COMMITTEE HEARING

BEFORE THE

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT

COMMISSION OF THE STATE OF CALIFORNIA

In the matter of,	)	
	)	Docket No. 14-IEP-1
	)	
Integrated Energy Policy	)	
Report (IEPR)	)	

WORKSHOP ON

MEASURING THE SUCCESS OF THE

ALTERNATIVE AND RENEWABLE FUEL

AND VEHICLE TECHNOLOGY PROGRAM

CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

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10:00 A.M.

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P R O C E E D I N G S

JUNE 12, 2014 10:00 A.M.

MS. RAITT: All right good morning. Good morning and welcome to today's IEPR workshop on Measuring the Success of Alternative and Renewable Fuel and Vehicle Technology Program. This workshop is part of the 2014 IEPR update.

I'm Heather Raitt. I manage the IEPR unit.

I'll begin by going over the usual housekeeping items. Restrooms are in the atrium. A snack room is on the second floor at the top of the atrium stairs, under the white awning.

In the event of an emergency and we need to evacuate the building, please follow staff to Roosevelt Park which is across the street, diagonal to the building, and wait there until we're told it's safe to return.

Today's workshop is being broadcast through our WebEx conferencing system and parties should be aware that you're being recorded.

We'll place the audio recording on the Energy Commission's website in about -- well, in a few days. And a written transcript will be posted in about three weeks.

I'll briefly go over the agenda. This morning

we have opening comments from Commissioner Scott and then a series of presentations before breaking for lunch at about noon, for one hour.

We'll return after the lunch break for more presentations and discussion. And at the end of the discussion there will be an opportunity for public comments and questions.

We're asking parties to limit their comments to three minutes during the public comment period. We'll take comments first from people in the room, then WebEx, and then phone-in-only participants.

For those in the room who would like to make comments, please fill out a blue card and give it to me. When it's your turn to speak, please come to the center podium and speak into the microphone. And it's helpful if you give a business card to our court reporter.

For WebEx participants, you can use the chat function to tell our WebEx coordinator that you'd like to ask a question or make a comment during the public comment period. And we'll let you relay your question or open your line at the appropriate time.

Phone-in-only participants, we'll open all lines after we've taken the WebEx comments.

Materials for this meeting are available on the website and hard copies are on the table at the entrance

to this meeting room.

We do encourage written comments and they are due by the close of business on June 26th.

The process for submitting comments is posted on the notice which, again, is on the website.

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

COMMISSIONER SCOTT: Thank you very much, Heather.

Good morning everyone and welcome. This is our Integrated Energy Policy Report Workshop on Measuring the Success of the Alternative and Renewable Fuel and Vehicle Technology Program.

There are many metrics that we already use to measure the benefits of the program and I think that there are many more that we could potentially use to measure the benefits of this program. And today's workshops will highlight and discuss both.

The Legislature has given us a set of measures in both AB 118 and AB 8, and you will hear a little bit more about those today.

The Legislature has also called upon the Energy Commission to use a portfolio approach in our investments. For example, not putting all of our eggs in one basket.

And at the first IEPR workshop back in March we heard from Professor Joan Ogden of UC Davis and Dr. Barry Wallerstein of the South Coast Air Quality Management District, and others, and they emphasized for us the value of a portfolio approach.

Another criteria is the benefit cost analysis which measures the number of greenhouse gas pollution reduced per dollar spent.

Charles Smith and Jim McKinney will spend some time discussing that with you today.

Additionally, the Legislature has also encouraged us to invest in projects that have the potential to be transformative.

And Dr. Mark Melaina from the National Renewable Energy Lab will dedicate a portion of his presentation in explaining one way to measure the market transformation.

And let us not forget about the important workforce training component of the Alternative and Renewable Fuel and Vehicle Technology Program.

This helps ensure that the dedicated folks who are working on today’s transportation technologies will also be able to take the courses that will allow them to work on the advanced, cleaner technologies that the Alternative and Renewable Fuel and Vehicle Technology

Program also helps to fund.

Peter Cooper from the California Employment Training Panel will tell us more about exactly how that works.

We will then spend the afternoon hearing about some of the metrics and measures that other agencies use, and engage in a robust discussion facilitated by Anthony Eggert, the Executive Director of UC Davis's Policy Institute for Energy, Environment and the Economy.

Before we turn to Jim McKinney and Charles Smith to get us going, I wanted to share with you some of the numbers that we released in our latest investment plan because, to me, this is a measure right here of some of the success of the program.

We have -- and some of these numbers are slightly out of date because this is from April and we have done additional projects since April.

But we've got almost 7,800 electric vehicle charging points. We've done ten plug-in vehicle readiness planning grants. And that helps regions all around the State be ready for the battery-electric vehicles.

We have done 21 new or upgraded hydrogen fueling stations. And again, this was before our notice of

proposed awards on the latest hydrogen.

We have done 35 projects to expand the production of low-carbon biofuels within the State.

We've issued more than 1,000 incentives for natural gas vehicles.

And 62 fueling stations for compressed or liquefied natural gas.

We have funded 30 projects to demonstrate advanced technologies in medium and heavy duty trucks, 18 manufacturing projects and last, but certainly not least, 39 workforce training agreements.

So, I just wanted to give you some of the numbers of what the program has done to date.

I know that some of you have been asking the Energy Commission to convene a conversation like this for some time now, and I hope you are looking forward to today's workshop just as much as I am.

So, I'd like to turn it over to Jim McKinney and Charles Smith and they'll get us going.

Oh, I'm sorry I also wanted to acknowledge that I have with me here, on the dais, my terrific advisors, Lezlie Kimura-Zeto and Jim Bartridge.

MR. SMITH: Thank you, Commissioner Scott and good morning everyone. I'm Charles Smith with the California Energy Commission's Emerging Fuels and

Technologies Office, in the Fuels and Transportation Division.

Today I'll be giving a quick overview of Assembly Bill 8's new benefit cost provision for the Alternative and Renewable Fuel and Vehicle Technology Program, and how we utilize and assess benefit costs.

Assembly Bill 8, or AB 8, passed by the Legislature and signed by Governor Brown in September 2013, made several important contributions to our program.

Among others, it extended our program's funding to January 1st, 2024. It maintained the primary purpose of our program, as described here, and it also added a benefit-cost score provision to our statutes.

So, AB 8 defined benefit-cost score as a project's expected or potential greenhouse gas emissions reduction per dollar awarded by the Commission to the project.

The benefit-cost score gets implemented in two other sections of statute. Section 44271 already required us to establish a competitive process for the allocation of funds for projects. And AB 8 requires us to consider benefit-cost scores among other factors in this process.

In the next section of statute, AB 8 specifies

that in addition to previously established preferences, we give additional preference to funding projects with higher benefit-cost scores.

This slide lists all of the preferences in selecting a project that are established in our program's statutes.

I won't recite all of them, but I would point out some of the more prominent ones, maybe including consistency with State climate change policies, lifecycle greenhouse gas emission reductions, reducing criteria air pollutants, match funds, economic benefits, technology advancement.

And so, to these existing criteria AB 8 added a project's benefit-cost score.

So, where in our program's implementation do we apply these preferences? Well, this slide shows our general process for implementing the program.

From the top we start by developing funding allocations in the annual investment plan update. Based on those funding allocations we develop competitive solicitations in which we receive and score applications for funding within specific project types.

And so, this is where our project preference criteria come into play, including the ABH GHG benefit-cost score criteria.

Based on “WRENCH” (phonetic) scores we develop and executive agreements with successful applicants until we run out of available funding in that area.

We also have interagency agreements, off to the right there, with sister agencies, such as our workforce training agreements with the State’s Employment Training Panel and Employment Development Division, as well as our fuels and standards development agreement with the Division of Measurement Standards.

All of these agreements get managed by Energy Commission staff and we periodically collect data from funding recipients.

Based on information from all parts of this process, we subsequently develop our biennial benefits report for the program.

And Jim McKinney and Marc Melaina will be talking about the benefits report in the next presentations.

The table that’s split over the next two slides shows we are incorporating benefit-cost scores and cost efficiency into our scoring criteria.

These five solicitations were all released after the passage of Assembly Bill 8 last September. Each one included scoring elements relevant to a project’s benefit cost and cost efficiency, which were part of one

or more scoring criteria.

The table also shows the weight assigned to those criteria in the right most column.

For example, our Federal cost-sharing solicitation included two relevant scoring elements. The first scores an applicant based on their cost-effective and efficient use of State match share funds.

And the second scores them on the degree to which the project reduces GHG emission for each dollar the Energy Commission funds or for each dollar of Energy Commission funds requested.

Both of these elements are included as part of the cost-effectiveness match share criteria which represented 25 out of 100 total possible points.

Similar scoring elements were used in our recent hydrogen fueling infrastructure solicitation as well. In this case, the two elements were part of two different scoring criteria which respectively represented 40 and 20 out of 380 total possible points.

Incidentally, in this solicitation we noticed a renewed effort by our applicants to seek less program funding. And so we originally expected to fund the development of 21 to 23 new stations, but we were ultimately able to offer funding for 28 new stations, plus a mobile refueling system, so good news on that

front.

Our recent solicitations for charging infrastructure and biofuel production also included GHG emission reductions for program dollar as key scoring elements in the project budget criteria.

Those criteria represented about 10 percent and 13 percent, respectively, of the total possible points.

Most applications from the biofuel production solicitation are still under review.

Within the charging infrastructure solicitation we provided funding for more than 800 new charging stations -- or new charging points, I should say, including 53 fast chargers in support of the State’s ZEV action plan.

And finally, for natural gas vehicle incentives we had to approach this issue a little bit differently. Since these incentives are issued on a first come/first served basis there are no scoring criteria.

But when preparing the solicitation we adjusted the incentive amounts for each weight class to aim for a more consistent benefit cost ratio.

Based on the successful applications we’ve received during these and previous solicitations, as well as information from other sources, we can develop estimates of benefit-cost ratios for multiple project

types.

The benefits in terms of direct GHG emission reductions are calculated using the volume of conventional fuel displaced and the carbon intensity of the new alternative fuel.

For simplicity, each project type in this exercise was assumed to produce a consistent level of benefits over a span of ten years. We then divide the total GHG emission reductions by the amount of program funding provided to the project in millions of program dollars. And this gives us a benefit-cost ratio.

Using data from applicants and other sources, we constructed a low case and high case for each project type for this exercise.

The low case represents a lower benefit/higher cost project, while the high case represents a higher benefit/lower cost project.

And in the next few slides I have four examples of our method for estimating this range of benefit costs.

We start with the simplest examples which are commercial-scale, diesel substitute production projects. Notice the cells in yellow. These are the key input cells which generate the values in the white and green cells.

The second row in this table, ARFVTP share, is the amount of funding our program provided to the project. You'll notice the difference between low case and high case, $5 million versus $2.6 million. Again, this refers to the difference between lower benefit/higher cost projects in the low case, and higher benefit/lower cost projects in the high case.

The next row represents the amount of fuel produced in diesel gallon equivalent, or DGE per year.

In the fourth row, since we are already estimating fuel production in DGE, we can assume that each diesel substitute, DGE, displaces one gallon of conventional diesel fuel.

The next row is the carbon intensity of the alternative fuel. We used an approximate value of 30 grams carbon dioxide equivalent per megajoule in the low case versus 15 grams per megajoule in the high case.

These estimates are based on stated applicant pathways in combinations with established low carbon fuel standard or LCFS carbon intensity data.

Using the amount of alternative fuel and the carbon intensity of that alternative fuel we can calculate the amount of GHG emissions reduced per year in metric tons by the project.

Multiplying that by 10 gives you the expected

emission reductions over a ten-year period. Divide that by the amount of millions provided by our program funding and you get the end result in the green cells, a range of tons of GHG emissions reduced per million program dollars.

