well, the next step in this investment plan process is for staff to analyze and incorporate all the information that we've gathered at these workshops. We'll produce a draft of the investment plan in time for the first advisory committee meeting in November, of 2009.

We'll then have two more public workshops for the draft investment plan, followed by another advisory committee meeting in September. We hope to have a final draft by January of 2010.

And if you're not already on our List Serve, I would encourage you to sign up on our webpage, in the bottom right-hand corner under the AB 118 investment plan.

Thank you so much for your attention and now I will hand over the mike to Peter Ward for his presentation.

MR. WARD: Good morning everybody, thanks for coming. And for everyone that's on the WebEx, greetings and good morning to you, too, thank you for all attending.

This is the first in a series of workshops, as Leslie mentioned. We are going to be talking about our new investment plan. Yes, the latest investment plan that we're operating under now was just adopted on the 22nd of April, but we're already up -- this is prepared next year's, I mean, fiscal year 2010-2011.

As Leslie mentioned, there are several workshops and this is the team that you'll probably see at many of those workshops in the coming weeks.

Just to set everybody's memory straight, we are establishing -- this program is established by AB 118, which was passed and signed by the Governor in 2007, in October, and it was Assembly Speaker Nunez's bill. It was

subsequently amended by AB 109, also by Speaker Nunez. And the principal purpose of our program, the emphasis of this program is to develop and deploy innovative technologies that transform California fuels and vehicle types to help attain the State's climate change policies.

The foundation for this program, I must say, is the jointly adopted Alternative Fuels Plan that the Energy Commission and the Air Resources Board adopted in December, I believe it was 2006. 2006, I think.

And it established the goals we would have for alternative fuels, and the goals were at nine percent in 2012, 11 percent in 2017, 26 percent in 2022.

This, if achieved, would displace four billion gallons' equivalent in 2020, that would be 20 percent.

I think electricity can be a large contribution to this goal and, of course, funding the large reductions of GHG and air pollution.

It's important to note that this foundational piece of study that the Energy Commission and the Air Resources Board adopted is really the foundation for this program and how we think we can achieve the goals of 20 percent alternative fuel use, 15 percent petroleum reduction, and greenhouse gas improvement over time, and we think that's a minimum of 20 percent for most of the alternative fuels.

We're lucky today to have Tim Olson with us, he was

the expert and the founding father of that piece of work. It was one of the first times that we employed life cycle assessment of fuels, and that is from well to wheels. We were establishing the greenhouse gas profiles for all the alternative fuels as we would replace petroleum, and petroleum, gasoline and diesel were the baseline in that study.

It's important to note that that was foundational because right at the time we were working on that work the low carbon fuel standard was established, and it is the analysis that we were performing on greenhouse gas while this was incorporated into the low carbon fuel standard, and ever since we are assisting the Air Resources Board in the analysis of life cycle emissions.

It's important to also note that we feel that the alternative fuels introduction, that means electric and all the other alternative fuels, can have a no regrets aspect to it insofar as we're displacing petroleum, using alternative supplies, using waste resources and producing emissions, both criteria and greenhouse emissions early, and surplus to regulation.

In the AB 1007 program, and in that report we established that we would not be able to achieve our climate change goals by regulation, alone, and that a market mechanism would be necessary. Lo and behold, a bill

circulated through the Legislature that gave us AB 118, which provides a substantial amount of funding over seven and a half years to provide that market mechanism that will be a perfect compliment to the regulations we've established in California.

Some of the key policy objectives are reducing GHG, as I mentioned. That is in the Global Climate Solutions Act the goal is to reduce GHG emissions to the 1990 levels by 2020 and 80 percent below the 1990 levels by the year 2050.

Petroleum reduction, as I mentioned, we'd like to reduce petroleum fuel use to 15 percent below 2003 levels by the year 2020.

Alternatives fuel use; increase the alternative fuel use to 20 percent of on-road fuel demand by 2020 and 30 percent by 2050.

In-state biofuels use; this is an interesting one as biofuels has become fairly controversial, but in California I think we have a great opportunity to produce biofuels and, of course, use them. The increase would be to increase biofuels use to one billion gallons by 2010, 106 billion gallon equivalent, gas and gallon equivalents by 2020, and two billion -- that can't be right. Two billion gallons by 2050, I think those numbers are wrong but --

And in-state fuels production, we also set goals for using an increasing amount of our own production of what

we use in the biofuels area over time.

Now, for the funding of AB 118, and that it is providing us up to $100 million per year for seven and a half years. In the first two years of our investment plan it was $75 million and $101 million, respectively, for the first two years. This coming year, 2010-2011, we're not sure what the budgetary allocation will be. We're hoping to catch up on the previous years, that's not known at this point, it will go through the Governor's budget process in the spring.

This investment plan that you're helping us prepare will be key for that because we want to make sure that we -- that we set our trajectory to achieve climate change omission reduction and take up the opportunities that we have for alternative fuel use production and distribution in California.

We are also going to be developing and producing, manufacturing, deploying alternative fuels, advanced vehicles, vehicle efficiency improvements for on-road and on-road applications, emphasize workforce training and job creation, foster education, promotion of technology centers of excellence, and prepare environmental, market and technology assessments as we go.

Here's the allocation that we have for the first two years of the program. In the different categories

across the stop are the fuel production, fuel storage, and blending fuel stations, vehicle incentives, and manufacturing plants.

And accordingly, down the left-hand margin are all the different technologies and fuels that we have allocated particular portions to.

You can note in the electric drive -- there's the electric drive, 12 million for stations, 25 million for vehicle incentives non- and on-road, and manufacturing is we had $9 million available.

I should go back and tell you, at the bottom of that page is something I mentioned previously, and that is $27 million for market-appropriate development. This will be taken up by different categories, workforce training and analysis that we do in support of this program and developing incentive mechanisms that would be most beneficial to the markets as they are developing.

And a little bit easier way to read the allocations we have for electric drive funding, this is for the current fiscal year and last year, the two-year investment plan. This is two and a half million for plug-in hybrid, ten million for hybrid -- hybrid vehicle RD&D, ten million. Non-road projects, reports, and truck stop electrification 11.5 million. Electric charging 12 million and manufacturing facilities and equipment nine million.

Now, we've seen now at this point that most of the ARRA funding from the Federal government has been decided, most, not all. I think it's fair to say we were a little disappointed because a lot of the -- all the funding that we have in this program we offered up as match, and we were not nearly as successful as we had hoped to be.

Hope springs eternal, but I'm not sure that we're going to have that opportunity.

We are hoping to turn around quickly and offer the remaining funds that we have not -- will not have obligated to the matching share on the Federal side for solicitations that will be released here in California over the next few weeks.

Here are the Recovery Act funding commitments; charging stations, this is what was in our investment plan and investment plan allocation, and you can see how many funds were requested based on our allocation. It looks like from either seven to nine times X as what we had as available.

And I think that we are still going to be evaluating the proposals that were successful and how we can help with the match share for those projects, and so we're still underway in developing that.

What will be remaining will be incorporated in the solicitations that I've mentioned.

But particular note, you can see the last category, manufacturing facilities we had $9 million allocated, we had $68 million in requests, and that zero dollar looms very large in my mind. Unfortunately, we were pretty much skunked in the Federal solicitation for battery and vehicle component manufacturing here, in California.

I think it's very unfortunate because this is, after all, the home of the electric car as we've known it through the nineties, and it really seems out of character to me.

Moving right along, no, we're not bitter.

(Laughter.)

MR. WARD: The next steps are that we will provide the ongoing evaluation and proposals for Federal Economic Stimulus funding.

We are preparing a California-based, the nation state of California-based solicitation in accordance with the current investment plan, and we'll be updating that investment plan for fiscal year '10-'11. We're hoping that we will have a draft document in the spring so that we will be prepared for the budget hearings that will inevitably come into play for the next year's funding.

Thank you very much.

MS. BAROODY: Thank you, Peter.

Now, I'd like to introduce Gerhard Achtelik, he's

with the Air Resources Board, to talk about the ZEV Mandate.

MR. ACHTELIK: Good morning and thank you all for attending the workshop for the CEC, and thanks for inviting us.

And I'm filling in for Elise Keddie this morning, who's actually the program manager for the Zero Emission Regulation, but she's been tied up with other stakeholder meetings related to the regulation.

But I'll be giving you an overview on the history of the ZEV regulation, and a lot of you probably are familiar with it already.

Now, the Zero Emission Vehicle program was developed back in 1990, it came out of the Low Emission Vehicle program. It was just a single paragraph that started the goal of looking to have our transportation technology transition to a zero emission technology.

And it's gone through a number of iterations since then, always trying to keep those adjustments made for the state of technology as it was. And currently, the ZEV regulation is in review, again, but because of the -- in large part because of the things that have been achieved.

And one of the program goals has always been to look for quality benefits and we certainly have achieved those, but to also push research and development of cleaner, zero-emitting technology, and to encourage the zero emission

vehicle commercialization through the development of enabling technology.

And the program has had over 30,000 vehicles placed in California, so starting with about 250 fuel cell vehicles, and that's the largest single concentrations of fuel cell vehicles anywhere in the world. There are over 4,700 battery EVs, full functioning batter EVs, and 27,000 neighborhood electric vehicles.

And also the program, although it wasn't -- hybrid vehicles came out of the zero emission vehicle technology, that we have a technology developing aspect of it, where we introduced electric drive and battery in combination with the gasoline vehicle, and over 200,000 vehicles are placed in California.

And also, another category where I don't have it on the slide, is the PZEV, which is the cleanest, that's a partial zero emission vehicle that's the cleanest gasoline or standard-fueled vehicle, and over a million of those are now in service in California.

And the program focused the research and development of these clean technologies.

There have been many challenges, as you're aware the program has been revised a couple of times to match the development of technology but -- and the pace of future development is sometimes difficult to predict, but it has

been -- but improvements have been made and a lot of you are now -- you're probably interested in the latest step, which will be the plug-in hybrids, which is another development that you can pretty much attribute to the Zero Emission Vehicle program.

But the infrastructure, which is part of what we're here about, is much keep pace or must match the Zero Emission Vehicle program. And if you -- if we have plug-ins, if we have battery electric vehicles, we need to have the charging infrastructure out there so that the customer can use it and use the car to its fullest potential.

The ZEV regulation applies to manufacturers of passenger cars and light duty trucks, and it specifically applies to large volume manufacturers and medium volume manufacturers.

And a large manufacturer is a manufacture that has sales in California of light duty and medium duty vehicles of 60,000 or greater. And the intermediate volume is, it's 4,501 to 65,000, and those manufacturers are directly applied by the regulation.

And smaller manufacturers, while they are not applicable to regulation, can produce zero emission vehicles and receive credits, and those credits can be traded or sold to the larger volume manufacturers.

And the intermediate volume manufacturers can

comply directly to the regulation with only the PZEV requirement, but all can -- you know, all can use the pure zero requirement to meet the regulations.

Now, sometimes I get it to work on the first click and other times -- use the mouse, okay.

I guess it's like in with the cars, we sometimes have technical glitches, you know.

MS. BAROODY: Excuse the pause; we're working on audio/visual.

(Off-record audio/visual discussion.)

MS. BAROODY: For those of you listening online, we are working out our audio/visual problems. Thank you.

(Off the record.)

MS. BAROODY: Okay, everybody, it looks like we're ready to start again. We're going to have it running on WebEx and, also, South Coast has a webcasting ability, so we'll have both going for a while. But we'll have the WebEx going now that we've figured out what's happening.

So thank you for your patience, sorry for the delay, and we'll welcome back our guest speaker.

MR. ACHTELIK: Thank you. And thank you for your patience and we apologize for the delay.

But just as I was describing, the regulation only applies to -- directly applies to large duty and intermediate volume manufacturers, but all manufacturers

through the development of zero emission products can earn credits.

The ZEV regulation, as it's traditionally been looked at, had three categories; a gold category, a silver category, and a bronze category. And we've also added a silver plus, and I'll have a slide on that in a little bit.

But the gold category is the pure zero category, it has either the electric fuel vehicles or the fuel cell vehicles.

The silver category had been made up of hybrids and natural gas fueled vehicles and the PZEV was the partial zero emission vehicle category was primarily the traditional gasoline engine, but it had the lowest emission of any gasoline vehicle, and it also has a 150,000-mile emission warranty, and it has almost no or zero evaporative emission.

So what makes it cleaner than the standard car is warranty on the emission components almost double a standard vehicle, and the zero evaporative emissions, so these are all very clean cars.

The gold requirement is either in the 2012 to 2014 timeframe was 25,000 vehicles; and 2015 through 2017 50,000 vehicles.

And the new option, that silver plus, and the silver plus, if you take an AT PZEV, people call these enhanced PZEVs, and what the silver plus requires is the use

of the zero emission fuels. So the zero emission fuels are either electricity or hydrogen.

And the silver plus categories are -- they can earn more credits. If we look back on the previous slide, or the PZEVs, the vehicle there earns less than a credit, meaning you have to produce more than one vehicle in order to comply with the regulation. And even the AT PZEVs earn only partial credits. But if you go back to the silver plus, you can earn more than a credit for these because these are the more sophisticated, more technology advancing categories.

And examples are the plug-ins or hydrogen-fueled internal combustion engine.

The expected number of vehicles, I'd shown you in the earlier slide, 25,000 and 50,000 vehicles, that's what the regulation says. But due to the credits that the manufacturers have earned and the optional compliance path, this is what staff anticipates; and currently in the '09-'11 phase we expect to see 250,000 fuel cell vehicles placed in California, and going up to 5,000 and 25,000 by 2017.

Or the manufacturers have a choice of complying with pure electric vehicles, the City EVs, which is a category, which is a range grading, and would be the 15,000 to 50,000.

So manufacturers, this is an either/or or both, so manufacturers can produce both fuel cells and battery

electric vehicles to comply with the regulation.

And in addition, they will be complying with the silver plus, the silver and the bronze category.

So you see that while the regulation started off as a ten percent mandate back when it was originally founded in 1990, we're well over that number in clean vehicles now introduced in California because of the regulation.

So there are -- so we didn't envision where we would get back in 1090, we certainly have -- California citizens have certainly benefited through improved technology through this regulation.

And future efforts is to, at the last revision at the 2008 March Board hearing, the Board directed staff to evaluate the regulation and make it -- you know, further enhance its technology fostering capability.

And what you will see is the partial zero emission category is going to be moved into the low emission vehicle three program, because these are considered established technologies, they're well known, all the manufacturers can easily comply with them -- I don't know if I should say easily but -- and the Pavley regulation, we'll probably see the hybrid vehicle moved into it because of the improved efficiencies and the lower CO2 emissions that you get from those vehicles.

So it would be hybrids that are clean, these will

go both for criteria pollutants and greenhouse gas emissions. So they revamp the -- the staff will be going to the Board with these recommendations in December.

I can't remember now. Yeah, there's the timetable.

So the Board hearing in December will still be informational, though not be a regulatory change at that time, and staff will get more directions from the Board on how the Pavley reg, LEV III, and the ZEV regulation should be coordinated, but the idea being that the Zero Emission Vehicle regulation will be primarily focused now on technology development, technology fostering.

And that's our -- the website for the Zero Emission Vehicle program, if you're looking for additional information.

And that ends my part of the presentation, thank you.

MR. MIYASATO: Thank you, Gerhard, that was really a long presentation.

(Laughter.)

MR. MIYASATO: Thank you for your patience.

MS. BAROODY: I'd like to introduce Ron Gremban, of CALCARS. Thank you, Ron.

MR. GREMBAN: Hi, I'm Ron Gremban, with -- I'm sorry? Okay, closer to me.

Hi, I'm Ron Gremban of CALCARS, we're a nonprofit

organization and, actually, I have the next slide to deal with that.

I'm very happy to have been invited to talk here and, hopefully, have something provocative and helpful to the whole process. Oops, wrong button. There we go.

So a quick reminder, electricity is better than gas, cheaper, cleaner and domestic energy.

I have a paper I'm about to publish showing that it's even better than we've been thinking, that the energy economy ratio that the CEC has been using, based on a couple of very early vehicles, is actually very conservative in comparison to what vehicles are actually doing.

And especially light trucks, that I'm going to be talking about, the idea of retrofitting to electric propulsion.

So as I was saying, we're a nonprofit start-up or, I mean, a nonprofit organization dedicated, we've got a dual focus of technology and advocacy or public education and promotion.

And we took my Prius and turned it into the first plug-in conversion ever, and we did that in 2004 in order to show that a high volume production vehicle had the capabilities, already, of being a plug-in hybrid. Back in the days when the auto manufacturers were saying no one will ever plug in their car, and the batteries aren't ready and

it can't be done, we generated a large level of news and public relations, and helped to spawn a whole alliance of organizations focused on getting plug-in vehicles out there on the roads sooner than later.

And since then there has been a lot of things that have happened, the Federal government has a tax credit now, including ten percent credits up to $4,000, which means if a conversion -- for conversion, which means if a conversion costs $10,000, it's like $1,000.

And so it's a small amount in comparison to the 7,500 for purchase of new plug-in vehicles, but it's a foot in the door.

And they're seeing plug-in vehicles as a way to meet the higher CAFÉ standards that are due to lots of effort, especially in California government, than now established as California and national regulations.

But notice that they're looked at as a way to meet these CAFÉ standards, not to exceed them by displacing even more gasoline.

And Obama administration has a goal of getting a million plug-in vehicles on the road, both plug-in hybrids and pure electrics by 2015. Well, that is a number that is way beyond what the mandate that we just saw in California -- California is part of that, would be way beyond the mandate that we saw, and even the scenario three,

which is the most highly electric scenario of the CEC's plans.

And from all that, there's 18 car makers interested and starting to do things, so we feel like we've won our first battle.

But for near term and mid term impacts we must do something with the vehicles that are already out there on the road, because there's 250 million of them in the U.S., almost 900 million in the world, and everyday they're guzzling gasoline and producing greenhouse gases.

And these graphs here are -- show the -- the solid line here is the rate at which plug-in vehicles would displace other vehicles in the U.S., fleet penetration here and percent of reductions in oil consumption, and pretty much greenhouse gas, also, which don't change much until the time span between 2020 and 2030, and then they're beginning to.

And that is with the Obama administration's goal of a million plug-in vehicles in 2015 and growing rapidly beyond that, with more -- less optimistic projections, you can see the value would begin to happen on a social scale of only around 2030, or later.

If we include doing some kind of retrofit of existing vehicles on a larger scale, we could save a decade; we could start having really significant impacts a decade

earlier or more.

But can we? So once again CALCARS has begun a campaign, something we believe is quite valuable, but not yet seen as viable out there in the world.

This time, instead of doing the proof of concept ourselves, we've found various start-up companies that apply existing technologies in a way that can do this.

And we're looking at starting with the 50 percent or so of light vehicles that are classified as trucks, pickup trucks, SUVs, light vans, things like that as the low-hanging fruit that has lots -- drinks lots of gasoline and is more economically viable for these conversions.

And we're going to show there are actually several companies that are demonstrating these internal combustion to plug-in hybrid conversions that add to the existing power train, instead of having to replace the whole thing; thereby reducing costs dramatically.

Okay. And batteries are, you know, both an issue and an enabler. There are batteries out there that can do the job now. There are concerns about and risks having to do with lifetime because they haven't been in vehicles for a lifetime of vehicles, yet, and before we do that we have a chicken and egg problem.

But that is something that can be handled and we have to look at ways of handling that; warranty incentives,

there's various battery leasing, various options.

So what's the -- how could this happen? One of the things is that conversions so far have been done in low quantities. Conversions of hybrids to plug-in hybrids are in the hundreds now, and even at that they've gone down to like 10 to 14 thousand dollars for a 20-mile EV range plug-in Prius conversion. That's not cheap, but it could get down to 6,000, we believe, in much more like minimum automotive quantities, in the tens of thousands or more.

And at that rate for light trucks it could be at 10,000, and it could be economically viable for a truck that has quite a bit of its life left, and then would be saving a whole bunch of fuel over the rest of it.

There's a cost for existing vehicles because you have to design a conversion for each vehicle and range of dates of model years that have pretty much the same technology. But there are many of those models, like the F150, the Silverado Truck, and so on that have millions of them out on the road, and each of these -- each design could have, you know, tens or hundreds of thousands of takers.

ICE to plug-in hybrid conversions do have more costs than a hybrid because they don't already have a plug-in -- I mean, an electric propulsion system, which means you have to add the motor generator, you have to add the control, and power electronics, and mechanical connections

and stuff, but the major extra cost is the one-time R&D expense to work out the control electronics and stuff to be able to control it all together.

And then, of course, the price of batteries, which battery packs, which is going to be consistent with that of new plug-in vehicles.

For conversions to battery electrics, all battery electrics, you don't have all that control stuff that has to deal with something that already exists; you're replacing the whole drive train. What you do have to do is electrify the power steering, brakes, cavity heating and cooling, and you have to have a larger battery, which is more expensive.

So now we come kind of to the crux of the whole thing, which is automakers so far have built the vehicles and then they've left them alone except for warranty repair, and the dealers income through repair throughout the life of the vehicle.

In contrast, all other high tech industries now, such as computers, Smart Phones, certainly software treat their products as a continued revenue stream. And to the consumer it's a product that can grow during its lifetime.

When you buy a computer, you can replace the disk drivers with higher capacity drives later, as they get cheaper, you can add RAM, and you can add optical drives and stuff.

Why not think of the vehicles in the same way? To the consumer, they could be something that could have upgrades to, in this case, plug-in capabilities, other things could come along later that makes that same vehicle during its lifetime, that's already 15 to 20 years, much more valuable.

To the auto manufacturers it could be a revenue stream that's continuing. They could build plug-in kits in factories that have been shut down because of lower demand for the vehicles right now, without lowering the demand for the vehicles really more because they already have a long lifetime.

The dealers that are hurting could be using -- could be installing these things.

The Air Resources Board has been pioneering new standards for certification of hybrid to plug-in hybrid vehicles, or conversions, they could be doing the same thing for ICE to plug-in hybrid, and ICE to BEV, and so on.

And CEC seed funds could help this whole process develop.

Now, what I'm going to be showing in the next few slides, very quickly, is some start-up conversion businesses that each have some -- have developed something, but have not had the funding to do third-party validation and so on, and volume production.

HEVT was started up Ali Emadi, Dr. Ali Emadi from the Illinois Institute of Technology, where he developed the first program for the students to learn power control electronics for electrified vehicles, and so had the background to do the tricky control systems to retrofit, in this case an F150, and they put the electric motor behind the differential, and this has the potential of making plug-in light trucks, and buses, and so on a relatively inexpensive conversion.

Rapid electric vehicle technologies has taken some engineers from early OEM electrification projects and done kind of the same thing for battery electric conversions.

Efficient Drive Trains, Inc. has -- was started by, founded by Professor Andy Frank, who’s like the father of the modern plug-in hybrid, done many complete conversions, changing out the power train with his students over the last couple of decades, and has a system for making a very efficient plug-in hybrid by trading out the whole drive train, which is expensive but it’s a possibility for vehicles like light delivery trucks, but outlive their drive trains by many years, and usually go through two or three drive trains over their lifetime, the next one could be a plug-in drive train.

Poulsen Hybrid has a low-tech, not very, what would you call it, low-cost system that’s not very capable yet, it

doesn’t have the controls yet or anything, but it has a very cool concept that you replace a couple of hubs -- hub caps with hub motors, and thereby have to do very little mechanically to turn the vehicle into a plug-in hybrid.

So in conclusion, watch CALCARS news and follow what we’re doing. We’ve got some white papers and on that EER that I was talking about, on the pricing of conversions and how that could be done; of relative to the value of cash for clunkers.

And basically, we’ve been doing all this stuff on a shoestring, two of us that are now working without income, which is not a sustainable thing in itself, and are looking for seed capital to continue, and begin and really go into this latest campaign.

Thank you very much.

MS. BAROODY: Thank you. Thank you, Ron.

MR. GREMBAN: Uh-hum.

MS. BAROODY: Now, I’d like to welcome Matt Miyasato, with South Coast Air Quality Management District. Thank you.

MR. MIYASATO: Great, thank you. I want to thank the California Energy Commission for not only hosting and deciding to host this workshop here at the South Coast Air Quality Management District headquarters here, in Diamond Bar, but also for asking us to participate, because we

believe electric drive technology is one of the key components of our technology demonstration program to help us attain our cleaner goals. So thank you for that.

I want to welcome everyone to the South Coast basin, for those of you who are not from the area and for those of you who flew into LAX or Ontario during the daylight hours got a good chance to graphically see the air quality problem that we face every day, especially during the smog season.

So with the fires, it helped really, fully illustrate the inversion layer and you're seeing what happens when we have emissions that are staying very close to the ground. All of the residents within our 16 or 11 thousand square foot region of the district, 16 and a half million residents are subject to that poor air quality.

And that's why it's a call to arms for us to develop, demonstrate and deploy clean technologies and, like I mentioned, we believe that electric drive technology is one of those -- one of the weapons that we can use to attack the issue.

Now, for those of you who aren't from the South Coast Basin, just a reminder that we suffer from the worst air quality in the nation, every year the American Lung Association puts out a treatise on what are the most polluted cities across the nation and, historically, Los

Angeles is at the top of the list for ozone, and this year was no different in 2009.

But you'll also notice there's two other California cities that are listed and it's in the San Joaquin Valley, and so all of our State is being subject to poor air quality.

And in terms of year-round particulate pollutions, that's PM 2.5, Los Angeles is also at the top, in the top three. We also know that Pittsburgh is doing its share, so I want to give a shout out to Pittsburgh for making the top ten.

But that being said, particulate pollution is of special concern to us because, as you may know, diesel particulate is a carcinogen, so we've redone our multiple air toxic exposure studies, that's MATES; this is the third round that we did early in 2000. We sampled emissions throughout the Basin and then, based on speciation of those samples, identified the carcinogenic risk associated with those samples, and the dark colors are indicative of higher cancer risk.

And you'll see the purple and blue areas on the map are really concentrated in the L.A. region but also, notably, near the Ports of Los Angeles and Long Beach, you can see this outcropping here.

And so there is a strong call to arms, an urgency

to reduce pollutant emissions, and most of these are from the mobile sector.

Now, what are the bad actors? If you look at this chart, this shows the inventory of 2002, 2014, and 2023. And so those dates are significant because in 2014 we need to meet our PM 2.5 standard, which we are required to meet the national air quality standards for PM 2.5 in 2014, and in 2023 we're required to meet the ozone standard.

And the numbers that you see at the top, 192 tons per day, that's the reductions we have to achieve by 2014 for NOx, because it's a precursor to PM 2.5 and ozone. And then 2023 we need a 383 ton per day reduction.

And you can see the bad actors are the bars here, it's off-road equipment. It's difficult to read, but it's off-road equipment, heavy duty diesel trucks, and then light duty passenger vehicles.

And as you progress through time, as fleet turnover occurs, we see that those bad actors remain the same, but you're also seeing in 2023, now you're seeing marine vessels and ocean going ships are one of the largest NOx emission categories in our Basin.

And so what we need to do is develop technologies that address the near term emissions today, in the near term in 2014, and in the longer term, 2023, and then how do we transition those technologies to attack these other

vocations or other applications?

So what we've done at the South Coast is adopt a technology portfolio approach, so we look at near term to longer term technologies, we have different pathways to achieve those emissions reductions. And so we're not betting on a single silver bullet, or a single horse, we're betting on many different types of technologies.

But one path that we see is alternative fuels, cleaner fuels, cleaning engine vehicle technologies; and electric drive is one of those technologies, including we'd like to see zero tailpipe emissions with the pure battery electric vehicles, or even fuel cell vehicles if the feed stock is done in an intelligent way such that your wheel-to-wheel emissions are low.

And now, our charter and our main mission is to reduce pollutant emissions, so those are emissions which give us low ozone, low NOx, low VOCs, and particulate. But we also have to keep an eye toward greenhouse emission reductions, as well as energy diversity, so a domestically reduced fuel and one which is done renewably would fit very well into our portfolio.

And so we have, for a long time, been very interested in plug-in hybrid electric vehicles. For the past nine years we've been investigating with many of our partners, including the Air Resources Board and EPRI. And

we've, about three years ago, sponsored demonstration to convert light duty vehicles, so most notably with Energy CS, and High Motion/A123, and also Quantum Technologies to convert Ford Escape hybrids.

And through that process our goal had been to not only convert an existing fleet, provide fleet turnover and also critical data with respect to the battery life, and also commuter performance.

But another one is to set the bar and to really push the automakers, and we're very pleased to see that there has been resurgence in interest by the automakers, notably Toyota and, of course, GM and Ford have all announced their plug-in hybrid electric programs. But also, a resurgence in pure battery electric vehicles, so with Nissan, and also Mitsubishi have announced their vehicle programs and we're anxious to participate with all of the auto makers to make those deployments happen earlier in Southern California, in our region, because that's where we see the greatest need.

But perhaps a better fit for plug-in hybrids, at least in terms of emission reductions, we see in medium and heavy duty vehicles.

We have been partnering with EPRI and, at the time, Daimler Chrysler, to promote the plug-in Sprinter Van. Now, that's a package delivery van, and those types of occasions

where there's lots of stop and go, there's idling, we see that there's a natural fit for plug-in technologies, and that's why we've been very interested in that.

Also, boom trucks, utility boom trucks, telecom boom trucks, instead of idling off of a diesel engine or an APU, you can use a battery. And you see the huge emissions benefit, not to mention you get a great fuel economy benefit, and these are the types of technologies that we look to support.

We are very pleased to have won the Transportation Electrification Award with the Department of Energy, with our partners at EPRI and EDEN to develop and accelerate the commercialization of plug-in technology to utility boom trucks, telecom boom trucks, as well as shuttle buses, and other applications where there's lots of stop and go, could be a package delivery.

And we're anxious to be working with the Department of Energy and the California Energy Commission, who are co-funding this project.

And with the interest, the resurgence in interest in electric vehicles, we're also sponsoring many different electric vehicle technology programs.

You've probably seen a lot of media attention on the Mini Es, so we have five of these Mini Coopers that are running around the Basin.

But also, as I had mentioned, our interest in medium and heavy duty, because we see greater emissions benefits there, and so an electric, Isuzu chassis truck, that's being demonstrated by Santa Monica, we partnered with the Port of Los Angeles to develop a low speed, low range battery electric drayage truck. It could also be used as a yard hostler, and also working with our -- and that's through a company called Balqon, and then working with our friends at MTA and, of course, ISC to develop and demonstrate battery electric transit buses, as well as fuel cell buses. So clearly interested in how we apply electric vehicle technology to a wide spectrum of vehicle applications.

But how about electric rail or the infrastructure there? So this is a concept by General Automics to promote dedicated guideways using Leer synchromotors to promote or to propel electric trucks or electric vehicles, or even locomotives, in this photograph here.

Or why don't we go back to World War I and do catenary electric trains, as they're doing in Europe. So it's that type of out-of-the-box thinking that we'd like to consider to the CEC for promotion of, again, electric and in different types of technologies, or different vocations.

And also, finally, ship electrification. So this is a photograph of a Chinese shipping berth where, instead

of running the diesel APUs and polluting at the same time while they're at berth, you plug it in. This is Alternative Maritime Power, you can see the plugs here in a blowup.

But to do this and work with the CEC for infrastructure to promote this type of technology or advances in that type of technology to make it less expensive.

So what do we see in terms of research demonstration needs at the South Coast? Well, clearly, we need to have partnerships with the technology providers, we need to continue to support pre and early commercial technology developments, and that's clearly what the AB 118 funds that the CEC is promoting in many of the different funding allocations that they are supporting.

But we'd also recommend leveraging off of existing programs, such as those at the South Coast AQMD, our research development demonstration programs in a wide variety of different categories, and then deploy those technologies in the regions of highest needs. So specifically in the South Coast Basin where we have the air quality needs and the consequences from the health effects associated with those emissions.

And then innovation of those technologies to different types of vocations, so as I mentioned perhaps it's locomotives, perhaps it's marine vessels, so looking at

these heavy duty polluters that are going to be the main polluters come 2014 and 2023.

So with that, I'm going to conclude my presentation. For more information, please visit our website, you can contact me, directly.

And I also want to just give a pitch that I currently have the largest electric vehicle fleet in my neighborhood and I'm hoping by 2010, 2011 that we can see more full performance battery electrics, not just in my neighborhood but throughout the South Coast Basin.

So with that, I thank you.

MS. BARODY: Thank you very much, Matt.

I see I'm going to have to just review the agenda once again, since we had twice as long an introduction as we expected due to our technical difficulties.

So at eleven o'clock, which is right now, we'll have the Light Duty Vehicle Panel I, the major OEMs.

Then at 11:30 we'll have the public comment time, which will be about 15 minutes, then we'll break for lunch at 11:45, come back at 12:30 for the Light Duty Vehicle Panel II, the California based manufacturers, followed by a Conversion and Demos Panel at 1:15, and then 1:30 Electric Vehicle Components and Battery Manufacturing Panel, 2:30 the Medium and Heavy Duty Vehicle Panel, and then 3:45 Electric Truck Fleet Customers. After that we'll have the public

comment and then adjourn, if that's okay with everybody.

So right now we would like to welcome Dave Barthmuss, with General Motors.

MR. BARTHMUSS: All right, I hope I get the technology right and don't cause another half-hour break.

So I, too, would like to thank the Energy Commission for allowing General Motors to have a seat and being patient with our on again/off again presentation, and very much appreciate, certainly, as being part of the new General Motors Company, I very much appreciate being personally here today to give everybody what is intended to be a high level look at where we're going in terms of electric drive technology, and a general approach to helping build a plug-in-ready community, since this is an electric drive workshop.

And it certainly has been a very challenging year for General Motors, since we celebrated our centennial back in September. I think it's important to sort of begin all of these kinds of presentations with a look at what we are and what we are today, and where we plan to head in the future.

You know, as my mom used to say, you know, where's there's challenge there lies a whole lot of opportunity. And I think right now General Motors has been given the opportunity of a lifetime. And we recognize that we're not

going to get a third chance to get this thing right, and so we are putting all of our resources and all of our commitments to really focus on customers, cars, and culture so that we can be around for another hundred years.

And I firmly believe that as we've gotten through this turmoil and emerged on the other side, we have a great -- we are very well positioned, probably better than anybody probably had imagined a few short months ago. I think we're right sized for the market, we've got a great balance sheet right now to move forward, and we've got a lot of people to thank for that. Everybody in this room right now, certainly the U.S. and the Canadian taxpayer, we certainly are very humbled and very fortunate, and we know that we've got to get this right so that we can return your investment in our company.

So our strategy at General Motors is to focus on technology that reduces petroleum use and thereby reduces greenhouse gas emissions that comes out of our tailpipe. We really want to displace as much petroleum as possible through energy efficiency and energy diversity.

And our goal is to use a diverse and ultimately renewable energy resources to fuel our automobiles, so that we can actually remove the vehicle from the environment and energy debate.

Now, a lot of you folks have probably seen this

slide. This indicates how we think we're going to get there in very general terms, we call it the "swoop chart" at General Motors, and it indicates, you know, the lower line goes across time, what's going to take longer to get where we need to be, and the vertical arrow talks about the kinds of things that will improve fuel efficiency, reduce emissions, and displace the most amount of petroleum.

Obviously, we've got to improve and will continue to improve the efficiency of the internal combustion engine, working very, very hard on a myriad, many different kinds of hybrid systems going into various different vehicles.

Battery electrics, very important for General Motors. The extended range electric Chevy Volt, which I'll be getting into in more detail, is sort of the poster child, if you will, of the reinvention of General Motors, the reinvention of the automobile.

And out there at the ultimate extreme is the hydrogen fuel cell electric vehicle, which does certainly hold the promise of zero when it comes to zero petroleum used, zero tailpipe emissions, et cetera, et cetera.

And as you see, the various technologies further out in time. But we are very excited about the fact that we'll be bringing in the Chevy Volt extended range electric vehicle to Chevrolet showrooms November of 2010.

I'm sure a lot of folks have read news about the

Chevy Volt, I'm sure you've been on various websites, so I really hope that this product is not news to anybody.

It takes a lot of the lessons, a lot of the technologies that we have learned with our EV-1 experience, an S-10 electric experience, and arrives at a vehicle that I think truly could be what the EV-1 would have been had we continued production and marketing.

It's our top priority when it comes to the advanced technology at General Motors. It's going to be a vehicle that will give you hundreds of miles of all-electric driving. Certainly, it does use a small gasoline or advanced biofuel engine to create electricity on board to help continue the battery pack and the electric drive train.

It has a lithium ion battery pack that when fully charged, using a 120 or 240 volt outlet in your garage, will give you 40 miles of all-electric driving. And for 75 to 80 percent of all Americans, who have a daily commute of that, we think that will work just fine.

But then we have the added benefit of the range extender, which when the battery depletes at a certain point kicks in seamlessly to generate electricity to keep the electric motor moving for hundreds of all-electric miles.

So you can go from Los Angeles to San Diego, to Los Angeles, to Las Vegas, or wherever you need to go without having as much range anxiety as you might have in other

cases.

And speaking of the battery pack, you know, we have announced that in 2010 we're going to open up the first dedicated lithium ion battery pack manufacturing facility I think of any major auto maker, and we'll do that right here, in the United States.

And we've opened battery research facilities and labs in Warren, in Ann Arbor, Michigan, in conjunction with the University of Michigan to really help pave the road for the ultimate commercialization, mass commercialization of the Chevy Volt and other vehicles that will be utilizing our EREV extended range electric vehicle system.

But that's going to take a lot of collaboration -- whoops, wrong button. That's going to take a lot of collaboration and one of the biggest parts of the pie here is the infrastructure that's needed to coincide with the vehicle.

Our goals with some of our collaborations, for example the one here with EPRI, Electric Power Research Institute, and the partnering electric utilities is to really accelerate the use of electricity to replace gasoline. So among other things, you know, in addition to energy independence and not being 98 percent reliant on a single source of energy, is so that we can realize the environmental benefits of the plug-in revolution, so to

speak.

We want to create affordable, desirable vehicles that will really take advantage of the electrical grid and we want to provide accessible, reliable, convenient low-cost electricity, and we also want to assure that homes are ready for the Chevy Volt when they bring it home, so that we can plug the vehicles in, it's easy for the customer to make sure that they have that plug in the right place, where it's 110 or 240.

Really, that's what we're focusing on right now. We're not necessarily, at least for the Chevy Volt, needing a large scale, vast, convenient charging grid because the one we're going to rely on at the outset is the 120 and 240 volt plugs.

And what this map illustrates are all the electric utilities that are part of this consortium that's helping us get things right.

Now, we've got to get a lot of things right with the Volt, I mean that goes without saying, and a lot of questions still remain to be answered about the market development of electric vehicles.

A lot of smart people, across different industries, are really beginning to look at this very, very seriously. We've got to get the market analysis right. We've got to know what we're up against.

We're designing a vehicle that simply plugs into a normal electrical outlet at home. You know, is that going to be enough, is that going to suffice?

Or, you know, how important, ultimately, will the fast, convenient charging be for these early introductions?

We have to get the technical interface right between the vehicle and the charging infrastructure. This really includes the charging hardware, as well as the communications between the utility, the home, and the vehicle, itself.

Public education, you can't start too soon. You know, I know when I'm talking to my teenage daughters I get what's a plug-in hybrid, what's an extended range electric, what's a hybrid, all of these acronyms begin to confuse people.

And when you go into the dealerships, you know, I mean it really gets even more confusing. And so what we have to do is make sure everybody is trained at the dealership so that this buying experience, the ownership experience is as easy to understand as possible. And you can never start too early in getting that public acceptance and education going.

We have to ensure that it's very seamless for the consumer to purchase or lease these vehicles, whether it's through the incentives, the tax incentives that are in play

to reduce the costs of owning these vehicles; whether it's making sure that their garages become plug-in ready; it cannot be an obstacle that someone says, no, that just seems too hard for me, I want to go for something else. We have to make it a very value proposition, we have to make it easy for folks to own these vehicles.

And certainly public policy is going to play a very, very important role. We're going to need a lot of collective skin in this game, as I'd like to say, and we need government help in the way of these kinds of incentives, in the way of these codes and standards that I'm talking about.

Certainly, it's expensive to introduce any new automotive technology and, certainly, the Chevy Volt extended range electric technology is no exception. And I think we need to align our thinking and our needs with the utility industry, as well. It's to our advantage to ensure that all of us are on the same page.

Now, when it comes to plug-in communities, we're working with folks in, obviously, the major areas of California, whether it's the Bay Area, Los Angeles, and other markets as well, and other markets across the east coast.

I mean, how are we going to make our communities plug-in ready for these kinds of vehicles?

Normally, there's a dedicated project leader, certainly there's a lot of involvement with both the State, city and county, clean city organizations. Ai districts are very, very important.

Utilities have to play a huge role as well, both at the municipal and regional level.

Regulators, public utility commissions, permitting codes and standards, local employees and certainly employers.

And the kinds of games plans that we've worked on are things like vehicle purchase incentives, making sure that there are incentives as well to put in the charging infrastructure that's necessary.

How do we make sure that there's low off-peak charging rates so that consumers and owners are plugging in at the right time?

What are the renewable and the green charging options to make that we are as clean as possible when we do all of this stuff?

Building codes and standards; as you put in new garages, new buildings, what are the incentives to make sure that there is a 240 plug and other kinds of things that are making sure that the outlet is in the right area of the garage.

As I look at my garage and I want to bring that

Chevy Volt in there I'm thinking, oh my God, I have to rearrange the entire layout of the garage because I had never anticipated, you know, having an electric vehicle going in there.

So there are a lot of things like that, that sort of come into play.

HOV lane access is critical. Free parking, where we can do that in various lots and, certainly, it will be great to have a place for free charging, some incentives like that.

So, you know, the ultimate question that we keep asking ourselves is, is California plug-in ready? Certainly, California has the greatest experience in terms of electric vehicles, dating back to the mid-nineties, so let's sort of build on that and figure out where we need to be for the Volt and all of the other manufacturers that are introducing electric vehicles.

We've got a lot of major stakeholders already engaged and we've got a lot of vehicle and infrastructure incentives as well coming into play.

But I guess that's, you know, one area that we really need to focus on, you know, AB 118 vehicle incentive funds may not go very far when you take a look at the fact that I think it's what, $5 million that's allocated right now, and we think that that's going to really help fund

maybe 1,600 vehicles or something like that.

And when you consider the very ambitious plans for Chevy Volt introduction in California and, you know, all of the other folks that are coming to play, too, certainly we're going to eat those funds up, you now, quicker than the cash for clunkers funds went through.

So I think what we really need to do is when there is another budgeting cycle and there's an opportunity is to consider how we can make more vehicle incentive funds available to bring down the cost of -- help us bring down the cost of ownership.

Charging incentives, even more important, and I think it's even more important to consider since the Clean City Stimulus awards for EV charging didn't come through as much as we had anticipated.

We've got what, 2000, something like that, existing charging spots throughout the State of California. Who is taking the lead on refurbishing these, so that these can become plug-in ready for the new kinds of technologies for EV vehicles? Is that happening, are there funds for that? Who is taking the lead to be the champion there?

Senate Bill 535, the Yee legislation is great, HOV access for these kinds of vehicles, we very much support that. And that's an example of the kinds of things that we want to build on collaboratively to help build -- you know,

to make these vehicles commercially viable and to help consumers say I want that vehicle, I want to have it in my driveway, that's a great incentive.

So as we talked about the electric no-plug/no-deal revolution, I think we also have to realize that we need a broad portfolio of solutions. Certainly, electric drive technology is very, very important at General Motors, whether it's the extended range electric Chevy Volt, whether it's a plug-in hybrid vehicle that we are getting ready for a nameplate to be named as soon as possible, or whether it's the hydrogen powered fuel cell vehicles that are part of project driveway.

We heard Matt talk about the fact that there is no silver bullet and we really, really do believe that right now.

Certainly, as you look at the very, very aggressive CO2 reduction, greenhouse gas reduction goals of California, I don't think that electric vehicles alone are going to help get us to where we want to be.

So although the workshop is really focused on electric drive vehicles, we very much encourage you, the Commission and others, to continue to recognize that a full portfolio of solutions is going to be required to meet the California CO2 reduction goals and to really satisfy a broad range of customer needs that are very differing in many

cases.

So we're going to continue to invest in vehicles that run on advanced biofuels, those that are biofuels that are generated from cellulosic feed stocks.

Hybrid systems, certainly continue extended range electrics and move it beyond the Volt and into other kinds of platforms, and hydrogen fuel cells as part of Project Driveway.

You know, none of these really have to be mutually exclusive and we really need to support a climate in which we can be moving forward at the same time, supporting more than one technology, and make progress on all of these fronts, so that we can reduce petroleum as much as possible, reduce CO2, greenhouse gas emissions, and arrive at a world where we ultimately have sustainable mobility.

So that is my presentation.

MS. BAROODY: Thank you very much, Dave, appreciate you being here.

Is David Paterson here from Mitsubishi? David Paterson? Don't believe he's here, okay.

At this time I think we'll take a quick, five-minute break, and then we'll come back for the public comment session. Thank you.

(Off the record for a break.)

MR. OLSON: I wonder if we could start our process

again?

Before we go into the public comment, my name is Tim Olson with the California Energy Commission, I'd like to -- a couple questions I'd like to ask of Dave Barthmuss again, if you don't mind coming back up, Dave, for -- and part of it is we really appreciate your interest in providing insights and helping us gather information.

And part of this is some of this is very difficult to do in a public setting.

MR. BARTHMUSS: Right.

MR. OLSON: And so we understand that you've offered to meet with us --

MR. BARTHMUSS: Yes.

MR. OLSON: -- to discuss some of the information. But I just wanted to -- this comment is also for some of the other speakers.

In essence, this series of workshops starting today is to help gather information to determine things like how much money should -- is there a need for an incentive? You've made some comments, suggestions, and we appreciate that, and what's the rational for that?

And so we need to get into detail in some cases, like what the rollout, potential rollout schedule might be, timing of that?

We're on a fiscal year basis, so for green in this

case, we'd -- in the case of electric drive OEM product, we've agreed with the Air Resources Board that the first year, which we're in mid-stream, they would provide the initial incentives.

But we need to revisit that every year and that's part of this workshop process.

And we're expecting to go from about close to a thousand vehicles today to 5,000 within the next year, and then close to 15, 30 thousand very quickly, and so we need to have an understanding of that kind of demand.

And just from the stand point of how much -- if we're willing to do this, how much money do we set aside for incentives to buy down the differential cost between an electric drive and a gasoline or diesel?

And we also need to know locations of where you think the customers might be, to help us in targeting money for the charging infrastructure and, in essence, how many?

We look at like your charge infrastructure as a pretty good deal, cost wise, and we're willing to spend money on it, just need to know locations.

And by the way, this is the same kind of comment we're making at natural gas workshop, hydrogen, et cetera. And so part of this is if you're -- this is an open comment, it's a comment to you, but it's open to the other people here.

To the extent you're willing to share that insight and information, it's going to help us in determining the rational of how much money to allocate for some of these areas.

And if you have any other comments on that at this point, we're open to that, or if you want to do this in a more one-on-one type of session, we appreciate that, too.

MR. BARTHMUSS: No. Well, certainly, we can get into a heck of a lot of detail when it comes to a one-on-one, behind-closed-doors session, because a lot of our rollout is going to be very, very proprietary.

Now, you're having workshops on other kinds of technologies. We have a very detailed and extensive rollout plan for where we think the hydrogen stations ought to be placed, how many we actually need. We were part of the Hydrogen Highway Blueprint Committee, and helped develop the actual locations and how many stations, where we think the stations ought to be.

Not stringing them up and down the highway where people aren't going to be traveling as much, but maybe concentrating them in urban settings, where the initial vehicles are going to be.

Now, when it comes to -- so when you have the workshop on the fuel cells, hydrogen, yeah, we've got a lot that we can share. We can also share a lot in the meeting

that's being set up with my colleagues from Detroit.

The Chevy Volt is designed to be a high volume production vehicle, that's why we put the Chevrolet bowtie on it. It's not intended to be a niche vehicle that's priced so expensive that only a certain -- you know, a lucky few can own the vehicle.

At product launch, we're going to launch the vehicle November of 2010, we are concentrating on -- we haven't announced the rollout markets yet, but I think everybody can imagine where the vehicle is going to be sold or leased first, it's going to be California is extremely important to us, as are a couple cities on the east coast.

And when you look at California, I mean, there are certain major markets where a majority of consumers reside. Whether that's the greater Los Angeles/Orange County Basin, whether it's the San Francisco Bay Area, or whether it's a market or city further south, you know, I mean that I would suggest that we haven't made any official announcements of what the phase one launch would be, but if I were a betting person I think those would be, you know, where you would expect to see the vehicle.

I would also expect that you would see the vehicle in the State Capitol, as well, for obvious reasons.

The Volt, at launch, is not going to rely on fast, convenience charging. We are really designing the vehicle

to be primarily used with regular 120 to 240 volt outlets.

Now, everybody's garage theoretically has one of those. We would like to see some help in maybe upgrading those, for those who want to, so you can have, you know, the three-hour charge at 240. It will charge roughly six hours at the 120 volt.

Certainly, when you go to work some incentives would be great there so there are some charging abilities there, at work.

If you live in an apartment, where you don't have a garage, I think we need to talk about how do you get the appropriate charging there for those to take advantage of that.

And we haven't talked production volume for the Volt, but it is very aggressive, that's all I can really tell you, it's a very aggressive launch.

Now, the first year goes from November 10, obviously to November 2011, it's going to be a 2011 model year vehicle, so the early numbers are stretched across that year, and then it's going to ramp up increasingly larger numbers thereafter.

And we are also looking at the EREV technology and spreading it across other kinds of vehicles, so that we can sort of make -- we want to own the intellectual property for battery development, battery technology, R&D on our own, and

we want to sort of have the electric drive mechanism become for us what the internal combustion engine has been for the last hundred years, we want to make it sort of like our internal -- I don't know what to call it, but treatment. Like a little bit -- you know, "Intel Inside" you're going to see "EREV" inside as we move forward.

I don't have specific numbers to tell you but there is, obviously, a $7,500 Federal incentive that the Volt applies for.

Certainly, we are very appreciative of the $5 million that are part of AB 118, but I think that's going to be used up just like that. And I think the more incentives we can get through other sources, over and above the 7,500, obviously we know that we have to subsidize the price a little bit ourselves, you know, the more money we can get for incentives to make the early adopters get the vehicle, the better.

And we build more of them, the battery technology improves, that cost will naturally come down as it becomes sort of a core product for General Motors.

MR. OLSON: Okay, appreciate your interest in that. I'd also remind people here that we schedule a second workshop, the topic of charging stations will be one of the key things addressed in that, sometime late September, early October.

So it's good to have your feedback to kind of put that on the table for those people who are doing the charging infrastructure and investing in that.

MR. BARTHMUSS: Okay.

MR. OLSON: Thanks a lot.

MS. BAROODY: Thank you, Dave.

MR. BARTHMUSS: Yeah.

MS. BAROODY: Okay, I think we're at the time now where we can have a public comment session, it's about 15 minutes. And I think Charles has collected a few blue cards.

Charles, would you like to read those questions?

MR. SMITH: Well, I was -- I could actually invite them to come to one of the microphones. Is Paul Scott, representing Plug-In America, with either a question or remarks pertaining to a electric vehicle manufacturers' loan guarantee program.