The next example looks at workplace, electric vehicle supply equipment or EVSE, also known as charging infrastructure

Again, we start off with our program costs, ranging from $8,000 per level two charging point in the low case to $3,000 in the high case.

To determine the amount of conventional fuel displaced we estimate the amount of electricity charged per workday and the number of workdays per year.

This all translates into about 1,750 kilowatt hours per year in the low case or about 178 gasoline gallons equivalent displaced per year in the low case.

For the high case it’s about 509 GGE per year.

The carbon intensity of electricity, based on the LCFS data, might be 36.5 grams per megajoule to 30.8 grams per megajoule depending on the particular pathway you use.

Using the amount of alternative fuel per year and the carbon intensity of that fuel relative to gasoline, we can again estimate GHG emissions reduced

per year.

Multiplying this over a ten-year span and dividing this by the cost of the project in millions to us gives our benefit-cost ratio in terms of direct GHG emissions reduced per million program dollars.

The third example is for our heavy-duty truck incentives. Here, since we've prescribed the incentive amounts there's no difference in program cost between the low case and the high case.

But what does change are the assumptions about the displaced vehicle.

In the low case we assume a displaced truck that would consume about 2,100 diesel gallons equivalent per year.

In the high case we assume a displaced truck that would consume about 12 and a half thousand DGE.

After accounting for a small average reduction in natural gas engine efficiency and the approximate carbon intensity of California CNG, it's pretty easy to calculate the GHG emissions reduced over a ten-year span and the resulting benefit-cost ratio for this project type.

The last example, hydrogen fueling infrastructure, is probably the most complex though it still relies on the same basic approach as the three

previous ones.

We calculate the amount of conventional fuel displaced by hydrogen per year using the station's daily fueling capacity in kilograms, the approximate miles per gallon of fuel cell vehicles, and the approximate miles per gallon of a displaced conventional vehicle.

This gives us the annual DGE displaced estimates in the seventh row.

From there we approximate a range of hydrogen carbon intensities based on the pathways submitted by our applicants and the establish low-carbon fuel standard carbon intensity numbers.

Once we have the amount of conventional fuel displaced per year and the carbon intensity of the alternative fuel we can once again estimate the amount of direct GHG emissions reduced over a ten-year span per million of program dollars.

So, in developing these benefit-cost ranges we noticed a few key points worth mentioning.

First and foremost there is a very large range of potential GHG emission reductions per program dollar for each project.

Even within each project type not all projects have an identical scope.

We also found that this direct approach toward

GHG emission reductions per program dollar left a few very important issues unaddressed. Calculating direct GHG emissions from the hardware we've funded doesn't get to these projects' contribution toward market transformation goals.

Our support, for example, for an initial network of hydrogen stations is critical to enabling the broader market introduction of fuel cell vehicles and has value beyond the immediate throughput of those stations.

Our early investment into multi-unit dwelling charging infrastructure can help improve the business case and technological feasibility of this activity for future private investment.

Similarly, our advanced technology truck demonstration projects and pre-commercial biofuel production projects will help advance vehicle and fuel production technologies even if the amount of direct GHG emission reductions by those particular projects is initially small.

We also noticed that the project types with the highest benefit-cost ratios tended to represent commercially and technologically mature fuel pathways.

This was expected as they need to invest fewer resources into technological development, demonstration and scaling.

And while these technologies are likely to make key contributions to the State's imminent 2020 climate goals, we don't expect them to be sufficient on their own to meeting the much more ambitious goal of 80 percent GHG emission reduction.

It's also worth pointing out the significant potential for changes to these benefit cost ratios, even with just minor adjustments to the assumptions, the things that were in the yellow cells, this approach also doesn't address the bigger question of attribution. Namely, what share of a project's benefits can be, quote/unquote, claimed by our program.

And, finally, an emphasis on direct GHG emission reductions has a risk of under-valuing other project types, including regional PEV readiness agreements, fuel standards agreements, workforce training agreements and other activities that don't directly lead to GHG emission reductions.

So what does it all mean? First and foremost we continue to use benefit-cost scores as an element of our scoring criteria when reviewing proposals.

Based on the benefit-cost ranges that we can observe, we can possibly use these ranges as benchmarks when developing solicitations and/or considering proposals in the future.

Third, we learn that benefit-cost ratios are most useful and most applicable when comparing similar project types and when a fuel or technology is both commercially and technologically mature.

And, finally, part of why we're grateful for all of your participation here today, we're interested in your perspectives on how we can improve both the calculation and use of benefit-cost scores, as well as any other measurements of program success.

So, thank you.

COMMISSIONER SCOTT: Thank you very much, Charles. That was an excellent presentation and a terrific way, I think, to set the stage for today's discussion.

I appreciate that you spent a few minutes talking about how the Energy Commission already is incorporating some of the different criteria throughout our program. And so the examples, I thought, that you had on slide six and seven were really terrific.

And I also wanted to just say how much I appreciate sort of the thought and care that you've put into in thinking about how it is that we might calculate the potential greenhouse gas emissions reductions per dollar awarded.

So this was, I just think, a terrific frame for

today's discussion. Thanks for putting that together.

I think Jim McKinney's next up.

MR. MC KINNEY: So good morning everybody and welcome to our workshop today.

So, I think I know most of the people in the room here. So, I'm the Program Manager for ARFVTP.

And my task this morning is to start to introduce the benefits reporting work that we do here with the Commission and with the National Renewable Energy Laboratory, and also give you the most current numbers on our program status.

So I think you've all seen this language before. These are the key parts of the statute, AB 118 back in 2007, and most recently with the AB 8 reauthorization from last year.

And I've highlighted a key word here, a key verb. So, to transform California's transportation market into a diverse collection of all fuels and technologies, and that's repeated below.

And I really want to start to draw your attention this morning to the market transformation part of the work that Dr. Melaina and his team at NREL have calculated.

In my mind, that's really kind of the ultimate mission for this program.

Calculating expected benefits is relatively straight forward. Charles did a nice job of walking us through that.

But I think, as we're learning from ARB's kind of over-success with the Clean Vehicle Rebate Project, we can't buy our way to these really steep reductions and climate change emissions from the transportation sector.

So we're seeing that, again as I said, with the light-duty electric vehicle sector. That's a tremendous success story. But that also means they're going to have to recalibrate how they administer some of these funds.

So as I think about it, again with the purpose of our program, really the Legislature asked us to step in and hedge risk.

And what does that mean? That means offering up government capital as an incentive until the private capital markets are ready to start making the substantial investments that we need to transform the transportation sector in California and start to really chip away at these just tremendous goals; 30 percent reduction in GHGs by 2020, and the 80 percent reduction target in 2050.

So, again, there's a broad range of policy

drivers that help drive our program investments. And, really, the core one for us is GHG reductions, stemming from AB 32 and then picked up in the original AB 118 statute.

And again, as a reminder, this is a shared program with our colleagues at the Air Resources Board. Our primary goal is carbon emission reductions and theirs is air quality improvement. And that plays out in some important different ways as we go through here.

Petroleum reduction, biofuels production, low-carbon fuel standard, again, we're pretty familiar with these.

The one metric that I saw at the workshop that Mike Waugh was helping to host with the LCFC Advisory Board meeting several weeks ago was the first time I'd seen this 10 percent figure quantified.

So, the figure I remember and, correct me if I'm wrong, Mike, 15 million metric tons by 2020.

So, that's really helpful and I think that helps create a context, again, for the work that Dr. Melaina will present.

So these are the current numbers, so I'm going to expand a bit on Commissioner Scott's introduction. And the numbers are going up.

So, we are nearly at the half-billion dollar

mark in program investment. So, what these figures represent is the current state of our NOPAs, or Notice of Proposed Awards.

So as you can see, some of the percentages for our investments are starting to change pretty significantly from the last few years.

So, biofuel has got kind of a lesser amount of the total project funding these days.

Electric drive has always been about at one-third and that’s staying the course. And we’re now at $150 million. So, that includes all of our EVSE investments and then our substantial investments in the ZEV truck technologies, which are quite expensive.

Natural gas and propane, we had a very important series of awards on the truck side, and I’ll talk more about that a little later.

And then hydrogen has really -- that’s been about 9, 10 percent, historically, now it’s at 20 percent. And that reflects the $46 million Notice of Proposed Award that we did in April.

Market and program development, and workforce development continue to grow at kind of lesser levels and they’re at about five percent each, respectively so again, coming up on a half-a-billion dollars in total investments with our program.

What else did I want to say here? Yeah, one other thing to look at is our ZEV technology investments. So, if you combine electric drive and hydrogen that's 50 percent of our program investments are now in zero emission vehicle technology categories, so I think that's an interesting stat.

One thing to note here, too, again these are the most recent figures, so these numbers are going to be higher than what Dr. Melaina is going to present. So, don't get too concerned if you see different sets of numbers.

So, Dr. Melaina's team analyzed what was available through March 31st, 2014, plus the hydrogen award. We felt that was very important to get into the analysis.

But some of the other things, where we've had big awards, aren't going to be reflected in the NREL numbers.

So here's another way of looking at it, so you can see biofuels was about $90 million cumulatively.

Fueling infrastructure has gone up quite a bit and you can see, again, that kind of relative proportion between EVSE, which is the green part of the second bar, and blue which is hydrogen, and the purple there are natural gas investments.

On the vehicle side, as well, electric vehicles are about half our total investments there.

And then the natural gas truck program, again, is really starting to accelerate so that represents about half of those.

Manufacturing, that’s all in or nearly all in the zero emission vehicle category, primarily with trucks, although we did -- there was the grant with Tesla, as well.

And then workforce development and program support you can see in the other category.

So, just to dig a little deeper and I’ve just got a couple of slides here. So, electric vehicle support, so on the charger side, so we’re now at $38 million in total investments, and we’re up to 8,600 charges.

So, about 3,900 in the commercial sphere, 3,800 in the residential sphere, 756 in the workplace area, and DC fast charging we’re now at about 107.

Our total support to CVRP is approaching $50 million and that -- I know those numbers ramp up really quickly so I may be a little out of date. But not too long ago 21,000 vouchers was about one-third of the vouchers they’ve disseminated there.

And again, that’s just a tremendously important

part of the government's efforts to promote this market.

Our regional readiness planning grants, Leslie Baroody, our team lead for electric vehicles did a nice job of walking through that with our workshop last week, where Dr. Melaina presented the other big task he's had for us over the past few years.

So, hydrogen fueling stations, total funding is $90 million, so we're coming up close on $100 million for this.

So, for new stations about $72 million in investments, three station upgrades for that -- did I say that correctly? It's 45 new stations I'm sorry, $72 million, three station upgrades.

And our new Operations and Maintenance and Grant Program, which I think is going to be really important as we get these stations built and as we wait for the vehicles to come in.

And I slipped in a slide of the Hyundai Tucson fuel cell vehicle. And Commissioner Scott, I think, went down and helped welcome the first kind of family owner of a commercially available fuel cell vehicle in California. So, that was a really nice event, and good photographs, and it was really nice to see that happy family with a car key to a car like this.

We're going to get a mobile re-fueler. And then

you can see our other hydrogen support activities, as well.

On the truck side, this continues to represent about one-third of our total investments.

So, the natural gas truck side, so these numbers are quite a bit higher than what you reported, Commissioner.

So, Andre Freeman, who runs this part of our program, was kind enough to get us the current numbers. So, we're now approaching $50 million in our natural gas truck vouchers, about 2,300 trucks. If you add in the propane, that's about 3,000 trucks we've been able to put on the road here in California.

You know, it's a somewhat modest reduction on the carbon side, but it is full petroleum reduction.

And this is one of those things that I want you to pay attention to when Mark Melaina goes through his numbers. The natural gas numbers were a bit of a surprise to me when I first saw them.

And then, also, advanced technology truck demonstration and manufacturing, so we're up $70 million there, 36 projects and, again, I want to flag that for you as Dr. Melaina goes through his presentation. Because the results from these investments really figure -- they predominate in kind of the long-term

benefits from our program.