Please introduce yourself for the record.

MR. SCOTT: Thank you, Paul Scott, representing Plug-In America.

MS. BAROODY: We ask for about two minutes, if you don't mind?

MR. SCOTT: I won't even need all of that.

MS. BAROODY: Okay, great, thank you.

MR. SCOTT: Plug-In America does support the

California Energy Commission to, you know, have a program for California EV manufacturing loan guarantees.

There are several companies, that we're aware of, starting up in this State that are going to be building either componentry or the cars, themselves, and they are in need of some capital to get started. I don't know how much, 10 million, 15 million, some sort of a pool of funds that would help get some of these car manufacturers going.

In addition, I would like to speak briefly to the charging infrastructure issue.

Plug-America, and in addition to the Electric Auto Association, both of us are national groups, and we've been essentially running the charging infrastructure primarily in the State of California, but it is now spreading throughout the country.

We are aware of all the existing charging stations, both active and inactive ones, all of which can be converted over to the newer technology.

We are also aware of the places where people like to charge, you know, given that we represent the people who have been using these vehicles for the last ten years.

We're very attuned to how they are used, where people go on a daily basis, and how long they're there, and what kind of charging is necessary, whether it's level one, level two and certainly, in the future, level three

charging.

So if you would like to have the Electric Auto Association and Plug-In America work with the CEC in helping to identify these spots, we would be most happy to help you with that. Thank you.

MS. BAROODY: Thank you very much.

MR. SMITH: Thank you. We also have a card from Linda Nicholes, I believe, also from Plug-In America, with a question about infrastructure, as well.

And if you could introduce yourself, that would be good.

MS. NICHOLES: Sure, I'm Linda Nicholes, from Plug-In America. I just think that funds for allocation for public infrastructure, Plug-In America feels that this is so, so very important. And we really need to have you take the lead to upgrade and create charging infrastructure bulk.

I can speak to this because I have driven an electric car for the better part of a decade. And whether it's important to have adequate charging in our garages, it's also important to have public infrastructure.

And one way I can emphasize this is Plug-In America has something on the website called a plug-in vehicle tracker. We actually show that there are going to be, or there are 73 electric vehicles on the drawing boards for global, possible global production. Some of them are

prototype, but many of them will soon be out on the roads or already are. Of those, 51 are passenger vehicles, eight are all-electric street bikes, and 14 are commercial truck vehicles.

So you're just about to face a wave of electric vehicles and I just want to emphasize how important it is to have the charging infrastructure. Thank you.

MS. BAROODY: Thank you, Linda.

MR. SMITH: Have we had any questions from the WebEx?

MS. BAROODY: Wait, hold on, we've got a question here.

MR. OLSON: I have a question for both the representatives from Plug-In America.

We're interested in that data, location of users, and where you see the growth happening. Is that -- how much of that is proprietary or not available for public consumption, how much can we use?

MR. SCOTT: Pretty much all of it is available, very little of it is proprietary at this point. A lot of growth is taking place right now because of the Tesla rollout. And the Tesla people tend to be wealthy, I'll just state that clearly, so they want to -- they want to travel a lot, and we're seeing new charge stations being put up, the 101 and I-5 corridors, and from L.A. out to Vegas. And so

these people are kind of driving it because they have the money to pay for it, themselves, so some of that is taking place anyway.

But for the lion's share of the new electric vehicle drivers who will be coming, they will rely on, to some degree, public charging infrastructure. I know I do. When I plan trips, like for instance coming out here today, I could make the trip round trip, but it would be very close, so I know that I've got a charger out here and so I had no qualms about coming out here and using that.

So having those kinds of things scattered around the State in places where people tend to spend time, restaurants, shopping malls, movie theaters, that sort of thing, certainly parking lots where people work are going to be very important.

The way it's going to work is, you know, a good 70 to 80 percent of the charging will be done at people's homes, at least that much.

There are quite a few people, however, who do not have access to electricity where they park their cars, some apartment dwellers, some people who just park on the street and don't have a driveway, or a carport, or a garage, and they will need to charge primarily at work.

And, of course, you know, work is daytime typically, so you want to avoid the peak hours, so when they

first get to work before peak hours hit, they'll be charging.

And so we'll need some, actually quite a bit of charging available for workplace.

And the rest of it is convenience charging, you know, at places as I identified before, movie theaters, any shopping mall area, just have a certain number of charges. You don't need a lot to start, just a handful in each location. But they will grow organically after that.

And initially, these places will probably give away the energy because they want to encourage people to come and eat at their restaurant, shop in their shopping malls.

And I can guarantee you, I shop at Ralph's because they have a charger, and I go to the Promenade because they have a charger. And I go and I spend a lot of time on Montana Avenue, in Santa Monica, because they have a charger and I spend a lot of money there.

So this does work. And so over time these people will not be able to afford to give away that electricity. But by the time we get there, that's probably four, or five, six years from now, then they can start charging for the energy that they sell, provided that the utilities allow them to do that.

Right now they'll probably just sell time on the chargers, which is the Coulomb Technologies program.

MR. OLSON: Very good, thanks a lot.

MR. WARD: I do think we would like to work with you, you folks have an infinite amount of experience in this regard. You've mentioned the on and off peak issue, which is pretty large from the Energy Commission's perspective, and the utilities' perspective as well, and we'd like to work with you on developing how we would avoid the off-peak charging as much as possible.

I know it would be convenience and strategic initially, but how we can over time --

MR. SCOTT: Yeah, and I guarantee you the way to do that is time of use pricing, tiered pricing and time of use pricing across the board, nationwide, and the sooner we get there, the better off we're going to be.

MR. WARD: Great. Thanks for your insight.

MS. BAROODY: Thank you. Charles?

MR. SMITH: Were there any comments from WebEx?

MS. MAGANA: I don't have any questions from anybody.

MR. SMITH: All right, we're going to unmute the phones, so if there are any questions we should be able to hear them.

MS. BAROODY: Okay, we're going to WebEx now, if there are any questions on WebEx.

MR. SMITH: I guess not.

MR. SHEARS: Yeah, this is John Shears, with the Center for Energy Efficiency and Renewable Technologies; can people hear me?

MS. BAROODY: Yes, hi John, just maybe speak up a little bit.

MR. SHEARS: Yeah. Well, you know, I agree with my colleagues from Plug-In America on urgency. I think rolling out charging infrastructure has to be very carefully planned, and I know some of the researchers, I know the Energy Commission has been funding at UC Davis on the intricacies of how to do that.

Similar conversations are -- and at other venues where these issues are being discussed.

MS. BAROODY: Any questions for John? Any other comments?

Pilar, do we have anybody else?

MS. MAGANA: No.

MS. BAROODY: Okay. Does anybody else want to say anything right now, while we have a chance for public comments?

If not, we will break for lunch, and we will reconvene at 12:30 with the Light Duty Vehicle Panel: California-based Manufacturers. So thank you for a good morning.

(Off the record for the lunch recess.)

--oOo--

AFTERNOON SESSION

MS. BARODY: If we could reconvene, again, for our afternoon session. Wait, let’s wait a couple of minutes for people to come in.

Okay, I think we’re ready to go, we have Green Vehicles, Mr. Ehab Youssef. Thank you.

MR. YOUSSEF: Okay, welcome back everyone. My name

is Ehab Youssef and I am the CEO and Co-Founder of Green Vehicles, Inc.

First and foremost I wanted to express my gratitude for all the hard work coming from the California Energy Commission, in particular Mr. Olson, Leslie Baroody, over the last few months they've gone way out of their way to accommodate long meetings with different municipalities, and I think the dedication goes well beyond what anyone would expect, so thank you for that.

I promise I'll be efficient. And I'm going to give the majority of the presentation and our President, Mike Ryan, and Co-Founder, will come up and talk about the technology points.

So my background, again I'm the CEO and Co-Founder, my background is as an intellectual property attorney, so I'll address the overview and I'll let Mike Ryan, our technologist, speak to any technology questions.

Green Vehicles is a manufacturer of battery electric vehicles, so pure electric vehicles. We have been around for approximately four years. We have finished our R&D and prototyping stages and we are now at the point where we are going into production and delivering vehicles to customers that are on the pre-reservation list.

We are also a technology company that's developed a substantially lower cost, longer range, high powered

advanced propulsion system.

Our lithium ion powered propulsion system delivers 40 percent longer battery life, 30 percent greater distances, up to a hundred miles range on a single charge, and speeds of up to 85 miles per hour.

Our greatest goal is to achieve a workable solution, put battery electric vehicles on the road today at a greatly reduced cost versus what's available today.

We believe we're positioned to become a vital supplier of advanced battery electric propulsion systems to the major automobile manufacturers that are rushing to fill a great demand that, as of today, is unmet.

And in order to achieve the immediate and significant market penetration, we've decided to create our own line of battery electric vehicles and put vehicles on the road, again, immediately as opposed to waiting for a rollout to come from major auto manufacturers.

Our strategic relationships with Silicon Valley Power, Stanford University's Rapid Prototyping Laboratory, and others, including MoBios Power, Coulomb Technologies, has really catapulted us into areas that we couldn't have reached on our own, and I think it will allow us to retain a leadership roll in the industry as it develops.

I think first I'd like to point out that electric propulsion systems used to power hybrid electric vehicles,

such as the Toyota Prius, really differ substantially from what is necessary for a plug-in hybrid electric vehicle or a battery electric vehicle.

The transition to lithium ion battery modules, high-powered charging systems, and efficient high speed motors and controllers really requires a great deal of experience, development and testing that can really come about only after a great deal of R&D and prototyping.

Currently, we've found that there's no such electric drive solution available today to power vehicles at freeway speeds for less than about $40,000.

And Green Vehicles is positioned to be the first to market to make these advanced electric vehicles affordable. And again, when we say affordable, we mean price ranges in the $25,000 range to achieve freeway speeds in a pure electric vehicle.

Our solution and our proprietary method to achieve the price point is really to balance power, range, usability and, of course, to achieve that cost.

And again, Mike Ryan will talk in just a minute about how we do some of that.

Today we have three different battery electric vehicles that are available. We anticipate that two of the models will begin being delivered to our customers before the end of this year.

The first vehicle is the one you see on the screen now, it's the Triac Freeway Commuter Vehicle, the price range is a $24,995 MSRP, and it is a freeway commuter, HOV lane access for a single driver, and it has a two-passenger capacity side by side..

Our standard AC motor controller package is a 30 KW package. We also offer an upgrade of a 60 KW AC motor system.

We're utilizing two different configurations for the lithium ion batteries. The first standard package is a 23 kilowatt hour lithium ion phosphate solution that allows a hundred mile range at full speed driving.

And then we have an upgrade available, a slightly larger battery pack of 26 KW, 26 kilowatt hour, rather, for a 120-mile range.

All of the vehicles come standard with an on-board charger that's capable at charging at a 120-volt standard outlet or 240-volt, similar to your dryers at home.

And we also include a battery management system which monitors, controls, and displays the individual battery voltages.

It's programmable through a color touch screen interface, and we also have access through a USB port to access the data memory log and track the last seven to ten days of each individual cell's performance.

It's really a diagnostic tool that will allow our service technicians to record where problems have occurred in the battery pack.

We offer optional balancing. And I say optional, even though our recommendation is that balancing isn't an option, it's an absolute must when it comes to lithium battery systems.

The top speed of a Triac is 85 miles per hour. We've included various safety features, including a structural steel cage, a frontal impact redirection system, side impact bracing and, of course, a low center of gravity to keep the wheels on the ground at all times.

Every one of the three wheels on the vehicle is balanced to have the exact weight distribution at all three points.

And, of course, the vehicle meets or exceeds NHTSA's FMVSS standards.

The second vehicle is the Buckshot, it's a half-ton pickup truck. The price point, again, is just under $24,000 MSRP.

It can achieve freeway speeds of 65 miles per hour, and it has a half-ton payload capacity.

The primary uses for the vehicle will be for delivery, fleet, and certain municipality uses.

We have a 30 KW or a 60 KW AC motor controller

package again available.

And this vehicle comes in two different configurations for the battery pack, including a 280-volt, 288-volt, 46-kilowatt hour lithium iron phosphate solution, which would allow just over 150 miles of driving range per charge.

The same battery management system's included as in the Triac. And we can configure this vehicle as a standard pickup truck with a bed, allowing dump truck type usage, or we can also configure it with a covered cargo delivery box that you'll see in some of the further slides.

Again, we satisfy all of the FMVSS standards for three-wheeled vehicles.

Our third and final vehicle that we have available today, and anticipate delivering before the end of the year, is the Moose, which is a minivan, again similar price point, just under $24,000.

We have two different battery configurations here. This vehicle will be configured as either an NEV, neighborhood electric vehicle, either as a low speed or medium speed configuration, depending on the state you're in. And we also have an option for a full speed vehicle that satisfies the FMVSS options.

The upgraded battery pack system allows a hundred-mile range and that would of course be with the lithium iron

phosphate package.

We also offer a shorter range VRLA battery pack for NEV use.

With that I'm going to bring up Mike Ryan to talk a little bit about the technology.

MR. RYAN: Afternoon everybody. I'm Mike Ryan, thank you for having me.

I'd like to start to talk about our technology direction future in the context of major EV industry trends in energy storage and charging.

Energy storage is an area that for any electric vehicle company requires ongoing analysis benchmarking and integration, in particular, at the present time where the landscape is shifting so rapidly.

There's tradeoffs being cycle life, energy density, specific power, temperature, and costs, and we believe over the next two to five years there's going to be a broadening of this landscape and new opportunities for companies that can move very quickly in terms of integrating the next generation of energy storage. So that's something that we take very seriously and we think is an important competitive advantage for us moving forward.

This Smart Grid is an important topic because this is an area where electric vehicles have a clear advantage in terms of environmental and cost benefits against

conventional vehicles.

The U.S. Postal Service just released a feasibility study for replacing their 150,000 delivery fleet vehicles. In that study they cite a benefit of $2,308 per vehicle, per year, from the Smart Grid, which is a staggering number, and I think probably a little unique to the Post Office, although they can illustrate some of the real benefit that's going to come to that in the future.

So as a vehicle and a technology company we want to enable the largest reduction in greenhouse gas emissions at the best value for our customers, and by eliminating the need for spending reserves, electric vehicles are that much more valuable to that end.

For our company that means participation in the J1772 standards, as well as developing the power and communication systems on the vehicle side.

It also includes our engagement with Silicon Valley Power, based in Santa Clara, who's actively constructing a best-in-class Smart Grid. And within their area they have posted a free outdoor WI-FI service, with the infrastructure already in place, which is going to be used for data communications, with plug-in vehicles for charge tracking, complex billing, and demand response.

So we think that's an opportunity to leverage a great deal of Silicon Valley Power's research and

development through our technology sharing, which will benefit both organizations, and also start to help some of the -- answer some of the practical questions about charging locations and real -- in real world applications.

You know, the composition of charging at home, at work versus public stations.

Okay. In terms of an IT system, we think this is also an important part of our technology. Moving forward, we've got a consumer focus. We see this as an opportunity to solve some of the range fears that people have, as well as some of the service unknowns by providing seamless information and diagnostic tools for tracking all your batteries, tracking electric vehicle related service issues.

In addition to that, let's see, the Idaho National Laboratory had done a study talking about the difference in driver behavior and how that tracked into range differences of up to, actually, over 30 percent. So the behavior of one driver and the behavior of another actually differed by as much as 30 percent.

We see that as an important number and by getting driver feedback, and sort of mixing technology and psychology together to guide the driver, sort of train the driver into certain behaviors that are consistent with longer ranges, we see that as an opportunity to gain efficiency with little or no hard costs.

And the last thing I'd -- I guess I should move this thing forward; shouldn't I. There we go, sorry about that, I've gone past that slide.

And the last thing is on the technology side, you know, some of the benefits of electric vehicles are the programmability, and the opportunity for dynamic improvements and some level of intelligence.

For example, the vehicle can learn the difference between what would be considered an urban driving condition versus a freeway driving condition, and the response of the braking system will be adjusted in accordance with the driving conditions that they're currently under.

And again, these are the types of two to five percent efficiency gains that in the aggregate -- there's other examples that I'd say are more proprietary, but in aggregate, when you add them together, you end up with serious benefits to the customers.

Then in terms of greenhouse gas emission reductions, we're trying to address where we think we fit into the CEC's goals, and so I gave some estimates here of our vehicle reductions per vehicle.

I think on a qualitative level, a creation of new niche, demonstrating utility of a regional vehicle, I think this is really something important as we unveil our vehicles now, people get the opportunity to really see that, yeah, we

sort of know rationally that there's a 33 or 35 mile average daily driving distance, but to actually establish that, yes, in fact our vehicles are meeting the needs of a great contingent of customers, I think that's going to be important.

Again, I already covered the Smart Grid and the work with Silicon Valley Power.

And then also just as well, in Silicon Valley and in California, developing a critical mass for EV technology.

And then one of the -- the last thing I'll cover before I pass it back Ehab is the cost benefit analysis, total cost of ownership. This is something where I think we're somewhat unique in that we're able to compete on par with a subcompact conventional vehicle.

And I give the numbers here, although I think they're a little bit hard to see. Essentially, my assumptions here are 35 miles travel daily, a $3 per gallon gasoline price, and a nine cent per kilowatt hour cost of electricity.

MR. YOUSSEF: Okay, and I promise I'll move it forward quickly here. The important point to everybody in competitor comparison is that I think competition is the single most important force in bringing battery electric vehicles to reality.

So everyone here today, from GM to Aptera, that's

coming up, to all the others that are here, I think the fact that there's competition is what's going to make this industry successful.

And I think that the niche players, the smaller players, historically, have been the ones to push ingenuity and actually sometimes get the giants to move forward and invest in their own -- their own futures.

So Green Vehicles, as we mentioned, is an advanced propulsion system provider and really the cost-effective nature of that is what's most important to us.

All of our vehicles, the hundred percent electric, battery electric vehicles will quality for the $2,500 Federal tax credit, the $1,500 CARF rebate, and we expect our vehicles to be 40 percent less expensive than same class vehicles on the market today. The magic price point for us is about $25,000 retail, before the tax credits and rebates.

The important point I want to make here is that there's a paradigm shift that's going on, and we're all familiar with what's happening regarding protecting our environment, regarding electric vehicles and the push from the consumers, really motivating the manufacturers to move forward.

By 2020, it's expected that plug-in hybrid electric vehicles will represent over 50 percent of the growing number of total hybrids sold and we conservatively estimate

that we'll be able to capture about 15 percent of that battery electric vehicle market by 2012, and up to 20 percent by 2015.

Beginning in 2012, we expect to place our advanced propulsion system into these next generation PHEVs. That market will amount to a $57 billion market by 2020, and the cost of the propulsion systems is about 30 percent of that.

So we're talking about a $17 billion industry by year 2020.

First to market is critical, as we all now, and I think Toyota Prius, those two words alone will signify what happens when someone moves forward, a company, and puts a good product in place, and how it's incredibly difficult to displace a company that's done that.

We plan on promoting our vehicles through both national dealership networks that will have sales and service, we'll roll it out on the West Coast, primarily California first.

We'll also have direct inside sales to cover municipalities, fleets, corporate uses, universities, et cetera.

This is probably the most important slide today. What I really want to emphasize here is that Green Vehicles, after four years and a lot more R&D and prototyping than we expected, we're finally at a stage where we're actually

delivering vehicles to customers. We believe we're in that production stage. And even though this year we'll only deliver about 60, so 6-0 vehicles, to our customers on the pre-reservation list, we anticipate that those first 60 vehicles, if we're successful in obtaining grants and funding, will really catapault us into going into larger volume manufacturing.

You can see from the chart that this year we employ roughly 15 people. We're at the initial production stage, delivering 60 vehicles this year.

By next year we anticipate producing and delivering 25 vehicles per month. We expect to employ between 25 and 50 employees at our San Jose manufacturing facility.

And by 2011 we anticipate 75 to 200 vehicles per month. That's a broad range, of course, but it depends on the funding that's available.

And we anticipate employing 35 to 70 employees, again, at our San Jose facility.

By 2012, if we're successful and the assumption is a $5.5 million investment, we anticipate 75 jobs and 500 plus vehicles per month.

It's important to emphasize that those job numbers that we're listing are just at the San Jose facility. It doesn't include any other employees, nor does it include outsourced manufacturing suppliers, et cetera.

The last point I want to make here is that we will employ light manufacturing, assembly, fabrication and test in San Jose.

We are an American manufacturer of EVs, with our own WMI identifier, and we will be a “Made in the U.S.A.” brand because over 60 percent of the net value of the vehicle’s technology and component parts will be manufactured in the U.S.A.

The very last slide, I’m going to quickly go over customer demand, which is in the very first 60 days or product announcement we were overwhelmed with the customer demand. We had over 50,000 website hits in that 60-day period. Thousands of customers inquired, requesting product availability all across the world.

And we pre-sold our entire first round or production. Again, a very relatively small number, 60 vehicles, but we did that immediately and today every one of the vehicles are called for.

The key sales opportunities that have approached us, U.S. Postal Service, UPS, FedEx, all the major high tech companies, including Google, Lockheed, Yahoo.

We’re working with the City of San Jose, Moneta Airport, City Fleet at San Jose, water treatment plans, and we’ve even been approached for unique uses, like the Salinas Valley agricultural uses in the field, with respect to our

three-wheeled Buckshot pickup truck.

I'm going to skip to the very last slide and I'm done here.

The important point here is what we are seeking is that we receive, and the industry really as a whole receive investment sourcing from The California Energy Commission. We think, because of the travesty in the ARRA funds and where they've gone, and the fact that California didn't receive those funds, the bad news, like the Newby Plant closure, we think that investment is so critical at this point in time to move manufacturing forward here, in California.

We are looking for a CEC investment in the form of the $2.5 million grant and we feel that that would enable us to achieve our goals as set forth on the previous slide and to go to large volume production in our San Jose facility.

We have been successful in soliciting and receiving endorsement from various municipalities and we'll confident we'll receive a million dollar grant in the form of cash and in-kind contributions from the city that we're working with.

We also feel that the contributions by the Silicon Power Company and their Smart Grid technology contributions are in, and of themselves, worth millions of dollars that they've invested in their infrastructure.

And then, finally, I think one of the most

important things that CEC can do is create a loan guarantee program, either through the State loan program, or the sort of guarantee program that allows the private equity investments, including RVCs, to be assured that their investments are guaranteed by a state or municipality.

And I think I will end it there, thank you very much.

MS. BAROODY: Thank you, Ehab and Mike.

Our next speaker is Ben Werner, Revolution Motors.

MR. WERNER: I'll give a brief overview of our company, Revolution Motors.

And just to state in the beginning, there's a key concept that I want to communicate and I'll reiterate at several points throughout the presentation, which is there's a new class of vehicles represented by what we and a few other California-based electric vehicle manufacturers are introducing, which we'll call the ultra-efficient commuter vehicle.

And this has significant impact towards, really, to the challenge of bringing sustainable personal transportation to this State and this country. Thank you.

So we are, in a certain sense, the new kids on the block in the California-based EV crew. We have a prototype of our vehicle, self-funded, bootstrapped to date, over the last two to three years.

This is our vehicle, she's named Dagne. Dagne means "new day" in Norwegian.

And again, the core features of this vehicle are that she's ultra-efficient, high performance, fun to drive, comfortable and safe as per the standards that people expect for mid-sized freeway capable vehicles, and affordable, in the neighborhood of $25,000.

The key features of the vehicles; designed primarily as a pure electric vehicle, with a range of about a hundred miles, with a customer option of a serial hybrid, with a flex-fuel internal combustion engine that's capable of running conventional gasoline or biodiesel, potentially other fuels.

The preferred interface for our vehicle is a joystick. This came about through our rethinking personal transportation at every level, and recognizing that this interface in particular gives an improvement in safety through eliminating the steering column, improving the airbag effectiveness and improving braking reaction times.

Certainly, given the dynamics, the way this vehicle drives, as you'll see, this also makes a lot of sense. Although a regular steering column is certainly a backup option as well.

The evolution of the design of our vehicle ended up converging primarily on needing to communicate to customers

that although this is a slightly smaller, lighter weight vehicle, it provides all of the safety needs for freeway commuting for your average commuter.

So the design of the vehicle is intended to convey that feeling to the customer such that, given the potential for mass market adoption, that it resonates with the customer at that level.

And just a little montage of our start-up operation down in Santa Barbara, we've done a lot for a relatively little of invested founder money. And this is where we -- this is where and how we built the prototype.

Some test driving. I didn't explain this clearly at the outset, but given the motivation for our vehicle to be as energy efficient as possible for the need that it serves of daily commuting, the vehicle is narrow to maximize the aerodynamic efficiency and to be stable, and high-performance in cornering, while being narrow the vehicle leans actively into turns.

The driver doesn't need to provide any acting lean command, the driver simply steers the vehicle as he or she would normally, and the onboard drive by wire, flight control system, if you like, determines how much the vehicle needs to lean or steer, depending on how fast it goes.

So it's very intuitive, very easy, and I'm sure you get a sense a lot of fun, as well.

So this comes to the concept which I raised and introduced in the beginning, which is that there really is an emerging class of vehicles here, which we're calling the commuter vehicle, or to deal more explicitly, ultra-efficient commuter vehicle.

And just in terms -- and these vehicles, actually, are all based in -- the company's based in California.

And there's others, such as Green Vehicles, that you just heard from, that are also based in California.

But the core concept here in terms of the efficiency of driving the vehicle, how much energy it uses to get from A to B, and in terms of the affordability, up-front price tag are both improved with this vehicle topology. And I'll explain quantitatively, technically, in a little bit why that is.

So first, just touching on the market need, the market demand for a vehicle designed specifically for the commuting purpose.

And these are 2003 statistics, these haven't changed much today; how many people in this country drive by themselves, or perhaps one other person, for the vast majority of their daily commuting needs, running errands and so forth? You know, it's really 90 percent of us.

So we're not claiming by any means that purchasing this vehicle means that you would displace your five-person

family car, the fact is that you could keep your five-person family car, or minivan or truck in your driveway most of the time, for when you really need it, and in the end you'll save a lot as an owner of a vehicle like this, driving this vehicle for most of your commuting needs.

So I'll briefly explain what this chart is, and there's some points to fill in here. Basically, the lower horizontal access is vehicle mass. This is vehicle topology, there's a mass to the vehicle, and the air that -- the size, how much -- how big it is as it pushes itself through the air.

So you've got vehicle mass in the bottom and you've got aerodynamic drag vertically here. And these constant lines are in thousands of dollars.

The battery pack cost, using today's lithium chemistry, battery pack costs to achieve a hundred-mile range. And if we drop in several well-known vehicles, you can see that if these vehicles were -- excuse me -- converted to pure electric, what the cost of that battery pack would be to achieve a hundred-mile range.

So in the upper right, right there, you've got the Ford F150. So that battery pack would be on the order of $20,000 to get a hundred-mile range.

Our vehicle, Dagne, is down here on the lower left, you know, four to five thousand dollars for a hundred-mile

range.

So as we've heard for some time, it's the battery pack that drives cost of the vehicle. So if you can minimize that, then you've made a significant impact in the affordability, in the adoptability, the ride adoptability of vehicles, of electric vehicles specifically.

So once again these are, you know, the vehicles pictured specifically, we can put in motorcycles there. There's Dagne.

And then just to generalize this point, these are the vehicle classes we -- we've done this study vigorously, and grouped as per the EPA, vehicle class, the vehicle classes, all these different vehicle classes. And there's this open place down here which is the class that we're now calling, or what we've decided to call is commuter vehicles.

And as I've said, there are a handful of California-based start-up electric vehicle companies that are -- have recognized this opportunity and, you know, this is -- this is a major opportunity.

So this simply restates the same point, but in terms of not battery costs, but in terms of fuel economy.

So the same chart exactly, but in this case the constant lines are miles per gallon if you were to convert an existing vehicle topology to a series diesel hybrid, which you could argue is the most efficient internal

combustion type of typology you could create.

So again, the same vehicles, there's Dagne. You know, if a Ford F150 were as efficient as it could be as an internal combustion vehicle, you might get, you know, on the order of 35 miles per gallon. But in the commuting vehicle class, you know, you approach 200 miles per gallon, and there's simply no other way to do this using larger, conventional vehicle topologies, fundamental physics.

Again, in terms of the fundamental vehicle classes, this is the opportunity which we're addressing.

So to translate this into -- all of these concepts into impact on CO2 and other air pollution emissions, the blue bars represent the CO2 tons emitted per year for a 15,000 mile per year drive, over several vehicles, F150, Highlander, Prius, the Tesla, and three versions of our vehicle, the hybrid, the electric, and the off-grid, if you were to power it from, say, a $4,000 solar panel on your home, which would give you about a 40-mile drive.

And the red bar is the monthly cost of ownership average over 15 years.

The point being these electric vehicles, including the Tesla, for example, have a much reduced emissions, but once you factor in the monthly cost of ownership, which translates into how many people can actually afford to buy, and adopt, and use this vehicle every day, the adoptability

and the net reduction over a whole, you know, society is much less -- or excuse me, is much greater for vehicles which take advantage of this vehicle topology and this vehicle class.

Of course, you want to address rigorously -- or qualitatively first, I should say, who's going to buy this vehicle. And, you know, we've taken our prototype and our concept and, of course, our website through feedback, and one of the things that both surprised and delighted us is just how broad a range of people and personalities resonate with this vehicle. It spans the typical demographic boundaries of gender, age and, you know, the ultra-green environmentally minded folks, and the sport enthusiast.

So in other words, we don't mean to claim by this that, you know, our vehicle's all things to all people, but the point simply being that there is the potential for the creation of a broad new market and demographic for this kind of vehicle, given how many needs, the range of needs that it addresses.

So to take a -- again the same form, and take perhaps a little more rigorous view of people who are buying current vehicles, or vehicles about to enter the market, why would they potentially prefer this vehicle?

For people who are on a motorcycle, whether they're male or female, superior safety is obviously a major

motivator, given that our vehicle will meet standard crash testing -- excuse me, freeway safety standards for midsized vehicles.

If you're a sport driver, if you like the driving experience, there's a very unique driving experience here which is pretty compelling.

If your motivation for driving or buying a vehicle is just to get as cheap a commute, a lowest cost to your personal budget as possible, well, the total cost of ownership is lower with this vehicle.

Up front costs, maintenance costs, recharging costs are all lower.

If your motivation is, you know, if you bought the Prius, like I did, because you wanted to make a difference and reduce emissions and so forth, well, you know, the environmental performance of an electric vehicle, let alone an ultra-efficient electric vehicle is simply better.

And finally, if you consider yourself to be in the market for a full-sized EV, whether it's a Tesla or perhaps more realistically the Volt, well, the purchase price is just going to be significantly lower for the reasons that I've already talked about.

Just another point on price sensitivity, top selling, ten top selling vehicles in the U.S. in 2008, green is the low end MSRP, red is the high end, the line

meandering across is the total quantity sold and, you know, we intend to fall right in that range.

So by all points of comparison, this is a compelling choice.

Our team, although we're the new kids on the block, we've got a fair amount of experience, both automotive, electrical engineering, auto design.

And our approach generally, as an automotive company, is not to reinvent any wheel where we don't need to. We have very strong industry partners in the area of batteries, motors, motor controllers. We're always looking for better sources and partners in those areas.

And some of these partners are also -- have expressed interest in becoming strategic investing partners with us, in that they will invest the development costs, given that they recognize the opportunity represented by this new vehicle class and our vehicle, in particular.

Financial projections; we're quite proud of the capital efficiency that we've demonstrated so far that's taken us to where we are today, and believe that it's imperative that we continue on that path. And so all milestones have been met today on about a quarter million of founder money.

The next step for us would be about a two and a half million investment, or low-interest loan, or grant to

build the pre-production alpha prototypes, and a total anticipated 40 million to build a pilot production and plant, by all means located in California, our home State, and with a capacity of up to about 10,000 vehicles per year.

I think it's really worth pausing and dwelling on this figure for a moment because we've already seen in the last few years of the electric vehicle start-up industry a huge range in the -- both the spent capital to get to production and the -- you now, the projected capital. You know, we're talking about an order of magnitude.

And certainly, if we were to model ourselves after the way business is currently done in large automotive, with capital investments on the order of hundreds of millions, if not billions, you know, obviously that's a different -- that's a different model. And there are -- not only are there ways to get to production successfully and grow organically through a reinvestment from that point of company profit, but we need to. We simply cannot afford, as a society, to spend that much money just to get started producing good vehicles. It's not a burden we control here.

So specifically, a vehicle like this does not need a large marketing budget, it will sell itself.

Just to prove that or to demonstrate that point, or underscore that point, the Toyota Prius was not marketed in any mainstream media for the first two or three years and

they couldn’t keep it on the lot. You simply have to produce and sell a compelling vehicle and it will sell itself.

Not reinventing the wheel as far as if there’s a good source for battery technology, and motor controller technology, use it as opposed to reinvesting in that yourselves.

Strategic partnerships with existing suppliers, again significantly reduces the development cost and timeline.

And in particular, light manufacturing as opposed to the hugely capital intensive manufacturing that we see from industry automotive.

There are already demonstrated case examples within this industry, the electric vehicle industry, of light manufacturing assembly sites being set up, operationally producing well designed, well-performing vehicles for total investment amounts within the range that we’re talking about.

Given the value of this vehicle to the customer, relative to the cost and resulting profit margins we can generate from it, we can grow organically through a reinvestment of profit to a level in about a decade of on the order of a million vehicles per year, revenues on the order of $10 billion per year, and on the order of 20,000

green-colored jobs corresponding to this level of production.

So thank you for your kind attention.

MS. BAROODY: Thank you, Ben.

Our next speaker will be Kathy McDugall with Aptera, in place of Laura Marion

After Kathy's done we'll have a few questions for this last panel, and then we'll go onto the conversion and demos.

MS. MC DUGALL: Good afternoon. I am Kathy McDugall, I am the Human Resource Vice President for the organization, and today I'm going to present real solutions for California's energy crisis, and introduce Aptera.

So with over a hundred years of automotive experience from some of our major automotive players, we see some really nicely styled sedans up there, and they're beautiful vehicles. But we would argue that the miles per gallon are about what you would have seen from the Model T.

And so can the automotive industry really be innovative? It's a good question.

We suggest that Aptera, in the 2009 Aptera 2E, and I'll explain that name, is achieving revolutionary levels of transportation efficiency.

So here's what it is, it's our first product. It is pure and purposeful in terms of the design, the

configuration, and the weight of this vehicle. It's a 2E, two-passenger, electric power. It's a hundred miles per charge in a real world, and by real world what I mean by that is two people, with full cargo, accessories, at highway speed. It is an equivalency of 200 miles plus miles per gallon equivalency. That equates to less than two cents per mile cost.

In comparison and the numbers that we saw with my predecessors in the presentation, versus seven cents with the Prius or 12 cents per mile with a typical sedan.

We're quick, not as quick as some of the others we just saw, but zero to 60 in less than nine seconds. And on a standard charge of a 110 volt outlet, meaning no additional infrastructures required, it's an eight- to ten-hour charge for a fully charged vehicle.

It's affordable. Our target price, manufacturer's retail suggested selling price is 25,000 to 40,000, that's depending on the final equipment and the options that we would have available.

It's a highly efficient commuter vehicle, it's capable of highway speeds up to 90 miles per hour. Again, the range is a hundred miles per charge, with full cargo, two adult passengers.

It's more than sufficient for the average American commuter. Again, the statistics show that that commuter, in

California and across the nation, drives about 39 miles per trip per day.

We have a fully enclosed cargo storage, it can hold several golf bags. And if you're in Southern California, like we are, in Vista and Carlsbad, surfboards fit in there as well. Our engineering team was assured of that.

It's affordably priced for the mass market, so this is not only for the individual commuter, but we're looking at fleet and multiple vehicle sales as well.

Recharges overnight, again on a standard 110 volt outage and a 200 miles plus miles per gallon equivalency.

We admit no greenhouse gases. The typical passenger vehicle emits 4.9 metric tons of CO2 per year.

So based on our project first year production numbers of 10,000 vehicles, Aptera 2Es on the road, we'll reduce the CO emissions by 47,000 metric tons per year. That's just in our first year of production.

We also utilize no gasoline. We support that independency on foreign oil and petroleum.

And again, the charging that we're discussing today, and this vehicle is configured with an in-home infrastructure. It supports the Smart Grid and the grids that we've seen in previous presentations today. So no additional infrastructure is required for this vehicle.

Additionally, the Aptera 2E incorporates many

recycled materials. So in our carpet, our headliner, our seat trim and other fabrics we're integrating post-consumer materials.

So not only are we eliminating greenhouse gases, we're using zero gasoline requirement in this vehicle, but we're also incorporating a recycled post-consumer goods in the vehicle.

The Aptera 2E will have full complement of safety features. Our body's made of ten lightweight, but very strong component parts. It is a dentless body. I'll challenge you, in fact I'll pay you a hundred dollars today if you would be willing to take a five-pound sledge hammer out to your vehicle, the one that you drove here with, unless it's a rented vehicle, and see if you can dent it.

You can come into our facility and with a five-pound sledgehammer hit our vehicle body shell as often and as many times as you want and you will not dent it, it is impossible to do so.

The body construction includes an integrated safety cage. We have a high stability factor in terms of our weight and center of gravity distribution with the three-wheel configuration.

We have low speed damage resistant bumpers; we have both the front and rear crash cradles; we have door impact beams; an aluminum crossbar beam inside the instrument

panel; four airbags; pre-tensioning seatbelts; and an eye-forward rearview camera, if that's an optional piece of equipment that you order with the vehicle.

So you can see that we have a safety feature package that would be like any other standard vehicle or sedan that you would see on the road today.

So we have a hundred plus million dollars of sales in our backlot. I have 3,600 Californians that have said sign me up, here's some cash down on a deposit for one of your vehicles. We are moving into the California market in early 2010. We have over 60,000 followers on our website. And if you're not one of them, I would encourage you to go to Aptera.com and sign up for our newsletter, and become part of the Aptera fan base.

So we are a California organization, manufacturing and assembling our vehicle in California, and our first market will be California, in fact, Southern California.

After we're done with California, we'll move up the coast to Washington and Oregon, and then we'll do the standard automotive smile, we'll hit Texas, Florida, we'll go up the East Coast.

And after we have proven performance in cooler weather, then we'll move across the United States.

But again, starting with a rollout in California, and in fact following the introduction of the Prius, as

well, from the best practices.

So I mentioned that we're a California-based manufacturer, we're located in Vista, California. This is a layout of the facility that we currently occupy, and I think it's important to know, especially for the CEC and the ARB, when we're talking about incentive-based money, that that money stay in our community and it stay in our State, unlike some of the other grants that we've talked about earlier. So California based.

We talked about being headquartered in Vista, California, and this is our only facility to date. We have about 75 employees. We've been actively moving into a full production model post our original proof of concept, which occurred in early 2007.

Production volumes in early 2010, again looking at the 10,000 vehicles, our vehicles will be assembled in Vista and, again, the initial offering for the vehicle will be to California.

Our employment is expected to grow. That happens to be a fact in Southern California, but it also supports a larger automotive industry that we've read so much about, from Detroit.

We're counting on those -- the first, second, and third-tier suppliers to some of the big three automotives to stay in the marketplace and to maintain health, because we

need them to buy components from to build this vehicle. And so we're very interested in what's going on in Detroit.

Even though we're advocating, like the other speakers that you've heard this afternoon, California-based manufacturer, we're proud to be associated with Revolution Motors, we're proud to be associated with Green Vehicles. It is the two- and three-wheeled vehicles that we're talking about in terms of the revolution for efficient commuter vehicles.

But we need that entire automotive infrastructure to support what we're doing because, quite honestly, we don't have the time, nor do we have the cash to qualify non-automotive parts into the automotive industry.

So in addition to building and assembling in California, to hiring additional Californians, and I'm talking about higher paying, non-minimum wage positions, we're looking at a capital investment of over $20 million in the next 12 months, in California.

We're looking at that extension into all of the sales and support base that would be required to support that kind of a rollout.

So our business plan supports a number of local, state, and federal government initiatives. We provide alternate energy transportation to a mass market, so not only are we talking about personal transportation, we talked

about the impact on greenhouse gases, but we also are assisting the American people, Californians, to reduce our dependency on foreign oil.

We also are creating employment opportunities and capital investment in California.

So let's talk a little bit about the incentives that are being offered today. We have a consumer incentive. In fact, there's quite a few consumer incentives for those folks that are purchasing the EVs. There's the Federal tax credit available for a purchase of a plug-in hybrid electric vehicle.

If you're offering a four-wheel vehicle, that consumer that purchases that vehicle is eligible for up to $7,500 of credit. That's fantastic, fantastic incentive.

For us, that are a three-wheeled vehicle company, that consumer, the person that purchases that vehicle is eligible for a $2,500 incentive. We're not as happy as if it would have been 7,500 or more, but we'll take the 2,500.

California State cash rebate, available through the CEC's partner in ARB, for purchasing a ZEV, a zero emission vehicle, again for a four-wheel, a little bit higher bias to that, that consumer has a savings of $5,000.

For a three-wheel, they would recognize the savings of $1,500.

Thirty-seven states, including California, offer

some type of incentive. So from a consumer stand point, we're absolutely seeing the pool created. We're seeing a recognition and a reward for that consumer who makes the choice to move to an electric vehicle.

We also are seeing manufacturing incentives. There's been several Federal funds that have been deployed to support the limited aspects of advanced vehicle manufacturing. And I'm going to make the distinction between manufacturing and design and development.

So if you have a facility that you're retooling, and you happen to be in the U.S., you certainly have options to apply for the various incentives.

Battery development and the manufacturing of those component pieces fits into that incentive plan, as well.

But not state or federal funds to date have been deployed for the advanced vehicle development. And so we've got the consumer incentives that's creating the pull and the demand, and we've got the manufacturing incentives in terms of how retool and how we set up our manufacturing facility, but what's missing is that gap in the middle, it's the R&D. It's the vehicle from an advanced stand point development incentive that we're really hoping that the CEC can step in and fill on our behalf, and some of the other California-based manufacturers.

So no state or federal funds have been deployed for

manufacturing of advanced two- and three-wheeled vehicles.

So you've heard from three of us this afternoon and we're all running this road alone, we're doing it on our own, we're doing it through capital investment and co-founder investment, and by Angel investment, but we're unable today, given some of the language that we see, and some of the legislations in the State, unable to apply for some of the incentives that are offered to four-wheeled vehicles.

So if that troubles you, I would encourage you to pick up the phone and speak to some of your politicians.

But nevertheless, we'd like to suggest that we do have an incentive gap and we're really pleased and very thankful for the CEC for not only hosting this workshop for us to present, but to also to really highlight this issue and really talk about what the incentives are that can really help us with that advanced vehicle development.

So we talked about the incentives available at the component level, and the consumer level, and the manufacturing scale-up level but, again, there's no incentives for advanced vehicle developing from engineering and design, from vehicle testing, which is so important if we have vehicles on the road at highway speeds.

And there's no incentives at all for those of us that are in the two- and three-wheel development and

manufacturing world.

So we're capital constrained. That's not an unusual term in today's economy. New developments in transportation are essential to hit the state and the federal targets for air quality and minimizing our environmental impact, and our dependency on petroleum, domestic or foreign.

The economic downturn has constrained our conventional sources for capital, it's a very tight fundraising market out there whether you're talking about traditional lines of credit or you're talking about the venture capitalists, it is very tight.

So we're really looking at and following the trends for what the green tech VC investment firms are doing.

So if you look at that, in 2008, the blue columns up there, that's really what the green tec VCs invested in, in 2008. And you'll see, in a very short period of time, the drastic decline in investment from green tech VC. And so that impacts us, that impacts any of us that are participating in that marketplace.

Again, technology pipeline, where's it going to come from? My second slide out suggests it's not going to come from traditional sources, it's going to come from the technology-based organizations, three of which you're hearing from this afternoon.

But without that access to capital, new vehicle

technology may not ever make it from the concept, from the prototyping to the actual commercialization.

I believe, as does Aptera and our leadership team, the CEC has a great opportunity to play a critical role inspiring, spurring, and supporting that innovative technology development and research and development in California.

The CEC -- excuse me -- the CEC funding for advanced vehicles can have a significant impact that will have a carry-on effect.

I believe that for every dollar that we could come up from a CEC loan, or grant, or any kind of a support, even a guaranteed loan, that private investment communities would look very favorable on that.

And so we're projecting that for every dollar we can raise that way, we get three or four from the venture capitals, or other maybe nontraditional investment avenues.

That fosters economic development in California, it creates opportunities for employment in California and it increases our capital investment because it's feeding the system and we're producing vehicles.

The end result, what this is all about, is producing vehicles that really help us meet those environmental targets and minimize the environmental impact.

So could the CEC utilize AB 118 funds to make

grants, or loans, or loan guarantees for advanced vehicle development?

Now, of course I'm biased because our vehicle has one, two, three wheels, but we would hope that that would include the two- and three-wheelers, and those that are manufacturing in California, that have made that commitment.

So grants would be really effective for an earlier stage company. Earlier stage obviously means non-revenue generating.

Loan guarantees would allow the CEC to stretch funding to its further potential. It gives us access to capital to help stimulate and flow of advanced vehicles into the market in California.

It supports the strong consumer demand by the very nature of some of t hose incentives that I talked about, but really from the interest that Californian's have in terms of supporting the environmental work. And it supports the achievement of our air quality goals.

And so Aptera, and the other manufacturers that you've heard from today, share in the CEC's objective of improving California air quality.

I don't' know how many of you were here this morning, when Matt talked about the air quality in this basin, and if you flew into Ontario or some of the other airports, you would have seen it very clearly. I moved to

California ten years ago and, unfortunately, moved to Riverside, California. It is a very questionable air quality, it's part of this Basin.

I, personally, am committed to whatever we can do, Aptera's committed to that, I wouldn't be with a startup that wasn't. But it's important that we take responsibility for that, and the CEC, obviously, is a fantastic partner for that.

We obviously believe in the technology, and the dynamics and the configuration of a two- and three-wheeled vehicle for an efficient commuter vehicle configuration.

We think it's important that we, in partnership with the CEC, support the AB 118 program. We're in the market now, we have more efficient vehicles that are coming. We have the advantage of seeing some of the additional product lines from my other two California-based manufacturers. All of us are freeway capable and we're affordable to the consumer.

So AB 118 funding could have a very meaningful stimulant effect for job creation, for capital investment in California.

And with that, I'd like to say thank you very much.

MS. BAROODY: Thank you, Kathy.

Okay, at this time we're going to have a few questions from Energy Commission staff.

MR. OLSON: Okay, not necessarily a question, but a comment, this is Tim Olson.

It would be helpful to your -- from the three companies it would be helpful from Mr. Barthmuss earlier is -- and you don't have to answer today, it's information we'd like to see from your insights on location and need for public charging stations. So when we go into our next workshop, we'd like to get your feedback for that.

Like to know whether you see, what your view is on utility role in electric-charged investment, whether it's home recharging, whether that -- we want to explore whether there's an interest in rate-basing that investment by utilities.

And also, for each one of you, the extent you think that carbon credits will play a role. Kind of early to say that right now, but as California develops this process the crediting could go back up to the -- upstream to the auto manufacturers and the oil companies, and to the extent you see any value in that process, we're interested in that kind of comment.

MS. BAROODY: Thanks, Tim.

I think right now we'll take a very short break, about a five-minute break, and then we'll have A123 Hymotion come up.

And then for the rest of the day we are going to

try to pack everybody in, but we're going to mix in the public comment sessions right after each panel.

And we want to still try to end at 4:30 if we can. Thanks.

(Off the record.)

MS. BAROODY: We have Doug Morehead, with A123 Hymotion, welcome.

MR. MOREHEAD: Okay, well thank you for having me. And in the spirit of being a late afternoon presenter, I'll try to be as cyclically efficient as possible here.

So, yes, my name is Doug Morehead, from A123 systems, and I'd sort of like to start off by, you know, thanking the Energy Commission, as well as AQMD for inviting us, as well as hosting the event. As well for, you know, a great relationship over the years and, you know, we certainly look forward to that going forward.

So I do have a few slides here just about the company in general and then we'll go into the product-specific with regards to our PHEV conversion that we'll be talking about today.

A123 Systems, we are an MIT startup, out of Boston, Massachusetts. By December of this year we will be eight years in the making.

At this point we are 1,800 employees strong nationwide.

Our headquarters and cell research and development is based in Boston, Massachusetts, and we have our first system level integration group, which we call the energy solutions group, in Hopkinton, Massachusetts.

In Michigan we have a core research and development group in Ann Arbor, Michigan. And we have an automotive engineering group in Novi, Michigan.

We have our mass production capabilities in Korea and China, as well as in Korea we have a large format automotive prismatic development center.

We have been a large recipient of the DOE USABC funds, which have driven a lot of our automotive development for the ATV hybrid electric vehicle cells and the EV electric vehicle lithium ion cells.

And we recently have received a large grant under the DOE battery and electric drive manufacturing grant.

In addition to the supplemental PHEV conversion we'll talk about today, we do see a significant portion of our revenue in our market coming from the OEM, direct service to the top-tier automotive manufacturers.

Our three big markets, cordless power, the grid service, grid utilization, as well as transportation. Our first customer was DeWalt, Black and Decker in the cordless power space.

The utility space is new. You know, it is in its

early stages as far as what the market there will be. We do see it as a good potential, as well as the transportation, which we're all talking about today.

This is our first manufacturing facility, our energy solution group, in Hopkinton, Massachusetts. So, you know, like I said it is a fully operational manufacturing space. This unit you see here, this is our 200-kilowatt lithium ion hybrid electric vehicle system we do for the Daimler Orion bus (phonetic), with B80 systems.

It replaces a 3,500-pound lead acid battery for a 750 pound lithium ion battery with an approximately three and a half times usable life of the lead acid batteries.

On the second assembly line back you will see our five-kilowatt hour lithium ion PHEV conversion system we have for the Gen II Toyota Prius.

So we still do maintain the position that we are the most commercially viable mass produced supplemental PHEV lithium ion battery available on the market today.

With regards to meeting the goals and the milestones of the Energy Commission, we have a reduction of joule consumption of up to 70 percent over a typical sedan, a reduction in greenhouse gas emissions of 60 percent over a stock Prius, and greater for a typical sedan, a reduction of up to 100 tons of CO2 emissions versus typical sedan over life of the converted vehicle.

And importantly, which I think the general theme that you'll see here and we talked about today, the vehicles are going to come before the infrastructure does. And the technology is able to handle fast-charging 110, 240.

Importantly, though, our supplemental conversion is able to charge off of the existing infrastructure that we have today.

The product, indeed, has been rigorously engineered and tested to federal standards, ARB standards, and it's commercially available today, you can buy one today in California and across the United States.

We have over a million miles of these systems on the road in the U.S. today. Many of that is available publicly through the Idaho National Labs. Tim, you were talking about that earlier today. That is publicly available as far as to our fuel economy, which I'll get to later.

With regards to emissions testing, we are in the final stages both with the Air Resource Board and the Environmental Protection Agency on being the first certified PHEV conversion in the United States.

We have completed and passed the Federal Motor Vehicles Safety Standards Crash Testing and have done numerous safety and reliability tests.