And in the biofuels side, so we're at $91 million total, about 33 projects so far.

And on the renewable diesel, the biodiesel side this represents two of our more recent awards. One is to Crimson Renewable Fuels. The other is to Community Fuels in Stockton.

So, this is good, we're starting to see some big numbers in the millions of gallons per year in commercial production capacity. And we're very pleased with these investments because they're very low carbon. And I know the renewable fuels operation is all waste-based feedstocks with that.

So, turning now to the statutory direction under AB 109 to do our benefits reporting work. So each two years in the normal IEPR cycle we're to report on several things, so one is a list of the funded projects. That's kind of a detailed accounting exercise and any expected benefits so again, petroleum reduction, GHG reduction and then criteria emissions reductions.

In some ways this is really a big part of my work here at the Energy Commission and this is the part that's the most fun to me, and I think these long-term projections for carbon reduction in one way may be the ultimate metric of our program because that's really the

policy basis for it.

What else did I want to say here? There are a couple of other things that we've added, so public health benefits and then job creation and workforce, and Peter Cooper will speak to those later.

So, just so you know where we are, so in the 2013 Integrated Energy Policy Report we did report on those figures.

So, this was the first time EPA Region 9 had kind of run their public health calculator and we identified 380 tons per year of NOx emissions from our program investments. And that tied out to about $3 million per year in annual public health benefit.

So that's improved -- I'm not good at this stuff -- reduced incidences of asthma and other respiratory diseases. So again, that kind of tallied up to $3 million.

And on the job side, so we calculated this in 2013, but we haven't done it yet for 2014, so the numbers we have are about 6,300 jobs created. And we will tally those up later in 2014 for the IEPR cycle.

So, in 2011 we did the first benefits report, so that was Charles Smith, Andre Freeman and myself, and some other staff that helped pull together the numbers.

And the really challenging part with this, and

Charles alluded to this in his introduction, is attribution.

So, for example we've got some really important grants out on battery chemistry with some battery development companies. And at some point -- and we know this is a critical factor, you know, power density cost is a critical factor for making EVs more affordable.

But if we look out, you know, in 10 years or 15 years, and perhaps there have been some important breakthroughs and some good payoffs, but that's really, really hard to measure back, you know, from this initial investment to some level of deployment, some incremental difference in the cost for those units.

So, we kind of did the best we could, but Dr. Melaina and his team have really formalized that quite a bit more with the analytic capacity that they brought in with the 2013 report.

So, more formal methods for expected benefits and, again, market growth.

And we also extended our analysis period to 2025. And you can see how kind of the number of projects we analyze each cycle goes up. So in 2011 it was 86 projects, in 2013 147, and in this one I forgot to write that number down, but I think Marc will catch it for the number of projects we're analyzing here.

So, kind of going back to the theme of the workshop that Commissioner Scott laid out, you know, how do we measure and communicate these market transformation benefits from our investments?

And again, expected benefits are really pretty easy to calculate, but that's always going to be kind of a short-term payoff for this and it's not going to get into the longer-term market transformation.

That's the challenging work. And again, we really appreciate the advanced analytics that Dr. Melaina's team brings to bear on this.

But just to go back to some of the points I was making initially, the goal of this program is to transform markets. And again, we can't buy our way to compliance.

And when I think of market transformation and all those synergies, a big part of that is attracting private capital, making it more likely that end-users are going to buy these fleets and private capital is going to invest in these technologies.

So, some of the examples that always stick in my mind, so Electric Vehicles International, down in Stockton, they talk many times of how our initial grants were really seed money. They kind of put a little stamp of approval on their technologies and their plants which

in turn helped attract private capital. And that's both on the investment side and then private orders for additional trucks than we had originally funded.

The same with Mike Simon at Transpower who's, you know, developing Class A, all-electric tractors for drayage operations down in the ports. The same kind of thing, the initial grant money was seed money, a little stamp of approval, demonstrated the viability of his engineering team and technology. And that's kind of escalated over the years and he's now attracting more private capital and, hopefully, will get some orders for commercial trucks.

And I think the first element award for the hydrogen sector, that Charles alluded to, is also a really good example of that.

The first element was able to be so successful because they brought in private money. So, for the very first time an OEM in North America is investing in hydrogen infrastructure. So, that reduced the unit costs for their station, so they were able to under-bid their competitors quite a bit.

We got more stations out of this. We got a better kind of cost-effective score.

But again, kind of through these seed investments that we're doing private capital is starting

to flow into the hydrogen fueling infrastructure side.

So with that, I would like to introduce Dr. Melaina.

So, Dr. Melaina is a Senior Engineer at the U.S. Department of Energy's National Renewable Energy Laboratory.

And his research addresses early market transitions for alternative fuels, with a focus on scenario development, market barriers, and hydrogen infrastructure.

Before joining NREL in 2007, Dr. Melaina was Research Track Director at the Institute for Transportation Studies at the University of California at Davis.

Dr. Melaina received his doctorate from the School of Natural Resources and Environment and an MSC in civil engineering from the University of Michigan. And he has a BA in physics from the University of Utah. So, welcome Marc.

MR. MELAINA: All right, thank you, Jim. I'm going to go through these slides. They're fairly high level and, hopefully, we'll have time for questions to follow up.

So, again, my name is Marc Melaina. I work at the National Renewable Energy Laboratory.

I have a couple of just introductory slides. If people are not familiar with NREL, we are owned by U.S. Department of Energy. We're operated by the Alliance for Sustainable Energy based in Golden, Colorado.

And of the U.S. energy labs, we are one of the labs -- we are the lab that focuses on energy efficiency, renewable energy.

Other laboratories work in that space, as well, but we focus in that area.

Within the energy efficiency/renewable energy we look across all the different sectors, buildings, electricity, transportation, and we look -- including R&D, bench, laboratory scale, we do work through to systems integration and market deployment.

So, I'm going to go through, pretty well, the categories that we have in the document, the report in terms of the types of benefits that we've estimated and really touch on the results, and some of the conceptual framework of how we've set up these calculations.

So, these are some of the numbers that Jim was getting into. At the top here, we already talked about the different metrics. Greenhouse gas emissions, petroleum use reductions are a major focus, as well as criteria emissions, tailpipe emissions in particular.

For the analysis that I'm presenting, we have

estimated benefits for 207 projects, with total funding of $426.1 million, and this is since 2009.

So, this is a subset of the total projects funded, which is 274, out of $487.8 million. And again, that's through the end of March this year.

So, this is the layout we have for talking about four different types of benefits in the report. Baseline benefits are benefits that we would expect to have occur from these different technologies if there was no intervention by a government agency in the market. The technologies would compete on their own in the market, which some of them are already doing, and we would -- benefits would accrue without any intervention.

Expected benefits we've already talked about. This is -- I liked the term Charles used about hardware on the ground. We know what we're putting in the ground, we know how it's supposed to work, we know how to estimate the effectiveness of that hardware.

Market transformation benefits, as we just heard, are trickier and so I'm going to talk through some of the particular market transformation influences and benefits that we tried to tackle in this report. It's a subset of the total possible market transformation benefits.

But as Jim said, it's a really key one in terms

of understanding how program funds are going to be leveraged as markets take off over time.

And the fourth one here is really to put us in perspective and this is the required carbon reduction benefits if we stay in compliance with our long-term goals out to 2050.

So, we have a trajectory there to place these other three in perspective.

So, just a visual on that, along the bottom here we have baseline benefits. This is a cartoon. These are not based on real numbers.

Expected benefits, putting hardware in the ground over time, the vehicles get driven a little bit less, eventually some of the hardware gets shut down, and these expected benefits would trail off, but the program provides the impetus to put this equipment in the ground, initially.

At the same time there’s an influence on the market. And here, this is shown as an influence, not a benefit.

We want this market transformation influence to happen early on as we put this equipment in and also as we support policy development, consumer awareness. Those are other types of influences that over time will accrue with benefits closing the gap between these

declining expected benefits and the required reductions that we need over time to meet long-term goals.

So, this market transformation influence would result in accrued benefits that would close the gap between these two.

So, those are the same four I just talked about on the previous slide.

So, let me talk about the expected benefits. We already talked about this a little bit, but just to say a little bit more about where the numbers came from and how we crunched the numbers on the different projects.

These are all based upon information about successful completion of all the funded projects. If a vehicle is funded and deployed, it is fully utilized, the same with production facilities.

And we assume that a mid-size car that is deployed displaces another mid-size car that was going to be in the market, so one-to-one displacement. So, that’s an important assumption.

This is really based upon project-level, proposal-level information that Energy Commission staff has collected, and we’ve vetted, and tried to place into consistent sort of harmonized, you might say, framework to calculate these different benefits.

So, this is really bottom-up data collection and

analysis.

So, as we heard earlier, these are fairly straight forward. We understand the different numbers that need to go into these calculations very well.

Vehicle miles traveled, again this ties us back to that one-to-one replacement of the service provided by the technology.

The same vehicle miles traveled that would have happened with that conventional car. Those vehicle miles are now occurring because we have a new technology that's been deployed.

Average fuel economy, fuel production capacity, these are basic numbers that you would put in for an energy balance calculation, and then fuel carbon intensity values are based upon the Low Carbon Fuel Standard look-up tables.

In some cases we have a little bit better information than that for some of the projects. Or not better, I should say new information.

This is one of the key tables in the report and this walks through the different project categories. There's two slides here.

It goes to the categories of fuel class, or subclass, the total awards in these two columns here. And then of those which ones were evaluated for the

benefits analysis.

And then in the far right, these two columns show whether we have included these under the expected benefits category and if we have included them in the market transformation category.

Some are in both, some are only in one or the other.

So, this is a high level summary of how we calculated benefits for each of these different project categories and subclasses.

So, along the top here we have fuel delivery infrastructure, then we have the different vehicle awards.

And then on the next slide we have fuel production. And then several of the awards that Jim mentioned we don’t really have metrics that we can build upon to try and estimate benefits because these are pretty far removed from direct hardware in the ground.

So, this is a high level graphic of the results of the expected benefits calculations for greenhouse gas reductions based upon that previous slide.

So, let me just go back and make sure people are connecting the dots here. This is the expected column here. If we summed these all up by each of these categories, fuel delivery, vehicles and fuel production,

for each category that has a checkbox there we get this annual reduction in greenhouse gases over time, out to 2025, the analysis period.

You can see they're color-coded. So, green is vehicles, blue is fuel infrastructure, red is fuel production.

You see these ramping up over time as projects are put in place and the hardware or vehicles are deployed.

And then at this point, when they've ramped up over the analysis period, we have a pie chart here that shows what fraction of this wedge goes to which category.

So, you can see here on the vehicle side the manufacturing category is really the dominant category for this wedge of reductions.

On blue here we have a similar pie chart, where we have the natural renewable gas category being the largest contributor, the other ones being important but smaller in overall magnitude.

And then for the bottom one, here we see diesel substitutes providing the majority of the greenhouse gas reductions.

If you wanted to make this more complicated, you could show all of these as trends over time, but that

would be hard to discern all those different patterns.

This really captures the major results here on the right.

This is slightly different than the petroleum fuel reductions because there are different carbon intensities and efficiencies associated with these different projects.

So, the next slide is the same set of analysis, but looking at the petroleum fuel reductions.

So, a little bit different. Some changes, I think especially in fuel reduction between the two. And again, this is based upon the carbon intensities versus the fuel use calculations.

So, these are two key rollup slides that summarize the overall results of our expected benefits calculations.

The next slide just shows a table that draws some numbers for people who prefer to look at numbers, rather than graphs, that represent those same figures.

These three categories here were the three colors on the previous two slides. This is greenhouse gas reductions. This is petroleum fuel reductions. And then we have the total for all expected benefits here.

The next few slides I'm going to talk about the market transformation benefits.