With regards to incentives, I'll talk more about

that later, but what we really see, you know, the involvement of government and the Energy Commission is advancing markets years beyond where they would be under normal market conditions.

You know, let's create the demand, let's get the customers using the products, increasing that awareness that Dave spoke about earlier, and getting that overall knowledge of what EVs and PHEVs can do to our basic transportation here in the United States.

So the product, itself, as I said earlier, it is a five-kilowatt hour supplemental conversion battery, so we remove nothing from the existing drive train of the Gen II Toyota Prius.

The total conversion time takes anywhere from three to four hours. And in a later picture, we fit in the spare tire well of the Toyota Prius. So once the system's installed, you still have all your cargo space available in the vehicle.

We currently have four dealers here, in the State of California, that do all the installation, labor, and work, and serve our customers here, in California. So we supply to them and they interact and engage with the customers.

To date, by the end of August, we have had over 550 installations across the United States and 150 installs

here, in California.

Our MSRP is $10,395 and that is an installed price. As I said earlier, it is commercially available and all installations work for our California customers are completed, like I said, at one of our local dealers here in the State of California.

So the spare tire well in the Prius is underneath the foldback full panel here. Once it's installed, it folds down as if the tire was in there, and the only point you can see externally in the vehicle is the charge port here, on the back left corner of the car.

With regards to safety, vehicle testing, one of the concerns is obviously we're putting a large battery where the car was not designed one for.

One of the inherent benefits and competitive advantages we maintain as a company is with our proprietary chemistry we use in our lithium ion cells, we have a very strong safety position. And so we've passed, successfully passed front, rear, and side crash testing.

And you can see a picture here, in the lower corner, where the system was crash testing and this is the rear hatch, this is our lithium ion battery back here, it was moved up against closer to the Prius OEM battery, but no leaking, no fires, and no concerns whatsoever.

We actually -- this system, in particular, went on

to be used, it actually was fully functional after this and we went on to use it in another demonstrative vehicle.

So within and, obviously, a growing debate within the EV and the PHEV markets, well, particularly in the PHEV market is how do you measure -- measure fuel economy and how do you report it.

And earlier this, I guess probably about six weeks ago now, GM came out and they said they get 230 miles per gallon. And the question obviously is, well, how did you measure that and over what range.

You know, as a company, A123, with supplement conversion, we state that on a fully charged battery you can get 30, 40 miles of a hundred plus miles per gallon. And that's, you know, under very good driving, a good driver, under appropriate drive profile, under a given set of conditions.

` This is third-party testing by the Idaho National Labs. As you can see, obviously, for the first -- for the first 40 miles, on the right-hand side here, are miles per gallon, this is obviously where we derive the greatest value proposition for our customers.

As you drive more, beyond this point, you've obviously used, you've consumed all the available energy in our supplemental battery and the way our system works, you basically revert to a stock Prius.

So on average, it's a mathematical, arithmetical gain down to here, where you eventually drive down to, you know, it has no value whatsoever.

So this is where we call our marketing position, where we create the most value for our customers.

This is an additional report and test done by Google where, again, they show similar results. And when they average across all their driving and all their testing, they average 93.5 miles per gallon and in the city, alone, they averaged 115 miles per gallon on their city trips.

Obviously, a very serious question that we get, and one of great concern for our customers is what do we do to the warranty of the vehicle they modify. And, obviously, there's legislation in place to support converters, like ourselves.

But what we've done here in the State of California, obviously, we have a five year/75,000 mile warranty on our high motion -- our system, alone. Importantly, obviously, the concern is that what do we do to the warranty of the base Prius. And what we do is we back stock the ten-year/100,000 mile warranty on the OEM battery and the 15-year/150,000 mile warranty on the emissions system.

So we do not leave our customers of our products in negotiations between, well, who pays for this, does Toyota

pay for this or does A123 pay for it, we take up that negotiation with Toyota.

To date we've had no claims on the system. Just in the way we interact, there's been no case that we've caused any damage to a Prius that's been converted.

Okay, well in summary for -- hopefully, I've given a good impression here that our product has a real impact on the vehicle performance with regards to miles per gallon. You know, what we say is a doubling of fuel efficiency based upon what the existing driver would have gotten in a stock ATV Prius, a reducing of the greenhouse gas emissions, and a reducing of California's petroleum dependence in accordance with the Energy Commission's guidance.

You know, again, what can he Energy Commission do for us is, you know, we are like all the other industry presenters here, we're a Gen I product, and we struggle with low volumes, you know, a developing supply chain where we have high product costs on our own inputs, and results in a higher product cost than we would certainly like to see for mainstream adoption.

And can we advance the market? Just because by driving the market, itself, getting more units out there increases our ability as a company to invest in those generation products.

So the next time I present, I'm not presenting a

product that has an MSRP of $10,400, I'm presenting a product that has an installed price of under $5,000, and that creates an incredible value proposition for the customers in the absence of incentives. But we're not there yet with the products that we have. You know, very good products, but it's still a Gen I technology that has a high price point.

And that's all I have for you today. Please, if you have any questions, I'll be around all day today.

And if you have any questions in the future, our website, hymotion.com, is a great -- is a great resource, as well.

You know, one point of clarification is that I think that some people think that those are two different organizations, Hymotion and A123 Systems. Hymotion was a -- is wholly owned by A123 and at this point it is a product line for us, so there is no difference between Hymotion and A123 Systems, it is all the same people.

So if that was a question or if that was your interpretation, it is all one company.

All right, that's all I have, thank you very much.

MS. BAROODY: Thanks Doug. Thanks for keeping it under 15 minutes, too, we appreciate it.

Are there any questions? Tim?

MR. OLSON: I have one question, Doug. And do you

have any -- do you have any plans to do conversions of other makes, other models, other manufacturers?

MR. MOOREHEAD: Absolutely. So the question is are we considering other platforms that exist today as an HEV to a PHEV, and we certainly do. It's in consideration right now and what do we do for the next platforms?

I was going to actually present a piece on that today, I was discouraged not to. But, you know, perhaps later if you want to talk about it, I certainly would entertain that discussion.

MR. OLSON: Okay. And I have question, also, for Gerhard. I didn't want to put you on the spot, Gerhard, on the spot for this, but Gerhard, do you have any comments on kind of the status of the certification process for conversions that the Air Board is going through?

MR. ACHTELIK: Yeah, the hybrid test procedure is on a 15-day notice right now. I think the deadline for comments is September 14th. But there were some revisions made after the Board hearing and those have been posted, and that's for both the OEM and the after-market conversions.

MR. MOOREHEAD: Yeah, I mean, I guess a question, Gerhard, is there a difference between the after-market and the OEM?

MR. ACHTELIK: Well, yeah, the after-market actually, they have a three-tiered certification based on

the volume, to where the first 50 basically have to give an engineering demonstration.

And this is sort of my simplified answer, I'm not the staff expert, and I think the next level is a hundred vehicles. And I lost my sheet. And you probably know what the third level, the third tier, but the third tier basically is when you're now in the commercial production and you have to do the full certification.

But the second, the second tier allows or requires some initial smog testing -- not smog testing, sorry, certification testing to be performed already. And the first tier, there isn't any required yet.

But so it's the more vehicles you product, the more you have to -- you're required to demonstrate that these systems are reliable and produce the same or no greater emissions than what they were to begin with.

MR. WARD: I have a question, too. You mentioned, in response and in discussion with the Volt, you mentioned that your increased mileage with that system is -- is it 30 to 40 percent increased mileage, is that --

MR. ACHTELIK: It wasn't miles per gallon.

MR. MOOREHEAD: Sure, so our market proposition would have got the market for, say, for a consumer that uses it with a good driving skill, consideration of miles per gallon, will for 30 to 40 miles get a hundred plus miles per

gallon. And after that, the system will be fully depleted and it will get the fuel efficiency of a base Prius, which a good driver using, again, good driving skills, with a base Prius will get 45 to 50 miles per gallon.

So what we like to say is that our system allows for a doubling of fuel efficiency.

MR. WARD: Okay, thank you.

MS. BAROODY: All right, are those all the questions? Anybody else?

Pilar, are there any WebEx questions that you see?

None?

MS. MAGANA: I've unmuted the phones, you can ask them.

MS. BAROODY: Okay, WebEx is unmuted, if anybody would like to ask a question on WebEx? If you're all still out there, haven't given up?

(Typing on WebEx.)

MS. BAROODY: I don't think that's a question.

Okay. Well, let's move onto our next panel. This is Electric Vehicle Components and Battery Manufacturing. We have Quantum Technologies; Neil Sirosh, is he present? Neil?

Well, I guess Neil isn't here.

How about Paul Beach, Quallion?

MR. BEACH: Thank you very much.

MS. BAROODY: Sure.

MR. BEACH: I want to thank the CEC and the Southwest Air Quality Management District today for this workshop and inviting Quallion to come speak, we really appreciate it.

And I, actually, would like to thank the CEC initially for their pre-award to Quallion on our ARRA proposal that we had submitted, that's been much talked about today.

Peter Ward had made a comment earlier on in the morning, that California, while it's the home of the electric car, kind of got the goose egg on that. And California's really been the epicenter for innovation, we think, in the area of green technology. And not withstanding this, California was really not acknowledged for this in the recent U.S. Government Stimulus Package Grants.

We view this -- we think the U.S. Government's trying to do the right thing, they were trying to reverse a trend that's occurred across this country for the last 30 years, if you look at it, which has been offshoring manufacturing, it's really been hollowing out the American industrial base, really. Sometimes I kind of wonder what we still produce here. And we do make widgets out here somewhere, and we make batteries.

But what they were trying to do is bring to the U.S. a manufacturing capability and key technology, critical areas that are focused on reducing greenhouse gases and fuel consumption. I think we can all agree that's a good idea, we'd like to keep pushing that technology, and whether we make it here or somewhere else, we think it's critical to this country's national security and the world health, as a whole.

We've been part of this process, we've been here for 11 years, we're a manufacturing company. We actually know how to make stuff here in California, and we know how to do it in L.A.

And we think California should continue to be part of that dialogue as it goes forward, and a major piece of that is be involved in the development and manufacture of these critical technologies, whether it's vehicles, batteries, components, drives, whatever it might be.

And while the DOE decided to provide 50 percent of its grants to foreign countries, our argument was that while market conditions overseas, you know -- and while the market conditions for batteries and these technologies might be rather globalized, we think the manufacturing conditions are very localized. And being able to produce something successfully overseas is not the same as being able to produce it successfully, in a place like California.

It's a very rigorous environment to produce and manufacture here, here's a lot of rules and regulations. It's a challenging environment, but we've been able to do it successfully.

So again, we really appreciate CEC's support in seeing that capability. And we've been operating here for 11 years now, profitably for six or seven.

We hired 50 people in the last year. I think you can kind of imagine in the recent climate, a 125-person company hiring 50 people in what happened to this State in the last 365 days is a pretty amazing achievement, and it's been a pretty tough road to hoe, but we've been pretty happy with it.

So it was kind of funny when someone asked us what we could have done to improve our chances with the ARRA and we thought, well, you know, 87 percent of the money went to Michigan and Indiana, so I guess we should have put our factory there.

But we like California, we plan to keep, stay, and produce and continue manufacturing in California. And we'd like to basically continue to be part of this revolution in moving forward and changing these technologies.

So what we see, what I want to talk about today is what we see the problems to be, how we think we can help solve those problems, what the key markets are and what

we're looking for in support from California to help us continue to move in this area.

Just alluding to some key metrics of what the company is, believe it or not, some people will doubt this or challenge it, but we are the largest maker of lithium ion cells in the U.S. today. We produce more cells in the U.S., than any other company.

A lot of companies are producing cells overseas, a lot more than we do, but we produce them here. And we make this for the medical, military, and aerospace market.

We are moving into the vehicle component market. I will allude to why that was a slow process for us in terms of the commercial sector.

But with the recent funding that came out from the DOE, that kind of changed things dramatically. And we participated -- we tried to participate in that activity because in order to be competitive in these large volume markets, you really do need a massive amount of infrastructure buildup, which we'll talk about.

We're up in Asilomar. We've been there, I guess I alluded to, about 11 years. We produce our cathode and anode materials that go into our batteries. We produce our own cells, we produce our own batteries, and we produce our own electronics, and we push these out to market.

So what's the issue? The issue is idling with

trucks, gas consumption, and peaks and valleys in electrical usage.

We're taking the whole -- we look at the world from the battery perspective, and the battery plays a central role in addressing this problem. It can actually be -- and we'll talk today, where I'll allude in the presentation to the various places that you can put this battery.

In designing our systems, designing our cells, our chemistries, our batteries, and our electronics we're taking a complete holistic approach.

I can't -- each cell in each battery design is very unique. If you design a cell in a battery for a plug-in hybrid, it's very different than the battery you designed for an EV, versus a battery designed for an HEV drive system, or for an electrical grid.

Lithium ion batteries are very complex and they're very finicky, and you have to really understand the chemistry and how they interact with the environment you're trying to put it in, in order to do this successfully.

And we try to look at it from all these perspectives, and we're trying to design a system that we can scale and be productive at, and also to be, you know, an ongoing business concern.

I don't want to build a factory in Field of Dreams, "hope it comes."

We're trying to build batteries for markets that exist today so we can continue to be profitable and still be around 20 years from now, and that's kind of the challenge.

So why lithium ion? Well, this chart just alludes to it, that lithium ion, really, from a battery perspective, and from the markets we're talking about, and we've heard a lot of talk about batteries today, it is really the gold standard and what makes the most sense from an energy density point of view and a cycle life point of view.

So our business model has been, kind of taking a shot out of the GE pagebook, is to be number one or two in whatever market we go into. We're the number one maker of medical and plantable batteries in the world today.

We're the number one or two maker, depending on how it shakes out in the next couple of years, player in the aerospace market for satellite batteries.

We are -- the military market's a little more diverse and so we are currently making our penetration into aviation and ground vehicles there.

And then in terms of key markets for vehicle transportation, we're trying to find an existing market that we can go into today, where I can sell my product today.

And anti-idling jumps out as a really obvious low-hanging fruit.

Everyone -- many people are focused on vehicles and

transportation and that's very critical, we think that technologies needs to move along and we're focused on it, we see it out there, and whatever we're doing today, we're designing to be a competitive player in that marketplace.

But anti-idling is a critical need today. Basically, people -- truck drivers idle every single night. They pull the truck over on the side of the road and they turn on their motor, and they're basically running their AC in the summertime, they're driving their heater in the wintertime, they got TVs on in there, they live in these cabs.

So what that translates into is three billion gallons of diesel idled out of a smokestack every single year in the U.S. Just simply wasted, and we'll show you the waste of energy in a minute.

So if you could literally put a battery on these folks' trucks, overnight you'd eliminate three billion gallons of diesel being idled every single year.

Currently, there's state laws going around the country, the Federal government hasn't mandated anything yet, so there's kind of a variety of different rules and regulations at different, you know, levels. California, I think, has got a five-minute idle rule.

And people are getting ticketed and these tickets cost a lot of money.

The current gen set solution is what you see here, which is a lawnmower engine. So basically they said, well, let's take a really small engine. Rather than having a huge truck motor driving my AC, why don't I have a little tiny motor driving my AC.

So it's a lawnmower engine that provides and burns about two gallons of diesel every single night, and powers all the electronics in the truck, for the truck driver.

Basically, what our solution is, let's replace this with a lithium ion battery and you basically get -- you eliminate engine, oil filter, generators, exhaust and fuel.

What it translates into is you eliminate two gallons of diesel a night. And for the truck driver, what really makes sense for then is for that little gen set I showed you a minute ago, they're going to pay about $7,800 dollars for that. For an extra $2,000 you can get the battery version, with a lithium ion battery.

If you basically assume two gallons a night, at three dollars a gallon, they're going to recoup their investment in two years and the next three years they operate without spending any more money on fuel.

So it makes a lot of sense to them, they don't have to deal with the maintenance on the engine, they just have a battery that sits there on the back of the truck and works, just like a battery inside a Prius, they don't have to even

think about it.

This is the solution, this is what it looks like. The system is ready to go, their design is ready to be implemented. We're basically just looking for the batteries that can go into it in a cost-effective way.

The diesel savings, as I alluded to, you see the yellow here, this is the energy that's consumed in gasoline in order to run that motor all night long while it's idling. This is all just wasted energy and this is the energy that's utilized to drive the coolant.

If you go with a more efficient AC system, so this is a reduced footprint for the energy, you basically can get down to a difference between running, basically consuming 2,900 gallons of fuel a year to 190.

The reason you're consuming fuel, still, with a full electric system is you have to account for the fact that when the engine is driving during the day and recharging that battery, there's a drain on the alternator that's recharging the battery. So it's not free, you got to take that into account. You've got to recharge the battery somehow, there's some amount of energy going into recharging that battery during the day, but it's a dramatic difference between what they're doing today.

And when you look at it in terms of just kind of holistic living and green, this turns into about 8,300 --

831 million trees per year being chopped down so people can have AC in their truck, or a TV, or a refrigerator.

It's a pretty significant number and thought it was some pretty good low-hanging fruit to go after.

I alluded to the fact that we're trying to address the market from a holistic approach, so while we're looking at an immediate market where we can go sell product today, if people invest in the infrastructure today, we can sell product tomorrow, immediately, and be profitable.

But at the same time I need to think down the road, what are the markets that are going to be coming down the road? We have three-wheel vehicles, we have EV trucks, we have plug-in hybrids.

This market is going to continue to evolve, it's going to continue to grow, and it's going to continue to change. No one in this room can tell us what they're going to be driving in five years from now. We have diesels out there that are very efficient. Who knows what this market's going to turn into, but batteries will be a piece of the story and we're trying to plan for that in the system, so we're looking at plug-in hybrid systems, we're looking at EV systems and making sure that's part of the plan.

We're also looking beyond the vehicle market. How else can we leverage our technology? We've heard the cost of batteries is a huge issue. So who's going to fund these

huge, expensive batteries?

The truck driver certainly has a reason to do it. He's today paying -- he's paying gas every single day to idle his truck, or he's going to buy a $7,000 system that he'll retrofit on his truck. They have to do it, it's part of the way they make money. They make money by driving their trucks, they need to have that solution, so it's part of their investment.

The consumer, we tend to just go buy whatever we want or what the lowest cost solution is on the street for us today. So we need to incentivize the consumer to try to push towards these more environmentally conscientious, less fuel consuming solutions.

One is to have the government pony up and put a lot of money towards offsetting the initial cost for the battery.

The other option is to try to look at ways to utilize the battery and have the consumer get a little bit of payback.

Now, vehicle to grid is a very interesting option. It seems kind of like voodoo, wow, does that really work? Well, when we were in Wilmington, Delaware last week, we saw a guy plug his car into the grid and we saw the battery immediately suddenly reverse the utility meter and you could see the utility was drawing energy off of the battery

immediately.

This technology exists, it's not -- you don't need some special plug, the guy just plugged right into the wall of the garage.

So if you take that technology and you really deploy it, you could save the consumer $4,000 a year on their car. They would get that payback from the utility.

Now, you have suddenly have a proposition where you're $20,000 car might even be paid for in five years, it's a really interesting proposition.

How does it work? A car is utilized for one hour a day, so 23 hours a day you're $20,000 investment's just sitting around doing nothing. I don't know about you, but I often think about that, like if I had $20,000 I'd prefer not having it sitting in the sun decaying, but that's the way we live our lives.

But if I could put that asset to work, that actually would be an interesting concept.

So what the idea is, is that utility companies have to pay a lot of money to put on small generators in the peak consuming consumption periods of the day, which is right about here, to deal with offsets from peak consumption.

Well, if you suddenly had about a hundred thousand batteries plugging in to the grid, that were five to ten kilowatt hours in size, you could basically have the power

generators drawing from those batteries and then at the end of the day the consumer picks up his car and goes home.

It's not that much energy that they draw off your battery, it's not like they're going to drain your battery down to zero. They basically will take five to ten percent of the capacity out of your battery and they can put it back in when the high peak is off right before you come back to use your car. These guys have this system in place, it's workable.

So now you have the holistic solution with the Smart Grid. You look at it from the entire ecosystem of which we're talking about here and the battery, again, is a central piece in that, and we're viewing it from this point of view and trying to implement these concepts.

So we're basically looking to set up cell manufacturing capability, battery manufacturing capability. Basically, in terms of the job creations point of view, you have jobs created where you're making the cells, making the modules, both of which we do now in California, installing these in the systems, maintaining the systems.

Basically, when the battery's reached it's end of it's useful life in the vehicle, you then ship it off to the utility companies to utilize for load leveling of that five to ten percent we're talking about, and then you can end up melting the whole thing down and reutilizing those

materials.

It's not perfect, it's not foolproof. I'm not going to tell you that, you know, this is like the -- you know, the absolute manna from heaven that's going to solve all of our problems.

But the story is there and we're looking to be a piece of that story with regards to batteries.

So one of the questions is why do you need so darn much money? Why is it that, you know, some companies are getting two, three, four hundred million dollars to open a manufacturing facility?

It's the economies of scale. If someone came to me today and said I'd guarantee you I'll buy three million cells from you in four years from now, with this great idea I have for a battery and I'll say, okay, that's fine, what's your price point? And their price point will be way down here, like pennies per watt hour, and I will have to invest literally a hundred to two hundred million dollars in infrastructure to produce the cells at that cost point.

So the reason these factories haven't existed in the U.S. to date is because no one wanted to invest the two hundred million dollars in the hope that maybe there will be a market down the road. And that's where the U.S. government came in and they leveled that playing field and said we'll take that risk on, we'll build that

infrastructure for you.

We play traditionally in these markets over here because we can afford to build the infrastructure at a higher cost in the U.S. and be paid by back by these higher cost systems.

But in order to pay in the markets we're talking about, we need to have our price point down here, which means we really need that economy of scale. And that's where we're looking for the CEC and California to kind of help out with increasing that production capability.

So we originally had our production capacity at about .17 megawatt hours. We've just recently gone through a large plant expansion, increase our capabilities to seven megawatt hours.

And what we're looking to do -- sorry for the typo there -- we're looking to go up to about a hundred megawatt hours at the full expansion of our facility.

And those would take place over two to three years. And we're looking to build a new, state-of-the-art, lithium ion battery, cell and battery factory in Southern California. It's about a three-year total investment plan of $50 million, looking at initial seed funding of $9 million from the CEC to leverage against other contracts that we already have in place.

We have a phase one battery assembly build out,

utilizing foreign made cells, and in phase two we'd bring to the U.S. the domestic production of cell technology to implement into these battery packages.

We're looking at, with the total investment of $50 million dollars, somewhere north of 400 new jobs created just in California and potentially 1,300 job creations around the U.S.

If you look at an 18-wheeler, we work with these truck companies, they figure one man day to retrofit one truck, and there's a million trucks on the road.

So if you retrofit all million trucks in four years, you've created 1,300 jobs and skilled people working in factories, or working in shops around the country, that are technically skilled in doing these retrofits.

Those are sustainable jobs because in year five not only are you servicing those batteries over the course of the four years that have already been installed, in year five you're going to replace that battery in the field with a new battery, ship that back to California where we refurbish it, send it off to a utility company or we recycle it.

So it's a full circle jobs creation.

There's the economic benefits and then there's the environmental benefits, which we've already alluded to.

And that's the end of my presentation. Thank you

for your time.

MS. BAROODY: Very good, thank you.

Okay, our next, Electric Vehicle Components and Battery Manufacturing speaker, Paul Scott, with ISE.

Paul, are you here?

MR. PAUL B. SCOTT: Yes.

MS. BAROODY: Yes, all right.

MR. PAUL B. SCOTT: Just an introduction, there are two Paul Scott's in the room. This one is a Paul B. Scott, I use the middle initial to distinguish between the two. The B stands for heavy duty vehicles, or it stands for hydrogen, as opposed to batteries, although we also do batteries because we do -- every vehicle that we do is electric.

And when I saw we, I'm referring to the company, ISE. There we go.

ISE is a heavy duty drive train supplier. Everything we do is electric, everything we do is 20,000 pounds, typically, anywheres from 15 to 30 thousand pounds.

On the screen here I've just illustrated a number of the vehicles that we have done in the past and are presently producing.

The buses you'll see in Long Beach, and other parts of Los Angeles, are gas hybrids, in the upper left-hand corner.

Our first fuel cell bus, pictured against the Washington -- the Capitol, here.

The HISE Bus, which operates in the Sun Line Transit District. A recently delivered trash truck at bottom, and immediately above that, a natural gas hybrid electric, that operates in San Diego.

One of the fuel cell vehicles that we've supplied, which operated in Connecticut and California, three of those are in the Oakland area, with AC Transit.

And the new fuel cell buses, that top one is our fourth design of hydrogen fueled bus, and that is operating in the Vancouver area, actually in Victoria. I think, as we talk, there will be 20 of those in February, operating at the Winter Games.

And at bottom is in production one of the London buses that we're supplying, that's in commissioning at this time.

So what we do, just to illustrate it on this next slide, what we do is integrate an engine, which you can see here, an engine supplied by Ford or by Ballard, depending on whether it's an internal combustion engine or a fuel cell, we make a lot of the components. The items made in the yellow background here are things that we make, and they're electronic components or electromechanical components, or software required to make all this operate together.

And so that introduces you to the company. We've been at it for about 15 years, this next slide indicates.

We focus, in particular, on gasoline-fueled vehicles, which is a clean, actually, in California, an alternative fuel vehicle, the heavy duty hybrid electric drive train, and in zero emission vehicles, predominantly hydrogen fueled.

We also do diesel vehicles. We're doing 50, which you'll see in the Las Vegas area, they'll be very spectacular, 60-foot, they're very streamlined, beautiful design. We're working with Wright, of the United Kingdom on that.

But predominatly VA systems and Ellison does the diesel hybrids.