An important distinction here is that for the expected benefits we've really taken what we think is a central value, best estimate of those benefits.

Where in market transformation we know that the influences that we're trying to estimate are much more uncertain so we have a high and low range of what that influence might translate into in terms of greenhouse gas, petroleum reductions.

So, this is a range here. We discuss these as being additive or you would have your expected and then you would have additional benefits for market transformation.

But in a lot of ways they are qualitatively different because they're different types of influences, different types of benefits in a qualitative way.

And then for reference, and I have a graph on this towards the end, require carbon market reductions. This is the trajectory we would need to be on to move towards the 2050 greenhouse gas reduction goal.

And this is really based upon the Air Resources Board Vision Study from a couple of years ago and one of their scenarios of compliance for carbon reductions.

So let me move into the market transformation methods and results.

This slide summarizes the major -- well, the key

influences that we felt we could estimate with a reasonable degree of certainty and theoretical cohesiveness.

There are other market transformation influences that we know exist, people have written about them, but they're very hard to quantify.

So, the one that comes to mind for me is information barriers between consumers and understanding the product. We know that's a real barrier for market transformation but it's very difficult to quantify.

So there's a little bit of that in here, but we didn't try and tackle that type of transformation barrier.

What we did try and tackle are these first two bullets here under vehicle price reductions. So, vehicle price means when a consumer is considering purchasing a vehicle they look at the price of the vehicle, and they evaluate their value of the vehicle versus the price, and try to determine whether or not they want to buy the vehicle.

If there are a greater number of electric charging stations, public stations, or there are, say, rebates for home chargers, workplace charging stations a consumer will see that vehicle as being more valuable and it changes how they interpret that price signal.

So, that's what we're talking about for that category.

Similarly, for fuel cell electric vehicle and hydrogen stations, if there are no hydrogen stations out there, the sticker price of the vehicle doesn't really matter because the consumer cannot possibly value that vehicle.

As more and more stations are deployed, they interpret that price of the vehicle a little bit differently because the value of the vehicle's increased by greater fueling availability being available.

So, both of those are similar. We tried to estimate them a little bit differently, but it's a similar type influence of vehicle price on consumer decisions.

Another influence is a more direct rebate being applied that also influences vehicle price. This is not quite as complicated, conceptually, as the first two, but there are some interesting things there about how a rebate might not be quite the same as a direct change from the automaker of the MSRP of a vehicle.

Okay, let me just check, am I moving through these quickly enough?

So, these vehicle price reduction influences on the market, on consumers in particular, are distinct from what we've categorized as vehicle cost reductions.

So, this is an influence on the manufacturer or the producer of the vehicle and making their production process more efficient, more cost-effective, moving down the learning curve effectively so that they can produce vehicles at a lower cost which we then assume would translate into a lower price for the consumer. But we do -- we call it vehicle cost because that's really what we're trying to influence.

So, direct investments in production processes. The way we've analyzed it is through increased experience by moving manufacturers down the learning curve.

This is a pretty standard analytic framework, but what we're trying to do is match sort of this high-level view of accumulative experience curve with this bottom-up information we have on specific projects.

Thirdly, we have a category of what we call next generation technologies. If a particular project is deployed and we know it's one of the first generations, it's not quite commercially mature if it's deployed successfully the project is successfully displayed to the market. Investors see the results. Other companies see what happens. Successful completion of that project makes it more likely that the next generation of the same technology will be scaled up and deployed at

commercial scale or near commercial scale.

So, that's what this category does. And we do this both for biofuel production and for the medium and heavy duty truck next generation category for those truck projects.

So, that slide really summarizes the different types of market transformation influences we've tried to incorporate.

Just a couple visuals on things I just talked about. This is what I was referring to in terms of a learning curve.

These curves have been developed based upon retrospective observations of prices, production prices, and cumulative experience.

Just because that happened historically does not mean it's going to happen in the future. But we refer to some of the cost curves from National Academy's study that came out early last year, and we used that as a reference for the electric drive vehicles in terms of their -- the progress ratios, the key number there.

So, if you have a project that pushes the manufacturers down the learning curve, they can then sell their next set of vehicles at a lower price.

Down here we just have a responsiveness, sort of demand elasticity function for consumers, how they

interpret that vehicle price. It does depend on the consumer and the vehicle, the type of vehicle.

And so we've tried to set up those calculations consistently across the different vehicle types to show how consumers might respond to those price changes.

Okay, so this is a little bit more detailed than the previous chart that I showed where we're indicating the fuel technology categories and which of those three market transformation influences we're trying to estimate for each one.

So you can see the fuel price reduction, what that applies to, the vehicle cost reduction in manufacturing, and then the next generation calculations for electric commercial trucks and for the fuel production projects.

So, this is a table. I have a graph next, but this is a table that just summarizes the high and low results.

What we've tried to do here is to have the high results be more optimistic about what that influence might be on the market, future markets and future deployments.

And then the low is to say that the influence is not going to be as effective. There's a fairly broad range here. It's really tough to say that we've set up

that range consistently across all the different projects. We've done it on a technology project basis for each one to try and estimate that range.

ZEV industry experiences the production, function, and then the next generation trucks and next generation fuels are broken out here.

Let me just give an example here. Say the uncertainty in our calculations around the influence of hydrogen stations resulted in a broader high and low range than electric charging infrastructure. Just because of the way we tried to estimate that influence, we know less about it, and the numbers suggest that there's a greater uncertainty about what that influence might be.

So, the high and low ranges shown here are aggregates of the various different projects in each category.

So what that looks like, if you take my previous slides, just to remind people these here, if you take this total for the expected benefits, adding these three up, and you stack the market transformation benefits as being additive on top of those expected benefits, you would move from this expected benefits total.

If you took all those categories and their low ranges, you would move up to this dotted line. So, all

of these low rows here, if you added those up to this bottom sum you would move up to this dotted line.

If you took all the high values, you would move up here. And here, this is the greenhouse gas reductions million metric tons moving in expected to, say, I think it's 1.7, 1.6, you would move up to this range closer to 2.6, 4.2. The numbers are on the next graph.

So, hopefully, visually people can see how that's a high and low range if you did stack these, which is how we present them.

Building on that, we have tried to show, for a sake of reference, what the trajectory is to get on track to meet the long-term greenhouse gas reduction goal, and that is the market growth benefits category.

Ramping up over time each of these results in a higher level of benefits and this is the range that you would need to be if you wanted to be on that long-term trajectory to meet the 2050 greenhouse gas reduction goal, which is a major de-carbonization of the whole sector.

You could say that you could wait longer. This is a delayed result. But you can't really justify saying you can wait this much longer and still bring about the same change. It's possible, but much less

likely.

These are rough numbers that we took from the Air Resources Board Vision Study.

So, let me talk about those a little bit more. There is some debate about when is the right time to tackle carbon reductions. There's some economic views that we should wait until the technology is more mature and then try and force the technology.

Some views say that we need to support the technology development early on and then the benefits will be easier to achieve later on.

We've tried to capture that range here but, really, there is some uncertainty about how that's actually going to play out and what's the best way to do it.

Overall, when you go out to 2050, and I have a figure to show this, the total emission reductions you need to meet that goal are much larger than what we've achieved so far under the program, or under any of the programs in California to move the market.

So, I think that's an important perspective.

And as Jim mentioned, it really emphasizes this idea that government programs, alone, cannot move us all the way through to that 2050 goal. We really have to rely on market forces taking over and influencing the

market in smart ways, effective ways so that there's a snowball effect, rather than saying we're going to push this all the way to the end.

It's just not possible from a funding perspective.

So, this is the figure that I showed earlier about stacking our expected market transformation benefits. And then that was out to the 2025 time frame. And we already had the market growth benefits going off the scale here.

So, if we wanted to increase that scale from 7 million metric tons up to 100, and we wanted to extend the time frame out to 2050, the green trajectory here is basically de-carbonizing the whole transportation sector. Those are the emission reductions you would have to achieve.

And this is where we're at in terms of the half-a-billion dollars and our estimate of their both expected and market transformation benefits.

So, I think that's an important perspective in terms of what we've achieved so far and the degree to which we have to rely on market forces in the future to push a lot of this change.

So, this is my last slide, a few recommendations on how to improve the estimate methodology. Better

collection and integration of data on the technology-specific effectiveness metrics.

I think this is a little bit different than some of the benefit metrics discussion we're going to have later today.

This is about how effective is it to install more public charging, more hydrogen stations. This is an intermediary number or influence that you need to understand before you can then calculate the ultimate benefits of that investment.

So, I think understanding that influence is really important.

Evaluation metrics for projects, which I think we are going to talk about today, we want to incorporate those into this framework so that we have a lot of transparency and fidelity to the best data available.

And then at some point, what we believe we're moving towards is explicit modeling of competitive dynamics between both the incumbent technologies, these new technologies, and the new technologies as they work out in the marketplace in different sectors.

And then the important benefits from electric charging, hydrogen stations really should be incorporated into a larger vehicle choice modeling framework that takes into account all the different

attributes of the vehicle, and the consumers in terms of the market adoption rates for the different vehicles.

And that's all I have. I'm not sure if I have time for questions or not.

COMMISSIONER SCOTT: I think that you do, actually, and I had a few for you.

And then what I might ask our audience to do, is we've got about 15 or 20 minutes, we might not have that many questions, but then we need to turn over to give time to Peter Cooper to talk about workforce training.

But if you do have questions, I'd ask that you limit it to clarifications related to this presentation.

For the public comment, we should hold the public comment piece until the end, during the public comment portion.

But to the extent that you have questions about this study, I think we could take some of those.

But I have a couple, so I'm going to start. And I can't decide if I should work kind of where you left off or start back at the beginning.

And maybe what I'll do is start back at the beginning. So, back on slide three you mentioned that these -- the benefits that you're calculating are based on 207 awards of about $426 million since 2009.

So, the calculation is limited to -- not limited

to but, you know, it just captures a set of kind of where we are today, so it's a snapshot in time.

And so I think, like my executive summary version of what you said, and I'll state it, and then you can tell me if I stated it right, would be, you know, based on 207 projects awarded to date.

And then if you jump up to slide 10, it would be that have the checkmark in the expected benefits category, right, so you have a subset of the projects, where you can actually calculate the expected benefits.

And what you see on pages 12 and 13 are up to almost 1.75 million metric tons of greenhouse gas reductions from those investments.

And we also see on page 13 about, what do you think that is, 230, 240 petroleum fuel reduction measured in millions of gallons.

So, you can actually take the numbers we've invested in that subset of projects and say these are the benefits from that. Is that right?

MR. MELAINA: That's right, that's the right interpretation. And I think for us it was a decision to just look at the retrospective awards that have been put in place, and not try and do any extrapolation further about other infrastructure, future awards, any other sort of build-on or add-on effects that would happen

from those. It's really just a retrospective on what's been funded today.

COMMISSIONER SCOTT: Yep. No, and I think that's an important number. That's a great number to be able to articulate about the program.

And I like, then skipping -- jumping up to page 14, the chart where you see the expected -- oh, so it's got exactly the right numbers on there, so it's 236 for petroleum fuel reductions in 2025 and 1.7/45.7 of greenhouse gas reductions.

I mean I think that's a really interesting number. And that's just in kind of a subset of the projects that we've invested in to date.

So, if we looked at this next year, that number will be a little bigger because we will have additional projects.

And if we look at this, you know, continue to do this out through the end of 2023, which is when AB 8 sunsets, that these numbers continue to get bigger.

Then let me see here, and I just wanted to restate that because it kind of put a whole bunch of slides together in like two sentences. Maybe not very articulate sentences, but I just wanted to make sure I was stated that back to you right.

And then I was thinking here, on page 22, well,

I had a few thoughts on there, really. I think that the Legislature has asked us to invest in projects that have the power to be transformative.