The status then is that we have about 250 of the gasoline hybrids delivered, operating day by day, 11 million miles on just the Long Beach buses, for instance. They're available in a new flyer chassis and a NABI Galley chassis as well, we're doing a Gillig as well.

I mentioned the 60-foot articulated that will enter service in Las Vegas next year, I mentioned the hydrogen buses, and I'll talk about battery electric at a later time.

All of these, with the exception of the battery electric, have the full performance of any other transit bus. This is an example, this is the prototype fuel cell

bus that's operating in Canada at this time. This is actually many months ago, before it was painted other than white.

But this has a 500 kilometer range, climbs a 20 percent grade, actually, 21 percent grade with full load, from a standing stop, carries 70 passengers, speed to 65 miles per hour. It does everything a conventional transit bus does. It is more expensive, that's the one drawback.

Hybrid drive; greenhouse reduction outlook is commonly 20 to 30 percent improvement reduction of greenhouse. You can get up to 50 percent. That is very much site dependent. The 50 percent reductions are observed in the London, where they don't have high speeds and they have a lot of stop and start.

A CNG bus should be better than the gasoline buses, as expected, but that's not yet proven. We need a certified 2010 engine for doing that.

Both battery and fuel cell vehicles offer big efficiency gains, 50 percent reduction in wheel-to-wheel greenhouse gases, roughly. Both offer a direct path to near zero greenhouse gases, with deployment of renewable electricity or zero omission biosources of electricity, methane.

Just reminding you of some of the fundamental physics here, diesel is a great fuel in the sense of you can

store a lot in a box of a given size, a lot of energy per gallon.

CNG, about -- well, considerably less. Including the tank, you can get about 18 mega jewels per kilogram in CNG, that's very similar to ethanol and it's considerably less than you get with diesel.

Hydrogen six, so you'd see the factor three difference between the CNG and the hydrogen in terms of energy storage. But look at battery, it's way down in the order of the magnitude lower.

So there are real problems in implementing battery vehicles, just for that energy storage reason.

Heavy duty vehicles offer more emission reductions per dollar invested, it's one of the key points here.

The heavy duty vehicles used 1,820 hours a week. These go out at 5:00 in the morning, they operate through the day, they come in at midnight, and are refueled, go out again in the morning.

They use a lot of fuel, 12,000, 15,000 gallons per year go through a diesel bus, a gasoline or diesel, as the case may be. And that's equivalent to plus or minus 40 cars.

So innovation -- the second point here is that innovation moves very quickly. Presently, about half the bus replacements, half the buses being sold are hybrid

electrics, just because it is more efficient, it's a quieter, cleaner bus.

And the final point here is a dollar of State funds will do five times the emission reductions that you use for heavy duty vehicles than light duty vehicles. Just a reminder, that has a lot to do with federal resources and subsidies.

Here's what we're doing in the all-electric range. This is a bus that is owned by L.A. Metro. It will be a zero emission all-electric bus. It's a very slow process because it's very difficult to find money to do this sort of thing, so it's been back-burnered.

There is no assured market for such a bus, and this has a lot to do with the zero emission bus program.

You notice that we sell hydrogen buses to, I mentioned London, we're supplying buses that will be operating in London, and they have the capability of doing 50 buses, and we're giving them five to eight to begin with. Twenty buses for Canada. And in recent years zero for the USA.

There are, another company is doing -- I think we have a total of about 15 buses going into the USA in the next -- but more, a lot more action overseas.

There is not an assured market, so that is a key point.

And the other key point is the next big challenge is zero carbon fuel, as I mentioned, whether it be an electric battery vehicle, whether it be hydrogen, you go zero carbon as long as you have a renewable source.

Incidentally, the picture that I had up there is the HISE Bus that operates out of Sun Line Transit, and in the background you see wind turbine. That was a wind hydrogen system that the AQNB sponsored, we put in about five years ago, fueled that bus, operated it for a period of time until the electrolyzer, which we had borrowed, had to be returned.

So again, there needs to be investment in that area.

Projections for the next three years, and now I'm talking about ISE as a company, we will produce hundreds of the gasoline hybrids per year. We have the capability of producing about 300 and we can easily expand that.

The fuel cell hybrid, very dependent on overseas orders or, if there should be domestic investment in this.

A limited number of battery buses and this is just because there's no assured market for the battery bus. As a result we're not investing, except limited amounts, we might do three in 2010.

Guesses on pricing, and this is strictly a guess, don't hold me to this, but gasoline hybrid is now about a

$550,000 bus. We expect that to come down in the next six years, about 20 percent, to about $450,000.

Natural GISE hybrid could be very competitive, we'll need to do an engine certification, need assured engine durability for that.

Hydrogen will come down to begin to be competitive, and we're looking at a million dollar bus. For a full service -- now, you can get a million dollar hydrogen bus by cutting corners in various ways, but for a full service transit bus that meets the 12-year specification of the U.S. Department of Transportation, presently it's a $2 million bus, it will come down to about half of that.

The battery-intensive hydrogen, if you look at a large battery, small fuel cell, you can bring that price down further.

You can do the same thing with the gasoline internal combustion engine or with the HISE, hydrogen internal combustion engine hybrid, and get down to the $600,000, so there you get 99 percent of the emission reductions, and you have almost competitive with the gasoline hybrids.

And numbers are given there for the battery electrics with a 120-mile range, that's like the L.A. Metro bus.

Why are battery buses more expensive? Well, the

cost of the battery is the key reason, a half-million dollar battery for a 150-mile bus.

If we could be useful at a hundred-mile range, then the premiums down to about 300,000, so you begin to think in terms of opportunity of charging of the battery, and that's been talked about, and essentially refuel every hour, or every couple hours at most.

So the price projections suggest reductions, but we're not convinced at this point in time, it's extremely dependent on the volume.

And I should also add that the heavy duty vehicle requires a battery that's typically a six, seven, eight hundred volt battery, 300 ampere capability. It's a very powerful battery.

Manufacturing capability, as I mentioned, that we can presently do 300 and we can expand to that on the gasoline hybrids. We can do the same thing on fuel cell buses, if someone would order. But again, that's a financial problem.

Significant cost reductions possible if we had modest investment for redesign of some of the components and we expect to do that with investment funds.

If we could have the sort of investment that Paul Beach as well talked about, 50 million, 60 million dollars, you can considerably reduce costs, expand the volume by

going to new plant.

However, venture capital, public monies are virtually frozen at this point in time, so all that's been held up.

Federal monies are -- well, I guess this only saying we're a little disappointed with the federal government investing in California.

DOT funds, however, do support bus purchases, 80 percent of the cost of the transit buses in California, as well, are supported by DOT funds, so that does help.

We are investing modest amounts of our equity funds in electric drive development. We'd always appreciate cost share on that.

Here are some possibly power, this is the last slide. Incentives, one is team with the Air Resources Board to maintain, in one form or another, a market for low emission heavy duty vehicles.

Use of State funds to purchase only gaseous or battery electric as it applies for light duty, as well as heavy duty.

Why does DGS have a fleet of 52,000 vehicles and how many of those are dedicated alternative fuel vehicles? So that is money that is used in California, that could be used in these directions.

Similar rules or incentives for university and

colleges that are State supported would be a possibility, suggesting award preferences for firms developing renewable, gaseous fuels, committing to large investments as required for dropping the price of renewable hydrogen to a guaranteed below five -- that is definitely doable, it just requires investment. I can give you the background on that, as you want.

NZEV approaches; may allow the best use of vehicle development funds. And I mentioned the gasoline hybrid with a large battery. That is something we'll not invest in because we don't see the market for it, but it certainly applies in city service if you don't have to go on freeway. HISE, as well, could be used for that.

Thank you very much for your time.

MS. BAROODY: Thank you very much, Paul

Tom Fulks with Bosch. He's not on the agenda, but we're adding him in.

MR. FULKS: thank you for letting me speak, I very much appreciate that. I do have a presentation, but I'm not going to put it up on the screen, I'm going to be very quick.

We're here primarily to address some process questions more than showcasing any particular Bosch technology. But give me a second to get my act together here, and I will talk about that.

My name's Tom Fulks and I am here today representing the Robert Bosch Corporation's Research and Technology Center, out of Palo Alto.

And the general content of my remarks are going to be aimed at a request that will be submitted, and that will be supported with white paper that will be submitted to the docket, that basically attacks the cost of batteries.

Robert Bosch, LC, is the world's largest automotive supplier, is a volume manufacturer, and oftentimes it finds that if it just throws in his money at a project, it can find ways to bring the costs of components down.

And given what we've heard today about the barrier of battery electric technology being the cost of batteries, Robert Bosch sort of zeroed in on that problem.

I will mention that the project has to do with lithium sulfur battery technology, as opposed to lithium ion. It's aimed at increasing energy density in the packaging of the battery, so that you can either bring more energy for a small package or you can have a larger package and increase your range.

The intended goal of this research project is to produce a battery with a minimum 300-mile range per charge. Bosch does see that there is a future for battery electric technology across all sectors of the transportation industry, whether it's heavy duty, light duty, transport,

transit, whatever, Bosch will sell to anyone at any time, and the way it makes its money is through volume sales and production.

So I guess what I'd like to say is having sat through the whole meeting today, oftentimes size does matter when it comes to trying to get the cost of technology under control. So again, I just wanted to emphasize that.

To be honest, full disclosure, the real barrier, as far as Bosch sees, to bringing the cost down and increasing energy density for transportation battery systems is the lifecycle of lithium sulfur. You know, our research has already shown that you can produce electricity, you can get a lot of energy into the package, but the problem is the package wears out really quickly.

And so what we're trying to do is figure out how to solve that problem.

What we will be doing in this research project, and I should mention the partners of the research project are Robert Bosch, LLC, the Research and Technology Center in Palo Alto, the University of California at Berkeley, and the Lawrence Berkeley National Laboratory, as well, so those are the three project partners and the three applicants for the funding from AB 188 funds.,

Also as a preface, we would like to stipulate all of the things that have already been said about how

important the CEC's decision is, how difficult it is to come up with funding for projects in a deep blue state. I'm sure it's just a coincidence that all of the DOE money went to two key battleground states in the 2010 and 2012 election cycles. I'm sure that has nothing to do with the merits of the technology.

But all that cynicism aside, we do believe that the CEC's role in the discovery of answers for these energy storage problems is really important, and the reason we're coming in, and one of the key reasons we're coming in is more a matter of philosophy than cost, and that is we really want the State of California to be a partner in finding this solution.

We're not a startup, we don't need money to pay for manufacturing facilities, we can take care of all of that stuff, and the amount of money that we'll be seeking is very modest. But I think it's the philosophical approach that is important to us, as well as the money.

One more thing I'd like to say about the sulphur end of this equation is that sulphur is dirt cheap and it may even be less expensive than dirt at some point. It is a byproduct of the removal of sulphur of diesel fuel. There has been some question about what to do with that stuff, so this just sort of incidentally may create some sort of a real, genuine beneficial market for that waste product.

As I mentioned to you, who are partners are, so I'll skip that part of our presentation.

I'm pretty much finished, but I did want to mention to you one last thing. Robert Bosch, as the world's largest manufacturer, employs close to a quarter million people worldwide.

In the United States there's 19,000 head of household jobs. In California, Robert Bosch employs more than 650 people, head of household jobs.

The Technology and Research Center in Palo Alto employs 60 people, alone.

And some of the things that Bosch does that relate to this research project that will be coming to you has to do -- you know, Bosch makes power tools, Bosch makes dishwashers, Bosch makes spark plugs, Bosch makes all sorts of stuff. And oftentimes, in bringing products to market, it does have to spend money in researching some of the technical barriers and finding ways to eliminate them.

So, you know, Bosch is moving forward with this project, regardless of what decisions that you make. And we wanted to come to you and sort of raise the flag and say we're coming in, even though we didn't really anticipate coming to this workshop, this is a late decision to come here, but we wanted to let you know that we are really sort of counting on the independent mindedness of the CEC this

time around, given that the tether to ARRA funding has been severed and you are a little bit more free to make decisions. We're happy about that and, again, we'll stipulate the importance of these decisions.

So again, we just wanted to come in and tell you that we're here, we're coming, and we will be submitting documentation to the docket. So thanks very much for your time.

MS. BAROODY: Thank you, Tom.

MR. WARD: Tom mentioned an interesting point at the end there, and it's one that I don't think we made it very clear, is that if you have other information you'd like to provide, our docket would be open for this next investment plan. It was used during the first investment plan, it's still open, we will use that, we will mine information from that and incorporate that into the development of our investment plan, so I'd urge you all to submit as well.

Thanks Tom.

MS. BAROODY: Yes. Okay, before we move on, I just want to check and see if we have any questions. First of all from our staff here. Don't have any questions, okay.

Any blue card questions? Oh, right here, come on up.

MR. OVSHINSKY: Do I have to introduce myself?

MS. BAROODY: The mike -- just let us know who you are.

MR. OVSHINSKY: Ben Ovshinsky, from Efficient Drive Trains.

A question for Robert Bosch, this sulphur battery, is that a hot battery as per the -- I just have an association with sodium sulphur from Ford days.

MR. FULKS: I'm really happy that you asked me that question, because that is actually one of the bullet points I left out and that is safety.

One of the primary drivers for developing this technology is to develop a high density energy packages that enhances the safety features, so it's not hot, it doesn't run the risk of exploding, or burning, or anything of that nature, and that's one of the key reasons why Bosch got into the safety angle was to deal with that safety problem.

So thank you for that question, we definitely appreciate it.

MS. BAROODY: Okay. Well, at this time I think we will invite Joe Calavita, with Air Resources Board to come up, he has a few comments to make.

MR. CALAVITA: Thanks for giving me the opportunity, I'll just take a minute. I wanted to update the group and the folks on the web regarding our solicitation for ARB's portion of AB 118 funds for the '09-

'10 fiscal year, the current fiscal year. We're actually on the street with our solicitation for the $20 million hybrid truck and bus voucher incentive program.

And there's some confusion, we're not soliciting actual vehicles, we're soliciting an entity to actually run the voucher program for us. And we expect once that entity is -- well, I'll give you the timelines.

The solicitation will be closed on September 30th and we're going to select an entity to run the program on October 20th. And so we expect it will be a month or two after that when we'll actually have the program up and running, so funds will be available around the end of this year.

So that solicitation for this funding year is on the street.

We expect our second solicitation for the plug-in hybrid and zero emission passenger vehicle portion of our AQIP program will be out next week or shortly thereafter and that, again, is for someone to run that program, so funds for that program should be available, once that entity is selected, by around the end of the year or early next year.

And the best way to find out information about our AQIP program is just to Google ARB AQIP, A-R-B A-Q-I-P, and that takes you right to our webpage where this all this information about all our various solicitations and contact

information for the various staff.

So thanks.

MS. BAROODY: Thanks, Joe.

Okay, for Medium and heavy Duty Vehicle Panel we've got Navistar, Darren Gosbee. Please come on up.

MR. GOSBEE: Okay, thank you very much. My name is Darren Gosbee, I'm the Director of Hybrid Strategy and Execution with Navistar.

And I'd just like to take the opportunity to, really, for inviting us here and for allowing us to talk through some of our projects, some of our ideas, and to share, really, with you some of our thoughts and potential collaboration opportunities.

So let me first start by really introducing ourselves to those who are not familiar with us. We are a large manufacturing -- we are a manufacturer of large displacement diesel engines, and commercial trucks, and buses from, really from class four/five, really, to class eight.

And we monkey [sic] trucks under our international brand and we sell to the defense industry through our Navistar Defense brand. We sell school buses through our IC brand. Just custom strip chassis, with the likes of different vans for the UPS and for FedEx through our workforce custom chassis brand.

We also have global partners in the form of Mahindra, in India.

We manufacturer and sell engines under our Max Force brand, and MWM from South America.

And a recent addition to our vehicle brand is the Monaco LV.

Okay, so what do we manufacture in the way of hybrid electric vehicles? Well, on this display here I show a number of different applications we do and the first -- really, the first commercially viable and first to market, I guess, hybrid vehicle was done in conjunction with H-Tough, and that's the hybrid utility truck you see in the corner there, in the top left.

The school bus, hybrid school bus that we do, pictured right there on the right-hand side, has also been in production for a couple of years.

And underneath, well, you see a nice, sunny day, but this is just an example of some of the applications that we offer from a commercial medium duty truck perspective. We're ranging from simple box trucks through chassis trucks, through different types of utility trucks. There's a reefer truck on there. And there's also, in the far corner, you can see a beverage tractor unit, and that's a recent addition to our portfolio.

Okay, let me talk in a little bit more detail about

our hybrid electric trucks, and the two graphs on the left, on the two charts on the left-hand side, the top one is for the utility truck and the bottom one is our hybrid box trucks.

And you can see here that the application of hybrid technology over the base vehicle really does give a significant improvement to not only criteria pollutants, but you also see a significant improvement in fuel economy.

The particular one I'd like to draw your attention to is the -- on the top chart, the hybrid utility -- the hybrid utility chart, this particular column here, this refers to use of the utility truck at a worksite, and it actually represents gallons per hour reduction in fuel use. Predominantly because when the vehicle parks at the worksite it operates its boom bucket from the electric motor and from the battery storage, not from the internal combustion engine in the diesel, so there's a significant reduction in the amount of fuel that's actually consumed from this vehicle.

Again, on the box truck you can see here that there is philicone (phonetic) improvements of around 30 to 35 percent, and also significant reductions in the arterial pollutants.

I'll quickly run through the comments on the right-hand side, but the thing I want to draw everybody's attention to is this is the only CARF certified hybrid

commercial truck.

We manufacture both the DuraStar and our WorkStar products in both Ohio and Texas. The hybrid system is actually supplied to us from Eton, placed in Michigan. We have manufacturing capacity for five units per day, but that is actually currently limited by supply of hybrid systems from Eton.

We have future application expansion plans really into the higher GPW ratings. We have plans for electrification of reefers and other body equipment, export power.

We're also looking at actually being able to do engine accessory electrification, to enable the engine to be switched off, as well as operating things like HVAC for, really for all prices and for workers that are out at remote sites. They don't need to necessarily need to run the engine to run the HVAC, we can power that from the hybrid system's keeper, the cab of the vehicle, the cockpit of the vehicle core, so they can come in from the heat for a rest period.

We have greater than 50 hybrid trucks in California. Crystal Coach is one of our major customers in the area.

There are no known safety issues. Basically, we've built the hybrid systems off the back of our commercial

trucks as they are today, we have no safety issues.

The incremental costs for our hybrid systems vary from application, but it's between 40 and 55 thousand dollars.

And our PHEV plans are on hold. And we did have, as part of the stimulus package, we did put the submission in to actually take this system and turn it from a HEV into a PHEV but, unfortunately, we were unsuccessful with that.

Moving onto our hybrid electric bus, again the chart on the left-hand side actually shows of the benefits from the plug-in hybrid school bus that we manufacture and sell. Again, significant reductions in criteria pollutants.

But I really want to draw your attention here to the improvements in fuel economy, that really is 65 percent.

Again, I want to draw your attention to the fact that we are the only hybrid school bus that's CARF certified.

We have two systems in production, a charge depleting plug-in hybrid system and a charge sustaining.

Our school buses are manufactured in Arkansas. We have -- our hybrid are actually supplied by Enova Systems, out of Torrance, in California. And again, the manufacturing capacity for our buses is limited by the supply of subsystem components from Enova.

We have doubled our number of vehicles in

California recently, with a successful order. Unfortunately, it takes us from one to two.

Again, we have no known safety issues, again because it's built from the existing product that we have today.

And here, the incremental cost over the base vehicle is between 45 to 90 thousand, that depends on whether you choose the charge sustaining or the charge depleting system.

Our future PHEV II plans are on hold because, again, that was a stimulus package that we submitted in conjunction with CARB, that we were unsuccessful with.

But further in the presentation I'll be able to talk through our PHEV generation III school bus and we can explore that in more detail.

One thing I should have added, actually, on the previous slide here is we've been in production with our trucks for about just over two years, but we are the first manufacturer and the only manufacturer to reach over five million field miles on our hybrid vehicles.

Okay. This slide really gives me an opportunity to start to lay out some of the opportunities for collaboration with the Energy Commission.

There are three vehicles here, but there are also some complementary vehicles that will actually make electric

vehicles and electric drive systems far more efficient in their application to real-world usage.

As I mentioned earlier, there is a plug-in hybrid electric school bus, generation III that we're working with, and we'll go into that in more detail in a few coming slides.

There is a recent solicitation, called Super Truck, which is aimed at Class A tractor/trailer combination and efficiencies in freight fuel, measured in ton mile per gallon increases. Again, I'll go through that in more detail.

Our Work Horse Electric Vehicle, some of you may be aware of that. Again, I'll go through that very quickly.

Thermoelectric generators, this is not a vehicle program, but it's a technology that really recovers waste heat from the system and puts it back into the driveline, either storing it or plant it directly through an electric drive. So again, it's not a vehicle, but it is an enabling or complementary technology.

And then there are a few others that I won't go into, but we can explore in more detail in later stages, micro turbine, Smart Horizons, and also Intelligent Routing, just ways of being able to optimize the vehicle's performance in a given terrain or given route.

Okay, so I'm going to go into a little bit more

detail. The PHEV III school bus project, this is a DOE award that we were successful with early this year, specifically aimed at the development and deployment of hybrid school buses.

It has an objective of 30 miles of engine off capability from one charge, so basically driving the school bus for 30 miles with no involvement from the internal combustion engine.

The top speed of 45 miles an hour in electric mode.

These two parameters were determined from analysis from the school buses that we have in the field. These are really the typical operating conditions. This is the sort of range that the school bus does per trip and these are really the maximum speeds that they do on average per trip.

So 30 miles out for the pickup in the morning, 30 miles out for the drop off route in the evening, with speeds at no more than 45 miles an hour. So it really is to try and maximize the use of electrical versus internal combustion power.

As part of the project we are going to evaluate four hybrid architectures, two barrel and two series. It's a four-year project. Phase one will be to actually evaluate eight prototypes to the system, there will be significant chassis and chassis moments, as well as road testing to make the appropriate selection for the architecture to move

forward with.

As part of the DOE project we will be delivering 30 PHEV buses, and we do need customers for those, so we're looking for any school districts, any states, and private organizations that are looking for hybrid school buses, leading cutting edge technology, we're looking for customers.

And then finally, those 30 buses will be delivered and then we will monitor them in the field to see how they evaluate and how they perform.

This is, as I said, a DOE project, it's a 20 million project, ten of which comes from the DOE, it's matching funds, it's an opportunity to see how we can explore this.

And it is, as I mentioned earlier, this is built from our existing bus platform, so it's more about the technology, less on type of vehicle.

As I mentioned, a significant portion of this is going to be engine off, so as to electric power steering, we need to have some form of electric HVAC and heating systems to make sure the cockpit and the environment inside the bus is correct, and it will require high voltage generators, high voltage distribution boxes to operate these engine off accessories.

And we're then looking at being able to give the

operator the control to switch between being an electric vehicle and being a diesel vehicles.

Now, that is a quite important aspect of this because what we're looking for is to try and ensure that we maximize the environment conditions for the vehicle, so we would have electric operation in and around the schools, in and around the pick up areas, but not necessarily on the outward bound journey.

So there are opportunities, as I say here, for us to try and play around to maximize the environmental effect for this.

It will have an onboard charger, aiming at 240 volts, so there will be infrastructure requirements, but that will be within the school districts and within the carriages in where they store the vehicles.

Really, the target customers for this are school districts that are looking really to reduce emissions, they're looking to reduce exposure to the children of particulate pollutants, it's also to really look at reducing fuel costs.

The current status of this project is we have awarded the project and we are about to go to contract with the DOE, I believe tomorrow, and then we will start the initial development stages of the project.

As I mentioned, Super Truck, this is a second DOE

project that we are working heavily with them.

This came out of an organization called the 21st Century Truck Partnership. It's really a partnership of the industry, and the DOE looking at ways of really improving not only the fuel efficiency, but also emissions and the way the freight is moved around the country.

And this particular -- this particular opportunity is aimed specifically around a tractor/trailer unit, so these are really the line haul or regional haul units.

And it's aimed at a 50 percent improvement in overall freight fuel efficiency and that's in ton miles per gallon. This is not about miles per gallon.

Miles per gallon, if you want to improve that, you put more trucks on the road but smaller, more fuel efficient from miles per gallon perspective, this is about freight efficiency.

As we mentioned earlier, or as we heard earlier, the commercial industry, and in particular the Class A tractors do use a significant portion to fuel them. If you look at a breakdown of fuel usage per sector in the industry, Class A's are by far the greatest user of fuel.

So having a 50 percent reduction in freight fuel efficiency is an enormous step to reducing fuel usage, CO2 production criteria, pollutant emissions. This is a significant factor, this helps out enormously.

Now, the 50 percent improvement is to be broken down in two ways, 20 percent of that 50 comes from increasing the engine's efficiency. And the term brake thermo efficiency is basically the -- it's a calculation used to determine how much real work is done for a gallon of fuel.

Most engines, and certainly our engines, at 2007 emission level, are operating around the 40 percent brake thermo efficiency. So this is a significant step forward in base engine design. This is taking an engine and making it significantly more fuel efficient.

And the remaining 30 percent is to come from tractor/trailer and power train aerodynamic improvement, so that's really making the trailer and the truck almost as one from an aerodynamics perspective, and then to get efficiencies from the hybridization of power train, as well as being able to recover the maximum amount of energy from the exhaust stream, from heat and from other areas.

It's one prototype concept demonstration vehicle required. In our case we're looking at a Prostar, short sleeper hybrid tractor, with a matching aerodynamically enhanced trailer.

And it's a reduction in vehicle mass, rolling resistance, and power train hybridization. I've mentioned some of the things there.