And so, I really appreciate the work that you have done in how do we estimate market transformation. And I think that it's really neat and it's cool to kind of see it added on top of the expected benefits that you have in the slide right before this one.

And then, you know, one thing I was thinking about in terms of the market growth of carbon benefits, which is your next slide, is that a restatement of your bullet -- you've got, "Moreover, it's not anticipated that government programs alone would be capable of funding the entire transition to the 2050 goal".

And I think that's something probably all of us have recognized. And with a program like ours, where we only -- well, we're lucky to have a terrific program, like ours, where we have $100 million, which is a lot of money to invest. But in a state as big as California, it's also not that much money.

And I was just thinking it would be interesting to see, I think one restatement of that might be that it's -- the government programs really can help us make progress towards the goals that we're trying to meet.

And that it would be kind of interesting to see

if you layer on the Air Resources Board AQIP program, and you layer on the Cap and Trade money, and you layer on what South Coast Air Quality Management District, and other management districts, and then you layer on what the Fed look like, how does that -- how does that, you know, expand that portion?

And then if you layer on how much private investment we know is already out there, how much closer does that bring kind of that bottom chunk of benefits up to where we need to be.

And I just think that -- not that I'm asking you to take on that part of the study, but I think that would be something really interesting to see what that ends up looking like.

MR. MELAINA: Yes, to me, that is the next step in terms of analysis. And to build towards that I think we do need more data on what I called the effectiveness of the different influences.

And so you would also, then, need to know the relative effectiveness of the different programs as they're interacting on the same market.

So that is, I think, where we want to move towards, but it does make it -- it makes it more complicated.

COMMISSIONER SCOTT: Yeah, for sure.

Advisers, do you have any questions?

Do we have any --

MR. BARTRIDGE: So, Commissioner I'd just add -- I mean I think that's a great point. With Marc's it's $526 million. Jim's presentation talked about almost a half-billion to date. And with ten more years of this program there's another billion dollars that we can put towards benefits that really can change that graph on slide 25, or more towards. So, I just want to reiterate that point.

COMMISSIONER SCOTT: Yeah. No, I agree. I think it's important to recognize that it's a snapshot in time so it's not like, oh, then the benefits all taper off because, of course, we haven't added all of the benefits in from the projects we haven't funded, yet.

Great, so let's go here and then over to John.

MR. CHUCK WHITE: Thank you very much, Chuck White with Waste Management.

This is really an interesting study. I'm looking forward to diving into it in more detail.

Just one question I have, a point of clarification. It's on slides 10 and 11 and you show that under -- and by the way, welcome to Sacramento, to a fellow Wolverine.

MR. MELAINA: Oh, thank you.

MR. CHUCK WHITE: The natural gas fueling infrastructure is not checked in the market transformation column and the natural gas vehicle deployment incentives is also not checked in the market transformation program.

But on the next slide, 11, biomethane is both in -- is a market transformation.

And I guess the question I had is we need to have -- if we're going to use the market transformation aspects of biomethane we need to have the fueling infrastructure and the vehicles in order to be able to make that leap.

So, I guess I would ask for your reconsideration that perhaps the natural gas transition to biomethane is part of a continuum, all of which is market transformative.

If you look through the low carbon fuel pathways that CARB has developed so far, the absolute lowest carbon fuels are biomethane-derived fuels into the negative territory.

And, in fact, Waste Management, the company I work for, will likely have the majority of its 3,000 heavy-duty vehicle fleet running on renewable natural gas by the year 2020.

So, it is a transformative process but we can't use that fuel unless we have the natural gas fueling infrastructure, unless we have the natural gas vehicles in order to be able to make that transition.

So, I guess my question is why were those boxes not checked under the transformative and why don't you think that natural gas is part of a continuum to getting to the very lowest carbon fuels that CARB has identified to date?

MR. MELAINA: All right, so that's a good question. Thanks for bringing that up.

So, let me just reiterate that there are a lot more market transformation influences that we know are real, that we know are happening, but we don't feel completely confident trying to tackle them analytically.

So, I think you're right that there are market transformation influences here.

The distinction that to me makes sense is really that we have a bit better understanding of how household consumers respond to public infrastructure than how fleets respond.

So, fleets have a little bit different decision criteria. It's sort of a different market influence when you're really putting in infrastructure that's focused on fleets.

Also, for biofuel vehicles, say plug-in hybrids, but also natural gas vehicles that can go on both gasoline or natural gas, the criticality of public infrastructure as it is for, say, hydrogen or battery-electric vehicles is a little bit more murky. So, it's harder to see how consumers would really respond to that if they had the option of using gasoline in their biofuel vehicle.

So, I wouldn't say that we're saying that the influence isn't there, we just didn't have an analytic framework to try and tackle it with the same level of rigor that we've tried to do the other ones.

So, we're not trying to suggest that the influence isn't there.

COMMISSIONER SCOTT: We'll go to John Shears and then Jim McKinney or do you want to --

MR. MC KINNEY: Actually, if I could -- Commissioner, if I could comment on this category as well? Sorry, John.

To me, this was one of kind of the unexpected results. And it's really fun to play around with the investment category and the dollar amounts there, and then kind of look at the results, whether it's expected or market transformation.

So, natural gas fueling infrastructure was one

that really jumped out at me because that's a very modest investment from our program, but the numbers are quite large.

And to me, that's a good example of our portfolio approach where, you know, we identified some early commercial market opportunities. Natural gas was one. E85 was another, some of the other biofuels.

And this is one where I think we're really getting a good return on our investment in this near-term category.

And as Chuck mentioned, there are longer-term opportunity as you integrate more biogas and grow the fleets there.

COMMISSIONER SCOTT: Great, John.

MR. SHEARS: Good morning, John Shears, a member of the AB 118 Advisory Committee. I guess now it's the AB 8 Advisory Committee, ARFVTP Advisory Committee, the Center for Energy Efficiency and Renewable Technologies.

And I want to thank Dr. Melaina for a great draft and I want to remind everyone right now what we're looking at in terms of the presentation and the document that's available for review is it's still a draft.

I just had a couple of clarifying questions and observations. One thing I think is in the draft, you know, when you start talking about market requirements

and market benefits -- and then it switches to market benefits. I think when you're presenting those slides that shows the magnitude of the remaining challenge, I would recommend sticking with market requirements because it gets -- it's very confusing when you initially look at it.

And given that a lot of people who aren't going to have time to dig into anything beyond the executive summary of the final report, I think that could confuse a lot of people as to exactly what these visuals are relaying to people.

That would also reinforce the message from the Vision, CARB Vision and Air District's Clean Air Vision, which is also discussed thoroughly in your draft.

I had some clarifying questions. With regards to fuel cells, well, I guess before I even go there, so right now, as far as this report goes, it's looking at all of the investments through March 2014, or a little bit earlier than March, depending upon the projects, and projecting out through 2015 what those current projects' benefits could look like.

So, we still have many more investments from the program that will be additive, you know, whether linear, or geometric, or exponential, what have you.

So, there's still a lot of stuff the program

could be doing, so I just want to sort of clarify that.

Then when it comes to the discussion of the ZEV technologies, I just wanted to clarify with you. It's a big report to try and read through carefully in a short amount of time, so I may have missed it.

When you talk about fuel cell vehicles, you show greenhouse gas reductions essentially plateauing. But then there's a little short discussion about criteria pollutant emissions and they taper off.

And I'm not quite sure why the greenhouse gases would plateau but the criteria pollutant emissions would taper off.

I couldn't quite get what was being done in the modeling there that, you know, would basically lead to those results. That's my first clarifying question.

MR. MELAINA: Right, so the tapering off effect is generally when we have, basically, the impulse of vehicles that would be deployed, and then the impulse ends, and then the vehicles are driven a little bit less and eventually retired over time. So, that would be the tapering off.

But that should be consistent with both the criteria emissions and the greenhouse gases. So, I think what's happened with greenhouse gas is there's some countervailing, additional things going on there

that are distinct from the criteria emissions. I'd have to look into it.

MR. SHEARS: Yeah, okay. You know, again, I know there's a lot of stuff that's underneath what you could try and articulate in a report, and I just want to --

MR. MELAINA: Yeah.

MR. SHEARS: The other thing was when you get to the plug-in hybrids and the -- well, actually, it's figure 22. Again, apologies for folks, it's not on the presentation, it's actually in the report.

When you switch from CVRP, you know, sales data, empirical data, to switch over to using the actual projected sales, and not using elasticities, there's like a reset that happens where you drop -- for example, for FEV sales it drops from, you know, roughly 17,500, 18,000 vehicles all the way down to below somewhere in the order of like 3,000 vehicles and then the model takes over.

MR. MELAINA: Right.

MR. SHEARS: Could you comment on that? I mean recognizing there's a discussion about early adopters then moving to middle and later adopter communities, and the differences in the elasticities of those consumer groups and I can understand that.

But it seems like there's a little bit of an artifact that's manifesting in this and if you could speak a little bit to that?

MR. MELAINA: Right. Yeah, I remember which figure you're talking about. So, it's not an artifact, it's really what was mentioned earlier is that we're evaluating these programs, projects retrospectively. We're not assuming that they continue into the future.

So, for the CVRP, we assumed that those rebates stop at some point. And so when they stop, that's the drop.

What's bundled inside of there that continues is the CVRP influence on moving manufacturers down the learning curve, which results in a price reduction. So, that continued market adoption there is just from the manufacturers having shifted down the experience curve and so the vehicles now cost a little bit less than if those CRVP investments hadn't been made.

So, compared to the baseline, the new electric drive vehicles being produced after that CVRP program, even if it's stopped, they're a little bit cheaper. So, we'd see some market uptake that wouldn't have existed otherwise.

MR. SHEARS: Okay, yeah, so that's helpful because then that leads to a follow-on discussion that

we don’t -- so my question is how can we follow up with Dr. Melaina and the Energy Commission staff on -- some of this is a little difficult to try and just relate through e-mail and texts, but how can we have follow-up discussions on some of this?

Because some of this I think affects the final projections that show up. Still, I think we still have the magnitude of the problem remaining but it does -- and this is important for the Energy Commission, you know, being able to be accountable back to the Legislature for the investments. And so anything that can be helpful in that direction --

COMMISSIONER SCOTT: Yeah, that’s a terrific suggestion. And I think what we could do is probably set up a meeting between -- with Dr. Malaina, and Charles, and Jim, and John, you, and maybe a few others who are interested, and kind of just sit and talk through some of the different pieces.

That’s something I think we will be doing, anyway, as we try to finalize the report.

I would also suggest -- I would highlight what you mentioned, which is that this is a draft report. So, any comments that you all have that you can write down and send to us, please be sure to do that as well because we will be looking for additional information

and the comments from folks.

And then I think as we finalize this report and as we think about how to write about this report in the IEPR, again there will be follow up, and conversations, and ways for us to kind of, you know, tweak it. Here's what we have, here's where we think we are, how does that play and work together there.

So, thanks for that suggestion.

MR. SHEARS: Great, and thanks again. I mean it's a great draft and it also gives everyone a great introduction into the whole academic research space around innovation and moving, transforming markets and all that, so thanks for that.

COMMISSIONER SCOTT: It does. Thank you, John.

And then we'll do one last question from Paul. And Chuck, and John, and Paul, if you would give your card to the reporter so he knows your name, gets your name right on the transcript, that would be great.

MR. GRUBER: Thanks Commissioner Scott. Thanks Marc. I'm Paul Gruber, Executive Director of the Next Steps Program at ITS Davis.

Two very quick things, I hope. On slides 12 and 13, when you break out the expected benefits in the pie charts, I understand the benefits for vehicles and fuels.

I just wondered if you could add some clarification to what was included in the manufacturing category, which is the lion's share of the vehicle expected benefits.

MR. MELAINA: Sure, so there's a few projects in that category. And not only is it the large fraction of that green wedge, but it's also the part that's making it continuous, an upwards slope.

So, that is really -- so, this is a tricky question. So, I'll try to kick this down the line until later today.

But this is an investment in not manufacturing of fuel, but manufacturing a device that's going to consume fuel and manufacturing more and more of them each year.

So, as they're deployed, these vehicles are going to be on the road consuming more and more fuel as that manufacturing plant produces more vehicles.

Does that answer your question?

MR. GRUBER: Yeah and I'll dive into deeper into the actual report. Is it sort of a gray area, then, between expected benefits for investments today and market transformation benefits that you're expecting to see later?

MR. MELAINA: I wouldn't say it's a gray area.

I think what it is, is we have tried to resolve all the best available data that we have and all the different projects.

So, the projects are not all consistent with each other. So, what I was just describing is the vehicle production process is distinct from CVRP. Those two investments are doing different things.

So, production process, you put that manufacturing plant in place and it's going to keep making cars over time.

So, we had information on what was going to happen with those and so that was information we were able to use.

For the other market transformation influences, they're different qualitatively and we had different types of data to back them up.

MR. GRUBER: Okay, thank you. And then --

MR. MC KINNEY: I'm sorry, Jim McKinney here.

MR. GRUBER: Go ahead.

MR. MC KINNEY: If I can kind of build on Dr. Melaina's response?

So, within the manufacturing category many of those are kind of medium-duty truck operations. So Boulder Electric, Electric Vehicles International, Motive, TransPower we're funding either kind of the full

plant or different assembly lines.

And as Dr. Melaina said, the capacity for those to expand, and especially in the face of the market demand that we anticipate, and a lot of that is driven by regulations from South Coast and the Air Resources Board, but we see strong market growth potential in the ZEV truck sector.

And again, I think as ARB may state later on today, the whole set of issues around clean freight and clean transportation strategies is a big part of it.

MR. GRUBER: Yeah, okay, and then final question. On slide 23, I wonder if there's an opportunity, because you show this very steep market growth curve, is there an opportunity to show a curve that it would take longer if CEC didn't invest in alternative fuels and vehicles?

Essentially, would that bump out the market growth curve?

You've got the baseline effects in there, of course, which would stay, but would there be a significant difference? And that would be worth showing, for sure, if there were.

MR. MELAINA: Yeah, I think that's what this implies. We're not claiming that we calculated that, but that is what the figure implies.

MR. GRUBER: Okay, thanks.

COMMISSIONER SCOTT: I think what Paul might be asking is if there were no Alternative and Renewable Fuel and Vehicle Technology Program, what would that green curve look like versus what does that green curve look like with the program?

MR. MELAINA: Right. So, the way we have it there it's independent of the program.

COMMISSIONER SCOTT: Oh.

MR. MELAINA: So, yeah, it hasn't been influenced by the program. We're superimposing it on top of the program benefits.

COMMISSIONER SCOTT: Okay.

MR. GRUBER: Okay, thanks.

COMMISSIONER SCOTT: Great. Well, thank you very much, Dr. Melaina. I think this was a terrific presentation and you gave us a lot of really detailed information, I think, based on some complex modeling, especially when you get into the market transformation benefits.

But I think you did a terrific job kind of walking us through, some of the nitty-gritty, but without getting too into the weeds.

So, I thought this was fantastic. I appreciate the great work that you have done on this, and on the

statewide assessment, and your great presentation. Thank you for being here today.

MR. MELAINA: Great, thanks.

MR. MC KINNEY: And Commissioner Scott, if I can just add on behalf of staff, this is really hard work and there's a lot of detail that goes into this. And we need to recognize others on our staff who have contributed.

So, Jennifer Masterson really stepped up for the first time, really good work on the spread sheets and really making sure the details are correct.

Andre Freeman and Charles Smith, as always you contribute to this.

But I'd just like to give Dr. Melaina and his team a round of applause. I think it's a stellar work and we're really glad to have it.

COMMISSIONER SCOTT: Thanks to them and our team.

(Applause)

COMMISSIONER SCOTT: Thank you very much. So, we are now on to Peter Cooper from the California Employment Training Panel. And he's going to talk with us a little bit about the jobs and workforce training benefits. Welcome Peter, thanks for joining us today.

MR. MC KINNEY: Yeah, and as Peter's walking up

there I'll kind of read his biography.

So, we're really going to switch away from hardware to the human factors side of our investments and all the benefits accrued around workforce training, a little bit on job creation.

So, Peter Cooper is now the Assistant Director of the Employment Training Panel with the State of California.

Governor Brown appointed Mr. Cooper as Assistant Director in May 2012, where he's focused on external affairs and apprenticeship policy.

He served as a Senior Program Manager and Legislative Advocate for the California Labor Federation from 2000 to 2012, working primarily on low-wage worker issues, environmental policy and workforce development.

From 1997 to 2000 he was the Research Coordinator for the Service Employees International Union Local 250, in Oakland, California.

And from 1992 to 1997 he conducted research for the AFL-CIO and for Public Citizens Global Trade Watch, in Washington.

And he's also a long-term advisory committee member for our investment plan process.

So, Peter.

MR. COOPER: Yes, thank you, Jim. Commissioner

Scott, thank you for giving me the time to speak today.

And, you know, this program is really important for ATP. I think it and our agreement, and interagency agreement with the Energy Commission really epitomizes the whole notion of a triple bottom line because helping the environment, providing job training, and helping employers, as well as being very measurable and accountable.

And so, today I'd like to kind of dig in a little bit into our program and talk to you about our funding model, as well as how we measure job training and job placement.

So, here you have a bit of an overview of the workforce component of the strategic plan. And you'll see that my agency, the Employment Training Panel, does receive quite a bit of funds through the program over the years.

I would point out the $10.3 million match. So, as you'll see later, our program does require in-kind contributions from employers for training.

So, a little bit more about the Employment Training Panel. Many of you may already know about our program or may not.

We are a State agency under the umbrella of the California Labor and Employment Workforce Agency.

We receive funding from employers that pay into the UI training tax. And so when they're paying their UI, they also pay a small sliver, which is about $7 per employee per year into this training fund, which comes to roughly about $65 million in the State of California.

The model that we have is very unique in the United States. We haven't seen it replicated anywhere else, really. And it's a pay-for-performance contract.

So, unlike other workforce programs that are often grants, we require the employers to enter into contracts and they'll only get paid after they've shown that training has occurred and the employee has been placed or retained in a job.

We write contracts that address the employer training needs and reimburse the training.

We don't mandate whether it's -- the training topics. We don't provide training. We let the employer select the training providers.

Although, we are monitoring all of that and especially in the case of the funding that's available for THRIVI (phonetic), AB 118, we make sure that the training topics are in sync with the investment plan.

So, let me move on to a little bit more details about our program. Here's our basic contract structure.

So, we kind of have two different contract

structures. One is for single employers and the other is for multiple employer contracts. And this could be a training agency. It could be like a local Workforce Investment Board, perhaps a community college, or an employer association that brings together employers, often smaller employers that need the assistance through that NEC model.

But this is kind of our basic single -- our basic contract structure. And so, we pay the contractor and review their training records, review the eligibility of the participating employers, and the individual training eligibility information.

So, one of the things that we do is we look at the Social Security, make sure that the trainee has a Social Security number, at the beginning of the contract.

And this benefits the employer, as well, because they won't get paid at the end until they've shown that they've placed or retained the worker in a job.

And so our staff actually goes and checks with the EDD's base wage file to make sure they're in a job.

Move to the next slide. So, here we can see kind of the timeline. Our contracts are generally for a two-year period of time.

After a proposal has been developed, it's

brought to our monthly Panel meeting. It's approved. Training starts, as you can see on the left side of the slide.

They may have a number of different topics that they're being trained in.

And they enter into a post-training retention period. So, they have to get in their 90 days of retention on the job before the funds are earned. And at that point, when the funds are earned, they've shown their retention they get paid on the tail end.

So, when you see from our Panel that -- for example, if we enter into a contract with a large company, let's say PepsiCo, or a small company, whatever company, and you see that number that's really the amount of funds that has been set aside for them, the contract amount.

They're not given that money on the frontend. That's a pool of money for them to draw from as they show success in the program.

So, as I mentioned before, with the 118 partnership, as we're developing contract proposals with the employer and looking at this training that they want to occur, and the job skills development that they need, we make sure that it fits within the context of the investment plan.

Let's see, what else? So, one of the opportunities and one of the benefits of having a model that's already in place that the 118 funds have been using, is that with this structure already in place we do have consistent metrics and performance indicators.

And we report back to the Legislature on an annual basis regarding our success in these programs.

Generally, employers are successful at about 70 percent, as far as drawing down the funds available that have been set aside in their contract.

So, we serve both the employed and unemployed. The goal is post-training full time employment earnings, earnings at a high wage.

So, we also have a metric of a wage that's required upon retention. The wages are set by the Panel and they are on a regional basis. So, we have that wage requirement, as well.

The most successful programs have really been the skill upgrade training for incumbent workers. But we do have some new-hire and job creation programs, as well.

One other thing that I wanted to mention is we do have situations where employers will come to the Panel and at first they may appear to be eligible for AB 118 funding, and that funding stream, but the employer

may wish to only train -- have a portion of their training be on AB 118-approved skills and training topics. And the employer wants to do a lot more training, more generalized training.

And so, they may come in under our core funding and be funded that way.

So, evaluation, because ETP programs are exclusively performance based, we stress throughout the development process that the training should be a good fit under AB 188 and addressing their needs, as well.

We seek out certifications and training that leads to certifications when at all possible.

And as the marketplace is beginning to mature, the workforce training needs are becoming more clearly articulated to training providers.

Let’s see, and we also make sure that there is in-kind contribution. So, if you were to go on our website and look at the contracts that have been funded by the Panel, you’ll always see a kind of a side-by-side analysis of the in-kind contribution that’s taking place.

So, one kind of exciting area that we have that’s being developed at ETP is that we’re in the process of moving over to a web-based computer tracking system.

And this will allow us to track and research the outcomes of the training in a more efficient way.

One area that we are also considering is whether we want to track the hours and the placement of the ETP trainees for a period of time that's longer than the 90 days.

So, that's something that would have to happen through statutory changes. But that's an area where we could have metrics in the future that are more robust and longer in duration into the career of the trainee.

As I mentioned, we verify the reported wages of the trainee, using the Employment Development Department's base wage file, during the retention period to make sure they meet our requirements.

So, here's one of the programs that has been very successful. This is a multi-employer contract that was done by the California Labor Federation working with the three public transit agencies for large fleet conversion efforts.

And they were able to earn 100 percent of their committed -- of their funds. And it was so successful, in fact, that they are entering into a second contract with ETP and we're expecting that to be successful, as well.

And we funded, in past years, Tesla and this has

also been very successful.

And we funded expansion at the NUMMI factory in Fremont. And as you can see, they've earned $647,000 under this contract, which recently terminated. And they earned nearly 86 percent of their initially awarded funds.

So, here's my contact information. Robert Meyer, who is really our specialist in this area, can be contacted as well, and his information is up there for you.

And so, I just wanted to leave you, lastly, with two areas where I think ETP has worked and is a good model to build upon.

The employers are encouraged to assume a greater responsibility for training. Under our program they get a flat rate, so they get anywhere from $18 to $26 per hour, per trainee.

And the reimbursement that they get does not -- not only is it matched by the employer, but it doesn't offset their entire funding needs.

So, the flat rate encourages them to assume a greater responsibility and really be involved.

With our multiple-employer contracts, we also require them to have the employers that are going to be participating, their list of employers, where they're

planning on doing the placement of new hires, in that case, all lined up before they get to our Panel. So, they make sure that they have a very high probability of success.

Because ETP is performance-based, it’s a structure that helps to ensure for success of the program. And we’ve seen that time and time again.

The funds that are not used, they revert back to our program.