But the important one is, again, one of the most ones, is to maximize engine off time through the hybrid selection.

And again here, electrification gives you the benefit of driving the vehicle with the engine off.

So how does this program work out? Well, the DOE had between 90 and 160 million dollars for between three and four project awards or grant awards.

It's expected that the grants will be somewhere between 40 and 80 million, with cost sharing, it's a five-year project. We submitted our proposal earlier this week.

And the thing I want to emphasize, really, is this is about technology deployment to maximize fuel efficiency.

There is a requirement that the vehicle must meet EPA 2010 emissions, that's the .2 NOx emissions, but it's about maximizing fuel efficiency.

And I've included a pie chart here, really to give some indication of where those efficiencies are going to come. I'm hoping it's visible.

Okay, the segment here, which represents approximately 25 percent, is from tractor and trailer aerodynamics, this is really just to make the vehicle move through the air a little more efficiently.

The second one of the bottom, which is just over 25 percent, represents the base engine design, calibration, and

optimization.

And then we have a sector just under 25 percent, which represents hybridization. And the remaining areas are really things like tires, idle reduction, waste heat recovery and other, I guess complementary technologies, that provide smaller increments in fuel economy, but that's what will add to the total of freight fuel efficiency.

As I mentioned, significant engine off operation, this vehicle, at 65,000 pounds, will be designed to be able to move at least five miles under electric power. So that's fully laden, five miles electric power.

The Navistar team that we've put forward includes industry-wide, well-known customers, suppliers, national labs and universities. Safeway and Swift, who have key presence in California, are our customer partners.

Lawrence Livermore Labs, AT Dynamics, these are all local, California-based organizations that are part of our team going forward.

Work Horse Electric Vehicle, many of you may have seen President Obama in our facility in Alabama. We did receive a $39 million award out of the Stimulus Package.

The program objective was to build and deliver 400 all-electric Class 3 electric commercial vehicles, a hundred miles on a single eight-hour charge, 50 miles an hour top speed, and there are already 150 vehicles in service in

Europe.

As I mentioned earlier, we were a successful recipient of the DOE award, and we are also a successful recipient of the California Energy Commission funding award and for that I thank you.

Our team is currently working through all of the DOE and the Energy Commission fun documentation. As you're aware, the award is only the first stage, there is significant documentation that needs to be completed before contract.

And as part of the launch of this vehicle, Sacramento has been selected for an initial vehicle demonstration, and that's targeted for end of this year.

Moving off of vehicle opportunities and vehicle projects, now, to talk a couple of -- really, to talk about one enabling or complementary technology that I think has significant merit, thermal electric generators are devices that can basically create electricity from heat.

If you apply a heat gradient across a particular series of semiconductor or silicon dot junctions, you can create electricity from heat.

And the little schematic on the right-hand slide there basically shows that if you have a large number or large array of these dot junctions, you can actually create significant quantities of electricity.

Now, the program objective here was really to utilize these thermal electric devices to harvest up to eight kilowatts of energy from the exhaust of a Class 8 tractor unit.

With the increase in the emission standards going forward, and Navistar's approach to that through the use of EGR, there is significant opportunities to recover heat through the exhaust stream and from the EGR cooler. And that energy can be returned back to the driveline, either directly into the electric drive or into batteries and stored for later use.

Now, the anticipation that there's approximately two percent, possibly a little higher fuel economy improvement from a six kilowatt heat recovery system and back, that's given on the typical Class A operating conditions.

But the thing about this technology is initial applications have really only been focused on passenger car markets, and BMW, for GM, have done some preliminary investigations.

But really one objective, and our objective here is to take this technology and put it into the Class 8 commercial region, where there is significant quantities of heat to harvest into electrical energy.

It is a joint project, it will be with BSST, based

in California. It will be really building on DOE-funded projects, as I mentioned the work with GM and what Ford was after, the DOE funding.

And the approximate project costs for this are around three million. We're still going through the early stages of defining this project, and scoping it out, and setting the timing, but that's the preliminary budget that we set aside for thermal electric devices.

A little bit more detail about them, I've included them in here just to give some indication of the type of technology, what it looks like.

The sense diameter here, for this particular device, is around four inches, so this sort of device is probably in the region of maybe two feet, two and a half feet long, about four inches in diameter.

Really, the objectives of this project are to look at heat recovery locations, where can we fit this on the truck, where can we package it, where can we maximize the heat, divert the architectures, select the appropriate architecture and then through modeling go through the final stages of design, test it and then install it on a Class A truck, and it has to be a Class A hybrid truck.

So we will be with -- with some of the advance work that we're doing internally, we will have development hybrid trucks that we can actually apply this system to, to really

evaluate the benefit it provides.

Just a final comment on the actual device, itself. There is, as I mentioned, a requirement for a temperature gradient, and through the sensor of the cylindrical tube is where the exhaust passes, and that's obviously the high temperature part of it.

The low temperature part, that provides the exhaust gradient is the equivalent of engine coolant, which will flow in through one of the blue ports and out through the second, and that will effectively give the gradient to allow the generation of electricity, and then there will be the appropriate electrical terminations on the bottom to take the power out.

Okay, this is really my last slide, just to summarize, Navistar is a leading manufacturer of fuel-efficient, commercial hybrid electric vehicles, and we remain today the only CARB certified commercial hybrid truck and bus manufacturer.

We do continue to set the standard for the development of low emissions, fuel efficient technologies and, really, the California Energy Commission and the Air Resources Board's objectives to reduce emission and improve fuel efficiency complement of Navistar, ourselves.

And we would welcome collaboration and project participation from both the Energy Commission and from the

Air Resources Board.

Thank you, that's my presentation concluded.

MS. BAROODY: Thank you, Darren, appreciate it.

Let's see, we have about one, two, three, five more speakers today.

I just want to check with people on time constraints, since our agenda changed a little bit, if anybody has a plane to catch, if they would like to go next to take a plane. Does anybody have time constraints?

No, we're okay.

Okay, Cummins, Wayne Eckerle.

Wayne, are you here?

MR. ECKERLE: Okay, I want to thank the California Energy Commission for inviting me to attend today, and I will get to the point, so I'll try make up some time.

For those of you that don't know Cummins, we are the largest manufacturer, largest independent manufacturer of internal combustion engines in this country. Primarily, our fuels of use today are diesel and natural gas, and I'm not going to talk about diesel today.

We are doing some of the similar things that you've heard already. We have plans in place that will reduce or increase engine fuel efficiency for conventional fuels on the order of 30 percent over the next five years.

So what I want to talk about, really, are the

pathways the CEC can use for reducing greenhouse gas emissions in other ways, other than improving how we work with conventional fuels.

This is our internal view of how we can reduce the CO2 footprint, so a lot of these approaches you've seen already.

I won't -- I do want to point out, you might say, all right, why is an engine guy talking about hybrids, and the reason is, is that the way hybrids are integrated, it it's done more from an engine viewpoint than a power train viewpoint, the efficiencies are significantly higher, and so that's why they show up on our roadmap.

And the other piece, of course, is that the cost of hybrids is really the biggest impediment for commercial applications.

And so there are ways to integrate, from an enginecentic view that can take some of that cost out.

One point that we always like to make is that a hundred percent of the fuel's burned by the engine and, of course, a hundred percent of the CO2 is burned by the engine, and a hundred percent of the power comes from the engine. So, i.e., in applications where you need an engine, it's pretty doggone important from the stand point of reducing greenhouse gas emissions, so we keep that very much in front of us.

This is our horsepower footprint. One of the fuels, of course, that we do burn is natural gas. The area that we're primarily talking about today, I think for this forum, is the automotive horsepower kind of range.

But you can see we burn natural gas in engines all the way up to 3,500 horsepower. So we've been at this for actually quite a few years. We have a number of natural gas engines in production today, not necessarily in hybrid applications, but very prevalent in what we do.

We believe a key pathway to reducing greenhouse gas emissions in California is use low-carbon fuels. So you can see those that are listed up there, clearly ones that are renewable are of more interest than others. Natural gas comes on this list and again, we talk about it because we have a pretty significant effort there.

Our ISLG 8.3 liter engine was introduced in 2007, and already met 2010 criteria pollutants at that point, and we sell, actually, quite a few natural gas engines here in California today.

I won't go through these next two, these are the CDC slides but, as we all know, one can't take a traditional view and hit these kinds of greenhouse gas reductions, it just will not happen.

In the area that we play here, we're in heavy duty, and you can see here from the stand point of the roadmap,

between basically now and 2020 we need to reduce by 22 million metric tons of CO2 equivalents, using low-carbon vehicles, and then another 19 from fuel economy improvements. And, of course, we play heavily in those areas.

Really, the area that I wanted to focus on more today than anything else, really is that as we see this thing going forward, we see low-carbon fuels, engine downsizing, and hybridization as being really three key areas to hit the kind of targets that the CEC is talking about.

E-85, if it's obtained from cellulosic sources, is actually a very significant opportunity from a greenhouse gas emissions stand point, and I'll talk about that some more in a second.

From an engine downsizing stand point, if one were to go to ethanol or a low-carbon fuel like that, with some of the technology that we're looking at there is a really significant opportunity to downsize the engine, while still hitting the same power nodes that we hit today.

So that not only reduces engine consumption, it also reduces criteria pollutants. Not necessarily, on a grand horsepower basis, but certainly on a pollutant over duty cycle basis significantly.

And also, that downsized engine then will lend

itself to be integrated from an engine electricification stand point for hybrid applications.

And of course, lastly, hybrid, there's lots of potential and kinetic energy available, probably more kinetic out here in California. But in any case it's there. there are technologies available today, but product cost is an impediment, as was mentioned before, for commercial applications.

Let's just talk about ethanol for a second. Ethanol is actually a pretty good fuel from the stand point that its latent heat of vaporization is low. What that allows us to do, if we directly inject it in the cylinder, we significant change the NOC limit line, which allows us to burn the fuel at a very, very nice point in the combustion cycle to get good efficiency.

But the other thing that we can do is we can, through our air handling capabilities, increase intake manifold pressures and also increase compression ratio, so that allows us to get the very high -- really, the same diesel equivalent peak torque, as really diesel equivalent brake thermal efficiencies. But, of course, since it's ethanol, we can reduce greenhouse gases by as much as 60 percent, of course depending on duty cycle.

The engine, itself, will be less costly than a traditional diesel engine today, primarily because of less

after treatment. We can burn in a stuck and metric way just like we do gasoline today, and that makes the package much easier to integrate onto a vehicle.

With ethanol, we can actually go to higher power density than diesel today by burning metrically, using cool DGR, we can get to the same power density as a diesel, with lower cylinder pressure, which means we can actually run at higher power densities for sustaining the cylinder pressure.

The other point that we'd like to make is that for commercial applications we think it's better to downsize a diesel carcass, than try to upsize a conventional gasoline engine.

As we talk to our customers, the kind of durability they're looking for is on the order of, depending again on application, 200 to 500 thousand miles, and we do not see that happening with these kinds of power densities in a conventional gasoline engine today.

When we talk about waste heat recovery, this graph really is showing that you have two choices. If you're running steady state, you'll tend to go after waste heat recovery, which the previous presentation talked about, and we use extensively in our Class A engines as well. Where there's frequent starts and stops the waste heat opportunity is less, and that's where hybrid application becomes important.

And the kind of numbers, you've seen these, the kind of efficiency improvements depend on duty cycle. This particular graph showing some efficiencies for a utility, a step van, transit bus, and a refuge truck. But you can see they're anywhere, typically, from 25 to 50 percent kind of energy recovery is possible. The key is what's the cost?

And you can see on this curve, for those kinds of efficiency improvements, what the three-year fuel savings is. But the problem is, of course, the cost of the hybridization is on the order of that fuel cost in some cases.

So that's the job is to be able to get this efficiency and get the costs down, and that's where an enginecentric view, we think, is a big help toward making that happen.

So from our input to the California Energy Commission, we think that there's opportunity to use an ethanol engine hybrid potential, we see it reducing -- and this is a wells to wheels kind of an analysis, okay, so we see an opportunity to reduce petroleum-based fuels by 80 percent. We see an opportunity to reduce CO2 emissions by 70 percent. And, of course, using an engine hybrid reduce our energy use by 36 percent.

These numbers are really not taking the extremes, these are numbers that are sort of in the middle of the

range of what we think is possible.

These are the potential markets, these are not surprising, vocational trucks and other applications.

Based on our relationships here in California, and with our distributors out here, we think that we have a pretty significant opportunity in beverage delivery, in municipal government, public and private utilities, irrigation districts and transit fleets to make this happen.

So next step, we sort of see a two-pronged approach. Our natural gas engines are ready today. We have on the order of a hundred natural gas engines in hybrid vehicles today, so there's opportunity through -- we think, through CEC's help to increase that number here in California.

And the other one is to develop an ethanol-based engine hybrid system. Also, we think it will have a significantly greater greenhouse gas reduction potential, as well as the opportunity to improve the hybrid technology that is used in vehicles today.

So in summary, we think the key is to go after low-carbon fuels, go after engine downsizing, and hybridize, and we thing from a commerce perspective we're well positioned for both natural gas and ethanol engine hybrid systems.

Thank you.

MS. BARODY: Thank you, Wayne.

Next we have Joe Dalum, from Odyne.

MR. DALUM: Well, good afternoon, I'd like to thank the CEC for inviting me today to this workshop.

My name is Joe Dalum, I'm President of Odyne. And today I'm going to talk about plug-in hybrid, medium and heavy duty trucks.

First, a little bit about Odyne and DUECO.

Odyne designs and manufactures plug-in hybrid propulsion hybrid systems for trucks over 14,000 pounds.

So an example, that photo right there is a truck that's over 33,000 pounds, and that has a 35 kilowatt hour plug-in hybrid drive system.

Odyne was founded in 2001 and developed the industry's first commercial plug-in hybrid utility truck in 2007, with DUECO.

Odyne is owned by the parent company of DUECO, one of the largest final stage manufacturers of trucks in the U.S., and UELC, one of the largest nationwide rental and leasing companies in the utility industry, with two locations in California.

So the photo on the right is of our main production facility in Waukesha, Wisconsin.

And just to be clear then, Odyne is the company that makes the plug-in hybrid drive system, and DUECO is the final stage manufacturer that completes the truck.

Odyne operates in partnership with its affiliates, DUECO and UELC, and works with Terex Utilities.

So why is there interest in plug-in hybrid trucks? I think it's pretty apparent here, I think everybody understands this, energy security, the ability to displace petroleum with electricity, ability to reduce emissions, greenhouse gas emissions and other pollutants, reduce fuel consumption.

In our situation, also, reduce noise at the job site, that's one of the benefits of a plug-in hybrid drive system on a medium or heavy duty truck.

A little bit about the U.S. truck market. There are over eight million trucks on the road that are over 14,000 pounds. There's typically high fuel consumption and high idle time, as some of the previous speakers have talked about.

We're focused on the work truck application. There's approximately 100,000 work trucks that are produced with a power takeoff, that's the device that actually powers the equipment on the truck, per year in the U.S. And there's a very large number of those currently on the road, and that's our target market. There's also a large number of those operating in California.

So Odyne believes that the medium and heavy duty truck segment is an excellent fit for hybrid technology and

we expect strong growth for our systems within the next three to five years.

Where we're at with the technology is this is pre-production technology, we have produced over 20 plug-in hybrid trucks to date.

Utilities across the country are receiving these units and we're expanding production in 2009.

The photos on the right are a couple of the trucks, the top one's from XCEL Energy and the bottom one is from PG&E.

We are working with PG&E, XCEL, AEP, DPL,, Progress Energy, Florida Power and Light, and other utilities with this technology.

Our rental company, UELC, currently has units available for rent, one unit in the L.A. area is available for rent.

So as far as the applications of the plug-in hybrid technology, we can target a lot of different applications with trucks over 14,000 pounds, including aerial bucket trucks, digger derricks, compressor trucks, and refuse applications.

Our system can be put on both a new truck when it's being built, or it can be retrofit on existing trucks in the field.

Odyne is a leader in plug-in hybrids. We developed

the first digger derrick application, that's the photo in the middle there, with the auger in the ground.

The first compressor truck, we can drive a jackhammer with our technology.

The first Class A tandem axle plug-in hybrid truck, with a 56,000-pound gross vehicle weight rating, and the first four-by-four Class A truck.

The way our system works is that we start with a conventional chassis, stock engine, chassis HVAC system, and Allison transmission.

We don't modify those systems at all when we're mounting our plug-in hybrid. And the Allison transmission is the most popular transmission on the market today and we're currently the only ones interfaced with it.

Then we install our plug-in hybrid drive components, which you see there.

We're also partnered with Bosch on some major components, such as the inverter and the electric motor.

We've designed the system so that we have redundant power for hydraulics. It also provides additional power for the hydraulic system for very high loads.

And the key point here is that there's no change to the original equipment manufacturer's transmission or engine parameters. So this system remains emissions compliant. We can install our system on multiple chassis. We've installed

it on International, Freightliner, and GMC. It can be installed on multiple weight classes, and it is retrofit capable.

So some of the benefits of the Odyne plug-in hybrid system are that we reduce fuel consumption and emissions, we eliminate or reduce fuel consumption emissions at the job site, that's one of the primary benefits of using the large, 35-kilowatt R battery pack.

We also increase efficiency when the vehicle is driving, we have launch assist and regenerative braking.

There's a fuel savings of 50 percent per year are possible, depending upon the duty cycle. And we have performed testing at Southwest Research Institute. We have quite a job site operation.

And our larger battery system offers some benefits over that of a conventional hybrid.

We have a 35-kilowatt hour battery system, as I mentioned, compared to roughly a two kilowatt hour battery system for a conventional hybrid, so that system can be charged using a grid or using the vehicle. That allows us to operate longer, in an all-electric mode at a job site, so other systems will turn on and off to replenish the battery R system, has a larger energy reserve so, in many cases, it's not necessary to regenerate in the field, at a job site.

It also has enough power for electrical air conditioning and heat in the cab, and reduces idle time at the job site.

We can also export power, so our systems have nine kilowatts of exportable power, which potentially eliminates the diesel generator.

So for the next steps, we are expanding production of our current plug-in hybrid system. We've moved the operations to our main production facility in Wisconsin and it's currently underway.

We also are going to be enhancing our system using a Department of Energy Congressionally directed project of $1.9 million in DOE funding, and we are requesting a potential match from the California Energy Commission for this project.

This project will allow us to use advanced battery systems in the design, also smaller, lighter weight components, which are important.

And most importantly is to reduce the cost and increase the economies of scale. So some of the people have talked about, such as Bosch, the advantages of scale, and that is what we are targeting with this new design is partnering with large automotive suppliers to leverage their volume.

We would like to expand this DOE program to

California. We'd like the California Energy Commission to expand matching eligibility to include Congressionally directed funds and other funding sources for future programs.

And then I'm going to talk now a little bit about the 2010 to 2011 goals. These goals are dependent upon customer interest in funding levels. We would like to implement a large demonstration of plug-in technology for new, medium, and heavy duty trucks. Those are trucks that are over 14,000 pounds, targeting 100 plus units.

We'd like to take a look at a variety of different applications, especially work trucks that must operate equipment, and include the required charging infrastructure. The infrastructure can be a challenge so you have to keep that in mind.

And we would also measure the duty cycle data on a wide variety of applications. So all of the trucks that we have produced have a data acquisition system on them, and that's afforded us the ability to assess the current duty cycles, but we like to expand that to new applications.

So this will help us to assess which technology is best suited for certain applications.

Another project that we would like to do, which I think would have a big impact on the existing fleets is a plug-in hybrid retrofit program for medium and heavy duty

trucks.

We'd like to target conventional work truck applications with high fuel consumption and use the smaller components that are developed through the Department of Energy Program. These systems would be put in place on trucks locally, within California, to complete the retrofit activities.

So we have retrofit existing trucks. With today's technology it's quite a challenge because of the size of the components. But I think that in the future, with advances in technology, this will become a much more feasible approach to reducing emissions.

Other development goals include the implementation of advanced varied technology and the evaluation of a larger stored energy system, potentially 70 kilowatt hours for larger trucks over 33,000 pounds.

Developing a CNG-powered plug-in hybrid; because our technology really doesn't modify the OEM chassis power train, this is technically something that can be done, and I think this might be a worthy project, especially in Southern California.

Also, too, we'd like to develop the retrofit kits with the existing vehicles by targeting certain applications.

And then also expand the Smart -- or incorporate

Smart Grid interface into the design, so that utilities can communicate with the system and control the charging.

Other R&D projects; these would be more in the out years, I would say, would require additional funding. But a couple of considerations would be, one is to apply the benefits of a plug-in hybrid with those of a hydraulic hybrid, so you would combine the high power densities of a hydraulic hybrid with the greater energy density of a plug-in hybrid, and increase the overall efficiency of the vehicle.

The other is to combine what I would call a combined series parallel, in which you would have a system that would either use series or parallel hybrid configuration, depending on which is most advantageous for the type of duty cycle that it's in at that particular time.

So in summary, Odyne plug-in hybrid technology reduces fuel consumption and emissions, we displace petroleum using the plug-in hybrid technology. We have a high, modular high energy system that's suitable for a wide variety of applications for large trucks. We are seeking matching funds in California for a Department of Energy Congressionally directed project.

And for 2010 through 2011 proposals, we talked about plug-in hybrid demonstrations, a retrofit program, and a variety of technology enhancements which could be done.

So thank you.

MS. BAROODY: Thank you very much, Joe.

Okay, let's see, the next, Smith Electric.

MR. OLSON: Can I ask one question first?

MS. BAROODY: Oh, sure, go ahead.

MR. OLSON: Joe, can you, if not here, provide some information on the difference in the costs of the retrofit versus an OEM version?

MR. DALUM: Sure, I can get – you know, I'd be happy to provide some estimates. Well, I can give you what it would be for the current system and then, you know, the system that we're developing.

MR. OLSON: Appreciate it, thanks.

MS. BAROODY: Okay, Mark Aubry, Smith Electric.

MR. AUBRY: I want to thank the California Energy Commission for the opportunity to have Smith here, Smith Electric Vehicles here again today.

My name is Mark Aubry, I've Vice President for North America, for sales for us.

Smith has spent over the last 24 months soliciting the participation of key corporate launch partners with a significant California presence in urban transportation and logistics operations.

In addition, Smith has met with key decision makers at California Air Resources Board, the Sacramento AQMD, Bay

Area and South Coast AQMD, as well as various utilities throughout the State, discussing and associating leverage funds for various projects.

Smith continues to work with committed partners on leveraging the maximum level of matching program funds and in-kind contributions to ensure that the CEC's sponsored program is met with with successful cooperation with both willing and well-funded collaborators.

It's of interest that, too, we recently received a fairly significant multi-million dollar award from the ARRA funds.

The picture that I show here is some of the most recent vehicles that were delivered for either AT&T, Staples, Frito Lay, Kansas City Power and Light, among others at a Washington D.C. event at the end of July.

A little bit about Smith Electric Vehicles, if you're not familiar with us, we have been based up until this year, which I'll show later, in Europe, based primarily in England and covering most of the continent of Europe, so we've had over 90 years of experience building commercial electric vehicles.

We have hundreds of current customers around the globe and in the thousands of total electric vehicles manufactured.

In that time frame of the 90 years we've been able

to build a integrated service network. We have a little over a thousand employees worldwide, and we have a number of facilities scattered throughout the world.

This shows you a number of pictures that, if you start at the top left and you work your way all the way around, you'll see a number of vehicles. As technology has progressed, as vehicles have become lighter, some of those vehicles way back to the beginning, we created everything from the axles up. Today we certainly don't do that, have the advantages of not doing that.

Really, our Smith mission, as we look at it here into the United States, we are looking for three key components, really the visionaries to take the driver's seat.

And we would look at that as the visionary in this case would be a commercial application for fleet use, we would say that, if you can see that slide on the top left, it's to bridge that gap between where the visionaries are and they take ownership of a vehicle, to where the herd ultimately moves in, in this new product development. And if you can bridge that gap, that's really where we feel we're at today for North America.

The second piece that we would look at is technology and legislation, really helping us to drive costs down.

I know Tim had mentioned a few minutes ago about some various utility partnerships, which we are working with, various universities and tech centers across the country, various Smart Grid applications that we are currently working with in the federal government, some companies that are based right here in California, with Coulomb and Air Environment.

And then as well as using various GPS components from large communications companies to help us with that GPS device.

And then the last thing we would see is as the total produce volume for us increases in the United States, it will really help us drive that battery cost down.

Various vehicle applications; we use this as a list to go through and identify who makes a great customer for us, anywhere from the food distribution network, the parcel deliveries, chilled foods, short hauls, utilities, but really they follow to or three significant points.

One, you don’t have to have a lot of infrastructure to put the vehicles in, although that is becoming a more significant piece. They all start and stop at a same location every single day, five, six, seven days out of the week that vehicle has the exact same route, they all go back to the same base delivering logistics location every night.

From an environmental stand point and bottom line

benefits we would look at, again, two or three areas, from a low operating cost perspective, certainly your cost of fuel is insignificant, your maintenance costs are nil.

They're perfect for an urban delivery type location, as we just identified in the previous slide. There are zero emissions on the vehicle, itself.

And then an overall energy security. As we've noted over the last two or three years, with that price volatility all over the place, many fleet operators have been scrambling to try to come up with a good bottom line.

Today, with an all-electric commercial fleet application, you have that low volatility because of the cost of electricity.

One of our products that we are starting with here in the U.S. is what we would call the Smith Newton. That's a picture of DHL, that has a number of those products. It has one of the largest payloads in the world for any fully electric, battery electric vehicle. They have a range of up to 150 miles, under two different configurations.

We limit the speed to 50 miles an hour only to be able to have the maximum payload, the maximum range, but certainly those parameters can be changed.