So, it is a constant balancing act, both with figuring out how much funding is available through our program, whether it’s the core funding or our funding through the AB 118 process.

Because after two years, we’ll have an employer that maybe has only earned 80 percent of their funds. The extra 20 percent goes back into our pot.

And so it’s a constant, you know, calculating and balancing act.

As well as an area that is really a challenge for us, and I think for this program as well, is on the one hand we want to be as accountable as possible with the funds and be able to document that they’ve led to job placement, and careers and training.

But on the other hand, we want to make the funds accessible to the employers, especially the -- well, the

employers that have paid into our program.

And often those two are at odds with one another. And so, trying to figure out the right balance between those two priorities is a real challenge.

So, I'll leave it with that and if you have any questions for me, I'd be happy to answer them at this point.

COMMISSIONER SCOTT: Thank you very much, Peter, for this presentation.

I would note, you mentioned the Santa Clara Valley Transportation Authority, and I had the opportunity a little while ago to go and visit, and see the different parts of transportation that they're working on, and the workers that had been trained with some of the funding.

And it was just a really neat thing to see. And they do all kinds of stuff. I mean it's light rail, it's the buses, it's how to work on different types of buses, whether it's a hybrid bus, or electric bus, and things like that.

And it was just really neat to see how, exactly how the money is getting spent and get to meet some of the folks who've had a chance to take advantage of those courses.

And, you know, while we were there one of the

things that they were mentioning is that even if you were a person who didn't get to take advantage of the training, a lot of times they can then go back and share a lot of that information with the other folks that they work with.

And that what they had found is it was kind of bringing up the skill levels of everybody there, and I thought that was a really cool thing.

I would just go back to your slide two. And the only reason I do that is because I think it's -- these are really cool numbers, right. It's $11.5 million with a $10.3 million match through the Employment Training Panel.

And it's, you know, almost 11,500 people have been trained.

Sorry, I'll let you catch up. I mean, yeah, I mean those are really cool numbers, 88 businesses across the State, 14 municipalities across the State.

And I think that, you know, I just wanted to underscore that.

And then you look at the EDD numbers and the community college numbers and it's pretty exciting.

To me, this is another way to ensure that people all across California can be involved in a program like this and also feel the benefits of a program like

Alternative and Renewable Fuel and Vehicle Technology Program, plus the program you have.

And so, it's been great to collaborate and work together with you all on that.

MR. COOPER: Yeah, well thanks. I'm really glad you were able to go down to that program because I think it's important to collect the numbers, but it's also important to recognize kind of the intangible benefits of a program that provides support for communities and workers.

COMMISSIONER SCOTT: Absolutely. Absolutely and I liked what you mentioned, also, about earning a high wage. That's what this is all about so --

MR. COOPER: Yeah, so we look forward to working with the Energy Commission in the coming years.

And our program is going to be having more funding as the economy strengthens because more employers will be paying their UI training tax.

But that being said, we want to build on this program as well because it really not only diversifies our program but I think, you know, it's good for the Energy Commission and it's a good model to replicate.

COMMISSIONER SCOTT: Agreed. Thank you.

MR. COOPER: Thank you.

COMMISSIONER SCOTT: I'll turn it back over to

Heather.

MS. RAITT: Okay, so just a reminder, I had some blue cards, but if people do want to make some comments after the afternoon session, please give me your blue cards.

And otherwise, we'll break for lunch and return at 1:00. Thanks.

(Off the record at 12:00 p.m.)

COMMISSIONER SCOTT: So, welcome back everybody to the afternoon portion of our Measuring the Success of the Alternative and Renewable Fuel and Vehicle Technology Program.

We are going to start with a presentation by Anthony Eggert, who is the Executive Director of UC Davis's Policy Institute for Energy, Environment and the Economy.

And after that we will go into sort of a lightening round of presentations where people just put their different metrics and ideas for how to measure different parts of a program, whether it's greenhouse gas reductions, criteria pollutant reductions, public health benefits all on the table.

And then we'll have a discussion facilitated by Anthony Eggert to talk through some of those ideas.

So, I will turn it over to Anthony. Welcome,

thank you so much for coming, and take it away.

MR. EGGERT: Thank you, Commissioner. It's great to be here.

And so, what I'm hoping to do over the next, say, 10 to 15 minutes is to provide, perhaps, a little bit of a structure for the coming panel discussion.

But I'm going to go through these fairly quickly because I am interesting in getting to that discussion.

Sort of in thinking about, you know, the ways in which this program is structured and the various criteria and metrics that are used, both to guide the investment decisions as well as measure their potential impact, I thought it would be helpful to give a little bit of a -- almost like a hierarchy and a diagrammatical representation of that.

And I'll just say up front that this is my own interpretation of the program, not necessarily that of the Commission.

But even before I do that I want to just cover a couple of topics that I think are going to be familiar with those of you who were here for this morning's session.

And that is just to really kind of emphasize the magnitude of the challenge and the opportunity for the transportation sector within California, especially when

thinking about our goals for climate change, petroleum reduction, et cetera.

So, as many people here I'm sure are aware, the transportation sector is the largest component of California's climate footprint.

I think some people aren't aware of the fact that this diagram that's frequently shown for transportation is only the downstream.

If you incorporate some of the upstream emissions associated with refining, et cetera, it gets closer to the half of the total State total.

And then, of course, on the financial side this is a, you know, many, many billion dollars of expenditure on an annual basis.

These are numbers from 2010. They're actually larger, now, $72 billion expended annual, about two-thirds in the transportation sector, across all of the energy expenditures, well over $300 million a day in the State.

And, of course, we are talking about a program here of $100 million a year that we're using to try to influence that future system.

And so I think that says a couple of things. One is that we really do have to think about how do we set the stage for a large-scale transition that's going

to be in the many, many, many billions of dollars of annual investment.

And also I think, just in terms of thinking about the way in which we measure the impacts, we do really have to be thinking about projecting into the future.

And so, this is sort of my interpretation of a slide that’s already been presented on, the major policy goals of the State for greenhouse gas emission, petroleum production, biofuel production, low carbon fuel standard, air quality, and the recent zero emission executive order.

And so I think what’s great about these policies is that they do provide us some guideposts, goals and milestones both in terms of the quantification of the goals and the time frames that are associated with different touch points, like 2020, 2023, and 2050.

And, of course, the policy itself, as has been described earlier, has its own language on this very clearly emphasizing the mission of the program to help achieve and attain the State’s climate change policies.

And then, also, as has been mentioned, not necessarily to rely upon any singular preferred fuel or technology.

And then there’s a whole list of other project

criteria and metrics. And when looking at these I realized that some of these, all of these could be interpreted as project metrics and I think many of them appropriately should be.

But also they are what I would also characterize as sort of guiding criteria for choosing different types of major investment categories.

So, I'll talk about what that means. So, this is the schematic, the cartoon version here that I put together.

And really, what this is intended to emphasize is that there really is, I believe, sort of two sets of criteria and metrics. Those that are -- can be sort of thought of as guiding these major investment categories.

And then if you go all the way down to the lower left-hand of the schematic, those criteria and metrics that guide both the selection of projects and the measurement of their impacts.

So, I'm going to walk through this very quick. You can obviously convert these major policy goals into criteria, including looking at sort of the potential of different types of technologies and strategies to contribute to greenhouse gas reductions, petroleum reductions, et cetera.

And then you can use that to sort of map against

a number of different technology pathways and strategies.

And, of course, because these are policy goals that are in the future, it does help to have sort of analytical framework for how to do that.

So, certainly, we've done a lot of work on this, others have as well, looking at which ones have the potential to sort of materially contribute to those goals.

This is just specifically calling out for the greenhouse gas reduction goals in 2050.

And I think Professor Ogden presented sort of a version of this in one of the earlier IEPR meetings.

And it kind of shows a couple of things. One is that there are options, like advanced biofuels, electric vehicles, hydrogen fuel cell vehicles, and even greater levels of vehicle efficiency that do have the potential to contribute very, very large greenhouse reductions in the time frames as needed.

But none of those, of course, alone can actually achieve the goal and you really do need to look at portfolios or combinations of those.

And, of course, we've run many, many different scenarios looking at how you might go and do that.

But, importantly, they do materially contribute

to the goal.

And so, you can kind of look at these different types of investments across the different policy goals.

And at one point I was thinking of trying to put some sort of a quantification or magnitude here, but I realized there’s enough of both diversity in the different scenarios and uncertainty that that’s a worthwhile exercise, but I didn’t do it here.

And then, of course, all of that information feeds into the investment planning process. But just because a particular technology or strategy can contribute to the goal, doesn’t yet necessarily mean that it’s something that the program should make an investment in.

And I think for that to be true, you really do want to kind of walk through a number of key questions.

The first one I think we can answer with the analysis. The rest of them I think take even kind of a further level of both quantitative and qualitative assessment.

So, for example, are there specific barriers that can be identified that are preventing these technologies from become commercialization in a material way -- commercialize in a material way?

Three, you know, can public investment make a

contribution to overcoming those barriers?

And then four, again given sort of the magnitude of this challenge, once those barriers are overcome is there actually a business case for private investment to sort of carry these technologies into large-scale deployment?

And then, finally, even after all of that I think you still have to answer this question about whether or not the public benefits of overcoming the barriers exceed the costs.

And then, even if the answer is yes to all of those, it’s still helpful to understand kind of what the role of what government investment is in terms of facilitating new technology, innovation and diffusion.

Of course, you know, sometimes this is represented as a linear process. But for anybody that’s studied it, you realize that this is sort of a very dynamic process in terms of as you innovate and technologies you learn new things, you identify further opportunities or gaps.

You know, when you think about it, we’re still working on both basic and applied R&D for combustion engines, well over 100 years after they were commercialized.

And so, the tools that the government has, or

public entities have, such as CEC, include demonstrations, the development of codes and standards, obviously regulations.

And we have a fairly substantial number of those here in California that are very germane to the strategies that are being pursued, like low-carbon fuel standard, like the Zero Emission Vehicle Program.

I think probably the majority of what we're talking about here is really kind of in this incentives category, but certainly also involved in some of the educational and even, to some extent, some of the codes and standards efforts.

And then I think, you know, the other thing that we have as the opportunity for input into determining sort of what types of specific investments might be helpful towards achieving the goals of commercialization of these different technologies are what I would call are either the action plans, or roadmaps that have been developed around these different technologies.

And so in California we have things like the ZEV Action Plan, the Bioenergy Action Plan. Certainly, the U.S. Department of Energy and other agencies have developed very detailed plans on how you sort of bring these new technologies, like hydrogen fuel cells, understanding what are some of those specific barriers

and what are opportunities to overcome them.

And some of those get quite detailed, you know, looking at the very precise barrier and what the specific role of what an investment might mean, a public investment might mean.

And then, of course, we have both the prospective and retrospective benefits assessment. We heard from Dr. Marc Melaina this morning about that. And I do think that that actually is a good framework particularly, you know, trying to understand what the potential future benefits of these investments can bring to the State.

And then we have, you know, other tools that allow us to look even beyond the time horizon that Dr. Melaina presented on. This results from a study that was conducted looking just at the deployment of zero emission vehicles in California and the other U.S. states that have adopted the California ZEV Program.

And what they find is that with a successful deployment of these technologies they could accrue very, very large, both public and private benefits, that are well in excess of the transition costs.

Again, here just showing GHG benefits that are consistent with the goals of the State, as well as financial benefits that represent net present values

well in excess of $100 billion.

Okay, so now coming all the way around here to the specific project level investment criteria and metrics, and I think that's going to be the majority of what we'll hear from the panel.

But this is one thing I would request is that to the extent there is a distinction between what you're presenting, either sort of as the major category investment criteria versus the specific project level investment criteria that you make that distinction, where appropriate.

And again, here this is again just that list that we talked about.

But I think, you know, really here, once you're at this level you really do want to know exactly what it is you're trying to accomplish.