Some of the key features within the Newton I've shown there. I would make mention of the battery perspectives. All U.S. vehicles will initially be powered

by lithium ion iron phosphate batteries. Additional advanced technology, lithium ion polymer batteries will become available later on this year and into 2010 as production is ramped up.

We would say today that battery life is seven to ten years, with even longer life spans possible from the advanced battery technology.

Battery configurations consist of individual cells packaged in seven kilowatt hour modules, which then can be combined to form battery packs of various kilowatt hour ratings.

We would use a range of kilowatt hours from anywhere from the 21, all the way up to 160 kilowatt on a larger truck.

Each vehicle has a comprehensive on-board battery management system to prevent over-charging, provide temperature control, and protect voltage cutoff, as well as the driver has controlled regenerative braking that is supplied to extend battery state of charge during vehicle operation.

From a commitment to service, every one of our vehicles come with a 3-year/36,000 mile on the chassis, 5-year/60,000 on drive train and batteries, and we would say that the life expectancy would be seven to ten years as I mentioned a minute ago on the battery, and at least 15 years

for the motor and the drive train.

Noted on there, from an environmental impact, there are many different types of environmental benefits resulting from the utilization of zero emission vehicles; elimination of street level vehicle emissions and associated health consequences, transfer of fuel combustion to highly efficient stationary source, either fossil or renewable, with no barriers to green grid capability, no noise pollution, among a variety of others. And this is a particular study that we did in the northwest not too long ago.

This is a vehicle that is in partnership with Ford Motor Company, it's the Ford Transit Connect that will come out into Q-2, early Q-3 of 2010. As you can see there, the parameters are fairly similar to what the Newton has, except we have raised the miles per hour.

The payload is almost exactly what Ford has as their payload on the standard vehicle. And the gas version is available through Ford, it came out in mid-July.

We would say that that is probably one of the – one of the best vehicles for the U.S. market, and that has been demonstrated in tangible form in Ford's version in the UK, over the last three or four years that has been one of their highest volume producers and volume sales vehicles for the last four or five years.

As we are with CEC a number of months ago, and with ARB, I wanted to make sure that we showed a timeline, some of the significant key points that happened since January of this year.

At the beginning I mentioned that Smith Corporation used to be solely a UK or European corporation. In January of ’09 we made, now, a Smith UK and a Smith U.S. that was established.

In February of ’09, the Ford partnership was identified and released by Bill Ford, Junior.

Then the Newton platform, specific to the U.S. was developed along with, in March, our Kansas City headquarters and facility was unveiled.

Obviously, everybody knows about the DUE applications and the approvals that were sent through.

In early May the Newton has completed Air Resource Board approval and we are working on the Transit Connect, on the developed timeline for that ,and that should be completed by January of this year, or January of 2010.

If you notice in there, the first U.S. Newton that was delivered, I show a picture of that on the last slide, that was actually delivered to a utility here, in California, the first U.S. product.

And then ultimately, if you go all the way to the right, you’ll see that there are other platforms that are

being developed, which I would make mention that you'll want to keep your eyes and ears posted to an announcement that will happen over the next few weeks, of a mid-version GDW, so right around that 10,000 to 12,000 pound gross vehicle weight.

And one of the questions that was asked from deployment timing, we would look at really, within California, the San Francisco Bay Area and Sacramento areas really begin this fall, as far as rollout. The L.A. region in mid-year 2010, and the San Diego region in Q-4 of 2010.

Partially, we'll be using Air Resource Board money that was allocated earlier this year, as well as the DOE monies that were approved just a couple of months ago.

And as far as the markets that you'll see in there, purple, the phase one, we would estimate 12 to 15 dealers in those purple markets that will happen in 2009, which we are working on today.

2010, which is phase two, that's the orange areas, those are expansions for ten plus markets and dealers. And then really, by 2011, which is phase three, a more aggressive addition of 20 markets and dealers, that's the green sections that you see listed.

I won't say a whole lot about this, except you'll see the UK facility, that's on the top. The U.S. facility, that's the one that's based in Kansas City, Missouri.

We do have a facility that is also in California, it's based in Upright Power Nexus, which is in Fresno, California.

We would say, from a job creation perspective, that of the four or five individual companies, as well as our own individual organization that's here in California, we have the ability to grow in the California markets over 100 individual high-paying jobs between now and the end of 2010.

From an incentive opportunity; federal incentives, we talked about that earlier today, there's a $7,500 federal tax credit, but there's nothing that really goes up into that Newton category.

And I you were watching the news at the end of July, Representative Sandy Levin, from Michigan, introduced a bill that would provide a $12,000 credit, tax credit that would be available if it's approved for the Newton size vehicle and, as well, there are various State level incentives.

So a variety of customers who, today, are working with us, and on the next slide you'll see a number of companies who in the – in Europe, and some who are based here, are also working with us as we open up the American market.

We, at Smith, would make the recommendation, and in this last slide you'll see the Transit Connect, which I

showed, you'll see the PG&E vehicle in that center product, that's an all-electric, fully battery operated utility truck. It is the first vehicle in the world that was made as a utility truck in partnership with us and with All Tech.

You'll see the DHL truck that I showed, on the far right.

On the bottom left you will see a dump truck, which is soon to come into the California market.

And then on the far right, we own a organization which is called Optare, they make fully electric, fully battery electric buses which will be coming into 2010.

So the last thing we would say is Smith makes a recommendation to the CEC, out of that hundred million dollar funding allocation that there should be a multi-million dollar to assist nationally branded, as well as smaller, localized companies to implement emission-free, technologically advanced commercial delivery vehicles, such as the Smith products that were shown here today.

The allocation should also include a smaller percentage for infrastructure cost, as needed.

This appropriation will assist Smith in driving an additional 200 vehicles, above and beyond the 150 that we had said earlier this year, into California, as well as directly or indirectly employing more jobs within the State with such an allocation, and by 2011 deliver on the promise

of having a sustainably priced product.

We believe that the market demand for that class five to seven Newton, a zero-emission vehicle in California, alone, will be strong enough to fully, if not over-subscribe that particular allocation that CEC is being requested of, and recommended.

We would ask that there would be a program offering of 80 percent of the incremental cost coverage, similar to what's happened in other states across the United States.

Thank you for your time.

MS. BAROODY: Thank you very much.

Let's see, CALSTART, Bill Van Amberg.

MR. VAN AMBERG: Thank you. I know the day is long so we'll try and move through this quickly. Maybe we'll do some jumping jacks while we're doing it, so we can get people's blood flowing a little bit. And sorry for turning my back on all of you, it feels awkward.

But what I'd like to talk about today, when we pull the presentation up, quickly, is kind of taking a high level look at maybe where the CEC should really consider, in this sphere, best and most wisely use its funds.

And I think while it was a pain to go through the stimulus funding and try and find the matching of the State dollars with that, I think it has provided an opportunity now, as we go forward, for the State to really find out

where were federal funds used, where can the State best move the needle and provide the most leverage, and where were there gaps in federal funding where State funding would do the most good to move an industry forward.

So with that approach, we'll kind of take a higher level look.

I would just say that it is exciting what is going on. There's no slam dunk right now in the truck technology arena, but we see some tremendous new technologies moving forward right on the cusp of market, but greatly in need of the next level of enabling technologies and components to further enhance the function of these technologies using electric drive and other approaches.

I don't think we need to spend much time on this, I think the Energy Commission fully gets the value of electric drive hybrid technologies.

When it comes, particularly for early action on AB 32, as well as directly affecting criteria missions, and these technologies are some of the few of them, in particular hybrid in trucks, where you can get both carbon and criteria emissions.

And we see a business case for the end user to use them in terms of fuel savings.

Now, the industry is moving forward. I've shared this with the Commission several times, we're seeing a real

nice continuum starting to develop from, if you will, development right on through, now, early production. There's a lot of models moving into early production. In fact, I need to update this chart because we continue to see things moving.

Yet, with what's going on in the economy and with some of the investment choices I think that have been made at the federal level, there is definitely more work needed in this area.

And I think for all hybrid and electric drive technologies we're really at this transition point, hybrids are really the front edge when it comes to the commercialization of moving these technologies forward. But we're at a tipping point that could go either way and we need to have continued push, so I'm going to talk broadly about what's needed.

Clearly, what we're trying to do is battle on early products the incremental cost and be able to move the product forward with fleets who do want to buy, but are struggling with the payback time. And yet that payback time, with modest volumes, we'll be able to move into a realm where it is very feasible and sustainable, and also continue to move good technologies through the pipeline.

I think California, in this case, really can move the needle. I think there is a great opportunity, for the

kinds of volumes that we're aiming towards, for California's investment to actually help move a national marketplace or be a big component of it, as well as make sure we fill some of the technology gaps that need to be filled, that I don't think the federal government's investments fully help us with.

I think in general this kick start would probably involve, clearly, purchase volumes and incentives to help do that. It would expand pre-production. We really need to get good things, like some of the technologies we've heard of today, into pre-production numbers, into the next level of numbers and collect good data and valid them, and we need to push the front end of the development and demonstration arena to bring the next ideas and good technologies into that mix and move them towards pre-production.

So specifically, what would that mean? I think from our perspective, at CALSTART, and we've argued for this for quite a while and I think we've started to see some success from this effort, it would really be a three-fold endeavor.

And in California I think it would involve something on the order of 75 percent of total AB 118 funds put into this sphere, into this arena, to be focused on trying to get – or at least up to 75 percent on incentives for purchase, but having at least 25 percent, perhaps more,

put into demonstration, deployment, and new technology so we continue to feed this pipeline of the next functionality that California needs ahead of the nation.

I think what we're saying is in California, at minimum, we would like to see three to five years of $100 million of AB 118 dollars put into the medium and heavy duty sphere for hybrid and high-efficiency truck technologies.

We certainly have seen some good early efforts on that, and I'll talk about that just in a moment, but I think there is more to be done.

Clearly, the industry is very supportive of this, we just held and event called "Hybrid Day on the Hill," and the hill being Capitol Hill, and brought together all the major truck makers, and system suppliers, and a number of major fleets back to DC, with a cohesive message, which was we need help on pushing the first product out there and supporting it. We need help on broader demonstrations to validate the new technologies moving into pre-production, and we need help on the front end with a consistent research and development program to get development and deployment on the streets.

Now, I'd say in California, using some portion of AB 118 dollars, we're starting to see some good movement. CARB has probably the most innovative program in the nation right now proposed on the incentive side, it's called, as

everybody knows, the “Hybrid Voucher Incentive Program.” But it really is a streamlined intent to move early volumes of vehicles, this first year of CARB funding is targeting in the ballpark of 800, which is a meaningful number out of a total national market.

But there is more that does need to be done. And I think, as the CEC really looks forward, you want to make sure that CARB or some type of incentive funding remains there out of AB 118 and I think you also, though, want to make sure that we don’t forget about demonstration, assessment, validation and new development of technologies.

And we heard a lot of it here today. I thought some of the presentations were really quite excellent and they’re people we work with pretty consistently.

We need to push forward the next generation of technologies when it comes to electrically-drive accessories, plug-in capability, optimizing hybrids with engines, optimizing energy storage or improving it, but also combining low carbon fuels with hybrids.

There are a variety of areas in which we need to continue to push the ball forward.

And as part of a continuum that we’ve argued for on the far end, early production, deployments, getting incentives there is vitally important, but we can’t forget kind of the middle and the front pieces of this, which is to

move product continually from R&D right through commercialization which is, frankly, where the United States has been very weak.

We're very good, usually, just on periodic R&D, we're not so good at making sure we consistently move it through to market, and I think CEC funds can really help fill that gap.

Now, we've heard some of the options today. Where would we really recommend that funds be invested as the CEC is looking for a portfolio of investments here in this space, I think could not agree more that the heavy duty tractor segment is really a blossoming area. There is a tremendous opportunity for growth and for fuel reduction and carbon reduction here, we think this is the next area that definitely needs pre-production seeding, as well as some new technology.

Class A hybrids in particular, but as we look at regional heavy haul in California, goods movement around ports and elsewhere, this is a critical area of new technology, and it is pretty close on the cusp, pretty much all of the truck makers now have some offering into early production in smaller class A, we need to push up the heavier Class A. And we do see some people working on these technologies now, Navistar, and ArvinMeritor, among others.

The reefer units, being able to use the onboard

electrical power to power other accessories aboard the vehicles, as well as the electrified accessories we'd like to see under the hood. This is a critical area, really a rich area for investment.

We've heard today, already, from several folks there is a lot of competition we would like to see spurred in the plug-in space, as well as the hybrid space, so we think there are a number of folks who are out there, who really need to move into this next level.

There's some innovative look at energy storage bodies, another way of reducing energy used at a truck in a worksite.

And then new competitors who are starting to move into the space and we've heard from many of these and the new partnerships that have come out of some of them.

So without taking too much time on that, the other thing that I would just suggest, I know we're dealing with electric drive here today, but I would not want you to forget hydraulic hybrids, because I think what we don't want to do as a State is pick the total winners, what we want to do is spur innovation. I think there's some tremendous energy savings innovation going on in the hydraulic space as well in hybrids. This is another area where I would really encourage the Energy Commission staff to pay great attention in their investment decisions.

We've laid out a roadmap in our Hybrid Truck Users Forum, our national program, really looking at hybrids and high-efficiency trucks, and how do we really make commercialization happen as opposed to talking about it?

But clearly, as we're looking forward, it's both driving up the volumes, and the platforms, and vocations that make sense, adding new ones to that, as well as starting to add in on that bottom level some of the new enhancements and capabilities that we need to be funding, both in development and demonstration, and in pre-production deployments, and many of these things we've heard about today.

Again, combining the optimized engines with hybrids, plug-in modes of all types, hybrid and battery electric, low carbon fuel integration, electrified components and the like.

Put a different way, if we were to look at where some of these dollars out of the total 118 portfolio could go, we clearly do believe that putting a nice chunk into incentives to drive the market is really one way to help pull new technology through, but we think it's smart to put a nice piece of the portfolio into these technologies.

I've gone through several of them now, but there are opportunities to do expansions of pre-production deployments today, ready to go, as we would have to the

stimulus folks “road ready,” beyond shovel ready. And I think there are a lot of technologies we’ve heard about here today that are really fitting and deserving of being considered.

So in summary, again, we really would encourage, CARB and CEC, as they’re looking at their total portfolio, to look at a multi-year vision, look at technologies, both for investment, as well as to help move into the market on commercialization.

What we’re doing now and what we hope to see launched with CARB is a nice start to it, but I think there is a lot more to be done, and I think we want to consider this as something that we can’t just invest in for one year, we have to consistently invest in over a series of years for a smart portfolio.

And so I rushed through that, but I certainly would invite everybody here to attend the HTUF National Conference, where we’ll talk about a lot of these issues. It’s coming up in Atlanta, Georgia.

This year we’re very proud to have a number of users who are the hosts of our event. This will be in Atlanta, at the end of October.

So I took that as quickly as I could but, thank you, and happy to answer any questions.

MS. BAROODY: Thank you very much. Any questions?

Pilar, do we still have online attendance, WebEx?

MS. MAGANA: Uh-hum.

MS. BAROODY: Any questions online? Hello, any questions?

MS. MAGANA: Yeah.

MS. BAROODY: There are questions, okay.

Can you unmute it so we can hear them?

MS. MAGANA: They just – they typed it in.

MS. BAROODY: They typed it in.

MS. MAGANA: It's from Jeff Fisher.

MS. BAROODY: Okay. Do you want to use a mike, Pilar, please?

MS. MAGANA: It's unmated, Jeff Fisher.

MS. BAROODY: Okay. Do you want to use the mike?

MR. FISHER: Can you hear me?

MS. BAROODY: There he is. Yeah, Jeff, go ahead.

MR. FISHER: I guess my question was related to the Navistar presentation, where they say they're the only CARB certified hybrid. And I was wondering how other manufacturers are delivering hybrids and selling hybrid trucks in California they're claiming they're the only one that's CARB certified and yet, Bill Van Amburg just showed a multitude of suppliers?

MS. BAROODY: Who would like to answer that? Can you just come and just say your name and –

MR. GOSBEE: Yes, certainly, Darren Gosbee, from Navistar. Yeah, the part I emphasized about being CARB certified with our hybrid school bus and with our hybrid medium duty trucks is really because by being CARB certified we qualify for various incentives and backed by CARB. And being the only one certified, we are the only one that qualify for those incentives.

MR. FISHER: Okay, I got it.

MR. GOSBEE: Okay.

MS. BAROODY: Okay, thank you very much.

Any other online questions? No, okay.

Well, let's move on, now, to the Port of Los Angeles, Chris Cannon. Hi Chris.

MR. CANNON: Thank you for inviting the Port of Los Angeles to speak today. We're coming at the end of what's been a long day, so I'm going to try to go as quickly as I can.

The reason we wanted to come today is to really encourage the State and other stakeholders to enter into and be a part of partnerships to develop Class A electric, all-electric vehicles.

We're involved at the port with a lot of heavy duty, obviously, industrial activity and so the Class 8 vehicles offer an opportunity for substantial emissions benefits and we think the State would be wise to get

involved in that, as well as all the other wonderful projects that have been talked about today.

So just to kind of give you -- set the context of where we are at, at the port, what you see are -- I don't need to get into the technical details of that, if you just look at that blob down at the right-hand corner there, that is the amount of health risk and toxic air emissions that were identified floating above the port complex and the area around it where people live. It was identified by the State of California that these are particulate emissions and the resulting health risks that derive from that, and this was identified early in this decade, it's been around for along time, obviously.

And so as a result of that, we were -- we were in a crisis. We had, you know, these toxic air emissions and the community in the area was outraged, they wouldn't allow any development to go through, they used the environmental process to essentially stall all of the expansion efforts that were going on at the port and demanded that something be done.

And the Port listened and responded, and came up with a historic thing for ports, and that's a clean air action plan. And I think it was a five-year plan and it was developed to control emissions from ships, harbor craft, trucks, cargo handling equipment and locomotives, and the

overall emissions reductions targets were in the 50 percent range. And for trucks, we hope to reduce emissions by as much as 80 percent.

And it worked, at least it has so far. It began last October and we banned pre-89 trucks. This January we're going to be banning everything older than 2003, that doesn't have a retrofit.

We spent a lot of our own money, $44 million, to help put 2,200 trucks on the road, and then there's a bunch more that will be – that were purchased privately, and right now we've got more than 5,000 trucks doing 60 percent of our drays, we're meeting our emissions benefits and thank God we can begin to do some development.

So what we did was we said well, okay, we've got an opportunity here, we're starting to make emissions benefits so we shouldn't stop, we should look for additional opportunities for emission reductions for our truck operations, as well as other operations at the ports.

And there's different categories of truck operations and, again, just to sort of give you an idea of our thinking and the kinds of things that we've been doing to reduce truck emissions, we've got all these trucks that run around on our terminals, they're called the yard trucks, they move the containers after they've been taken off of the ships, they move the containers around on the terminal yards

and get ready to place them either on trucks to depart the terminals or even on trains from our on-dock rail yard.

So, obviously, there's emissions from those, they idle, they stop, they start, there's plenty of opportunities there.

And then the drayage operations, for those of you who don't know the term, drayage just refers to the movement of these containers from our terminals to either railheads or warehouses.

And so we've got different types of drayage, we've got the real short-haul drayage, where you go five-mile trips, and back and forth, and back and forth from our terminals to the local railheads, and so those are really short.

And we've got medium distance drayage, where they go downtown from our port, or maybe local warehouses, and then the regional and longer distance, which come out toward the Inland Empire and beyond.

So we said to ourselves, where's the best opportunity to reduce emissions? Yard trucks, we thought were an excellent idea. They're off-road vehicles, they operate exclusively on the terminals, the emissions are all localized, as I said, and so we felt they were strong candidates for zero emission vehicles, and so we began to look for opportunities to do that.

Also, for very short drayage, as I said, they're limited range, they do lots of stopping and starting. They're right in that little blob area that you saw, all of those short-haul drayages occur in that area and that's where people live. So again, strong candidates for zero emissions.

Medium distance, 25 to 50 miles, that clogs up the highways, the emissions along the highways have impacts, and so they are definitely candidates for either the low emission vehicles that Cummins and others were talking about earlier today, or zero emission vehicles.

And then, finally, the regional and longer distance of 50 or more miles, these have impacts on goods movement corridors, the 10, the 60, et cetera, they cause emissions..

Due to the longer distances and less infrastructure for alternative and zero emission vehicles, the low emission diesels will continue to play a role, but we believe there still is even an opportunity for some of the regional drayage for zero emission vehicles as well.

So what did we do? We began investigating this. We funded the first all-electric dray truck, it's a Class 8 yard truck. We worked with Balqon. It uses lithium ion battery technology. This is something we'd like to continue to work on and we'd like to encourage the CEC and others to begin to look at this type of work and even work with us,

because we think this is a good project..

We are now working with UC Riverside, the CE-CERT people. They're very interested in goods movement emissions and the impacts from that.

And we've asked them to get involved, to give this some real technical foundation. They can validate duty cycles, they can refine some of the truck technology along the lines, what was talked about with the super truck DOE effort, and even assess the potential for alternative uses.

I mean, we're not trying to just create something that works just for the Port, we'd like to work with the community to do things that work for others. There's all kinds of opportunities for urban use of these kinds of vehicles, refuse trucks and other types of short haul delivery.

We're in the process, with the top picture there, is Vision Industries, that's one of the trucks that we're starting to have a discussion with, and then the bottom one there is the Balqon truck that I've talked about before.

The two trucks there, the Vision Industry Truck is -- well, the Balqon truck is the one we talked about already, it has a 100-mile range, we actually did the yard truck.

Now, we're asking Balqon to start working with an on-road truck. It has a 100-mile range under load, it can

complete at least one full, eight-hour shift. It really is a candidate for that real short, five-mile, very, very short drayage haul, and so this is something we're working with, we've talked about -- we've talked with the CE-CERT folks.

And we'd sure like to have an opportunity to work with the California Energy Commission to work with this kind of technology.

The one at the top there is hydrogen fuel cell, so that has a battery but it also -- the fuel cell continuously recharges the battery, gives it a lot longer range, 400 miles and it, too, is very promising for us in the medium haul, as well as some of the regional drayage opportunities.

It also has a lot of spin-off uses for other types of urban movements.

We're already working with CE-CERT on these –- to work with these two. We're looking to work with other participants in Southern California.

Right now you have a unit cost of $250,000, but we'd like again to work with the CEC to further develop this and begin to deploy and test these in the Southern California area here, with some of our drayage operators, as well as other heavy industrial people who are interested in Class 8 vehicles.

So again, I went fast because I know you guys are tired and want to go home, but I would love to talk with any

and all of you at any time. The Port of Los Angeles is very, very interested in electric vehicles and we're very pleased to have already been able to reduce a lot of emissions from our Port and we'd like to continue to do so.

So thank you very much.

MS. BAROODY: Thank you very much, Chris.

Well, it's amazing, it's 4:30, we're actually on time after all that's happened today, so congratulations to everybody.

Staff have any comments they want to make, Tim, Peter, Charles?

MR. OLSON: Yeah, I'd just like to invite people to participate in the other workshops, if you're interested in this, the other workshops that we're conducting. We do not have a date, yet, for the other part of the electric drive, so that will be the charging station, utility role, some other -- probably some other discussion of off-road and other types of unique electric drive technology.

And again, this is very valuable for us, having this kind of information to help us determine things like the technology status, where things stand in the development stream, the cost, the cost information that will be helpful in defining how much incentive money we set aside.

Part of this is also we've asked the Air Board staff to participate in this, we will continue to have

discussions with them about how we allocate our funding from AB 118, and there are other sources, too.

So, for example, I think it's probably worth looking at can we combine some of our funding with, say, Prop. 1-B money on some of these projects, and to also know what other sources of investment are out there, including matching, not just depending on the federal stimulus.

So very helpful to us, this is kind of our first blush series of workshops. We expect, if you're interested in this, we've already made some comments about this earlier, if you're – if you're open to meeting with us one-on-one, where we can get into some more of the details, that would be very valuable, too.

The timeframe, as Leslie went over, this is the first stage. I think we're looking at a draft report sometime in November, probably, for this next round of funding.

But the other thing that's important here is this workshop and a series of workshops in September are very opportune for us because we're still allocating money from the first round and going through the process of solicitation, so this is very helpful for our current money, too.

And appreciate your interest in providing that information and attending.

MS. BAROODY: Thanks, Tim.

MR. WARD: I'd also like to thank everybody for coming. It's an interesting day that we've had. We obviously had a little bit of a slow down early on with the technical problems but I noticed during that period of time there was an awful lot of networking going on. So please understand, we didn't play it that way, but I think there was a very good outcome because of that.

I do think that we will benefit from all the information you've provided today and the information you can provide to our docket.

As we go forward with the draft of the investment plan, we will be holding two advisory committee meetings for the process.

As we develop and adopt our investment plan, I encourage you all to stay tuned. If you're not signed up with our List Serve, it's easily done on our website, on the lower right-hand corner, and I'd encourage you all to be prepared to attend advisory committee meetings in Sacramento, as well, because the advisory committee meeting, I think that's helpful for the Commissioners who will be in attendance, and our Advisory Committee Members, that we'll hear from you as well, so that does help support anything that we go forward with in this investment plan.

But again, thank you all very much for coming. And

all of those that were on the phone, that stuck it out all day, appreciate your involvement and participation as well.

MS. BAROODY: Thank you.

MR. WARD: Thanks again.

MS. BAROODY: Yeah, thanks again to everybody for making the effort to be here, for the excellent presentations.

And again, I want to thank South Coast Air Quality Management District for the use of this great facility.

And Paul, our AV guy, and Pilar, you did a great job this morning through the pressure.

So thanks again.

(Whereupon, at 4:30 p.m., the Workshop was concluded.)

--oOo--