So, for example, if you've found that infrastructure is one of the specific barriers for the deployment of a particular vehicle technology, the metrics that are -- that you use for understanding whether or not your investment is achieving that goal should be very specific to whether it's the number of stations, whether it's the number of vehicles served, which can both be an issue of the infrastructure coverage, as well as the capacity, the amount that it

can actually dispense in a particular time period.

Similarly, for these other categories for vehicles, fuels production, manufacturing and workforce training, the project level metrics that you might use should be very, very carefully tailored to what it is you're trying to accomplish.

And then, finally, I just want to make a real strong plug for the value of doing data collection and review as a means of both providing further insights, refining investment strategy and building a greater confidence in the value of the program.

And that can not only help inform future investment strategies and plans, but can also help us really start to better understand, you know, what the true gaps are.

You know, we sort of -- we think we know when we conduct these analyses, we do the modeling. And then when you actually get around to actually trying to build one of these on the ground, in the real world, you realize occasionally it's easier, but most often it's even a bit more difficult than you had anticipated.

And making sure that we have a mechanism by which to collect that information, analyze it, and then incorporate it into future program efforts.

And again, here I think there is a very strong

case to be made where it's appropriate and efficient to engage third party, expert, non-conflicted reviewers -- I think it's this week or next week is the big annual merit review that the DOE is putting on, which I think is a great example of that, where they invite many, many different parties from academia, from business, from others to basically take a look at both the programs and the specific projects to understand whether or not they're actually contributing to the goals of the overall effort.

So, that's kind of where I wanted to leave this and very much looking forward to the lightening round and the discussion that follows. Thank you.

COMMISSIONER SCOTT: Terrific, thank you very much, Anthony. I think that is a fantastic way to sort of set up the conversation that we would like to have with all of our wonderful panelists, who I'd like to say thank you as well for coming.

And I also look very much forward to the discussion.

So, I think what we should do is I'd like to -- well, we'll start with Amy Zimpfer here, from EPA. And maybe what we'll do is just have you say a word or two about yourself and then tell us -- give us your lightening round presentation.

And then we'll just work our way around the table and have each person say a few words about themselves, and then give us the metrics, and then we'll jump in the conversation.

MS. ZIMPFER: Would you like us to stay here?

COMMISSIONER SCOTT: Well, you can stay there or you're welcome to go up to the --

MS. ZIMPFER: It doesn't make any difference, I don't care.

COMMISSIONER SCOTT: Either way. What would you prefer? Wherever you're most comfortable, I'm happy, too.

MS. ZIMPFER: I'm happy to stay here.

COMMISSIONER SCOTT: Okay, that works great.

MS. ZIMPFER: I think that's good, too.

Okay. Well, I'm very honored to be here today. My name is Amy Zimpfer. I'm an Associate Director in the Air Division at USEPA. And among my portfolio, it includes leading our clean energy and climate change work in the regional office.

So, today what I -- the next slide, please. What I'd like to just briefly do in this lightening round is give kind of a broad perspective on EPA regulation and the use of public health metrics in pretty much everything that we do.

And then give you all two examples of how we've recently used the social cost of carbon in fuel rulemakings, and then go into the diesel emission quantifier which we use when we go through and evaluate projects for Diesel Emission Reduction Act funding.

So, the next slide -- in general, EPA has conducted credible science-based regulatory impact analysis for all of our major rulemakings. And we've been doing this for many, many years.

And just from my perspective, being at EPA for many years, it's really been over the last decades, a couple of decades that we've gotten a lot smarter and have really used science better to estimate the public health benefits associated with our rules.

It's been easier to estimate the costs associated with our rules to a particular industry, et cetera.

But we've gotten a lot smarter about how we estimate the benefits. And what we've found is that the modified benefits typically far outweigh the costs.

And we had a study done in looking at the decade 2002 to 2012. EPA's rulemakings yielded between 112 to 623 billion dollars in annualized benefits compared to 30 to 37 billion dollars in annualized costs.

And, primarily, these human health benefits have

come from the reduction in premature mortality risk and a number of reduced morbidity impacts. And also, such things as reduced hospital visits, lost workdays, et cetera.

So, indeed, we've found that our rules far outweigh the costs. The benefits far outweigh the cost.

Another estimate is that benefits from EPA's National Clean Diesel rulemakings, and these include everything from light to heavy duty vehicles, locomotives, marine engines, and oceangoing vessels that we've estimated that over the life of those rules that the benefits are expected to outweigh the cost by 18 to 1 by 2030.

So, let me give you a couple of examples. The social cost of carbon; this is an estimate of the economic damages or the damages avoided associated with a small change in CO2 emissions, a small change being perhaps one metric ton in any given year.

And we've used this quite a bit recently. We used it to estimate the global climate benefits of the series of adopted rulemakings that EPA has done on GHG standards for light duty vehicles and for the first round of heavy duty standards.

And the Department of Transportation used it, also, in their Fuel Economy Standards for light duty

vehicles.

We also used the social carbon -- the social cost of carbon in our recently proposed clean power plant. It was proposed a week ago Monday. And this is to -- we're proposing the various ways to reduce CO2 from a power production from fossil fuels.

So, what's the methodology? Well, first we do an estimate of the damages and we take a look at future global climate change damages, including changes in net agricultural production, human health and property damages from increased floods and a whole host of other global damages.

So, this is one interesting aspect of the social cost of carbon.

We take a look at the timing of the emissions. We take a look at the year that CO2 is released and the reductions. This is key to getting an estimate of the impacts and benefits.

We have a number of discount rates that we look at. And I'm going to provide a chart for you to just give you a sense.

And then we have one that's based on the 95th percentile from all the social cost of carbon models at a three percent rate.

I do want to note that there are some

limitations, as with any metric and any model, that there is a strong chance that we're likely under-estimating the damages due to incomplete capture of catastrophic and non-catastrophic impacts.

This is very difficult to do on a global scale and so, likely, all our values are conservative. So, we're under-estimating the damages.

It's hard to treat adaptation and technological changes. There are assumptions that we use regarding risk aversion. So, there are some limitations, as there is with any number. But it's the best that we have right now to estimate the social cost of carbon.

And the next slide shows -- I won't go over this in great detail, but it does show the different discount rates and this fourth 95th percentile, and it goes out over a temporal time period.

So, let's go on to the next example in this lightening round, and that is our Diesel PM2.5 Emission Quantifier, the monetary health benefits associated with it. So, we call it the DEQ, the Diesel Emission Quantifier.

And this health benefits model uses a benefit per ton, or BPT value, to estimate the monetized health benefits of diesel PM2.5 emission reduction options.

And we look at things like exhaust treatment,

engine replacement, fuel switching, and other things.

And as I mentioned, we do use this as one of our criteria when we evaluate projects and whether we should be funding them using the Diesel Emission Reduction Act grants, or DERA grants.

So, if you want to go to the next slide, here's the types of inputs or the methodology that goes into the DEQ.

So, we have three data sources, primarily, that we use to come up with the benefit per ton, and that's the National Emissions Inventory. That's updated annually.

The National Air Toxics Assessment, NATA, we're going to be coming out with an update on NATA fairly soon.

And then BenMap, which is the Environmental Benefits Mapping and Analysis Program.

These are the three primary data sources.

For valuing benefit, similar to the social cost of carbon there are specific avoided incidences of various things that go into the benefit calculation.

So, I've listed a number of them here, including premature mortality, asthma exacerbation, non-fatal heart attacks, work loss days, restricted activity days, et cetera. So, that all goes into valuing the benefit.

And as with the social cost of carbon there are limitations. While the numbers -- we have numbers nationally, we do have the ability to bring them down to a localized basis. But based on the input, we believe the benefits can only be distributed in up to five counties per project.

So, if a project is statewide, there has to be some modification on how the numbers are used.

This is not important in California, but for those of us that do work in the islands, and in Hawaii, we cannot use this methodology for, in a verified way, determining the project's benefits out in Hawaii. That's true in Alaska, as well.

And then because of some of the uncertainties on the numbers, we do not use this DEQ, the benefits for ton, when we're doing an evaluation of our State Implementation Plans, and what kind of reductions you can get there. There are other methodologies.

So, the last slide that I have here is just an example. I'm not going to go through this in great detail.

But it looks at six counties in California. It looks at the 2000 population and then gives you an example of, if there were projects in those areas, what the benefit dollar-per-ton value would be.

As you can see, in general higher population results in a higher benefit per ton, but it's not unequivocal.

So, for example, if you look at the San Francisco project there, the population there is just about three-quarters of a million, but you've got a benefit per ton of this particular project at $2.5 million per ton.

Whereas Orange County, which has a population of almost three million, on a particular project that we looked at there, it's $2.9 million

So, it's not across the board. And we also have to take care when we use this metric because there may be places where you have disadvantaged communities and it may not pencil out because they may be in Inyo County, or maybe in counties that have smaller population, but there may be a very strong need.

One example that comes to mind, I work a lot with the State of Nevada, and we do provide Diesel Grant funds to every state. If we did it just on a population basis, places like California would get all the money.

But we need to ensure that all of our states get some benefit of the Federal dollars.

So in Nevada, where they've put their funding, and it does pencil out is for converting buses in some

of the rural areas. And for those children that ride those diesel buses, that is an extremely big benefit for them and for their health.

So, I'm going to close there. And just the last slide has a number of individuals in our office that I want to make sure that you have contact information. They're the economists. I'm not an economist. They're the specialists and can really provide some very specific help if you need that with your staff.

Thank you.

COMMISSIONER SCOTT: Thank you so much, Amy.

Let's turn to Erik.

MR. ERIK WHITE: Thank you, Commissioner Scott. It's a pleasure to be here today. My name is Erik White. I'm Chief of the Mobile Source Control Division at the Air Resources Board.

Part of the programs that I oversee, among many, are the implementation of most of our incentive programs, and those are incentive programs that are focused on diesel emission reductions, as well as those that are intended to target greenhouse gases and move the advanced technology needle forward.

The next slide -- so, ARB, we're actually quite fortunate to have, and have had for many, many years, strong support through investments in incentive programs

that we really began about 16 years ago with the Carl Moyer Program.

That program, along with the Goods Movement Emission Reduction program, and the Lower Emission School Bus Program have been very successful in addressing diesel emissions throughout the State.

More recently we've been fortunate, as with the CEC, to have investments through the AB 118 program, where we can look at advanced technologies, both development and deployments.

As well as some new funding that we expect in this upcoming fiscal year from the cap and trade auctions proceeds, which should allow us to build on the 118 investments that we've made so far.

One of the things you will see, though, in all of these programs is they have different goals, different priorities, and they use different metrics.

And so, a lot of that is reflective of both what they're intended to achieve, but also when they came into inception.

And so for some of these, for instance, we are going back and looking at whether or not there are opportunities to consider new metrics in some of our older programs to recognize, you know, some of the new priorities, both for GHGs and criteria pollutants, that

the State now has.

The next slide -- so, let me start with the Carl Moyer Program. And I think, similar to how Amy described their programs, this is one that's very quantitative in terms of looking at what are the absolute benefits for the dollars invested.

It is a focus on reducing diesel emissions, but cost effectiveness really is the driving metric. And in fact, the Carl Moyer Program has in statute minimum cost effectiveness thresholds that projects have to meet.

These are projects that are done or this is an assessment and metrics that are applied at the project level.

So, as local air districts implement this program, they really do look at what are the individual cost effectiveness of each of the projects that they fund.

Some districts look at that on a first come, first served basis in terms of as long as a project is cost effective, it's eligible.

Others go through and they rank their projects, and fund only the most cost effective on an annual basis.

That latter model is how ARB works with the local districts on the Prop. 1B program where applicants

can apply to a local air district for funding, the projects are ranked on their individual cost effectiveness, and only the most cost-effective projects are funded until the funding is exhausted.

So, it’s a very straight forward program, but it is very limited in terms of cost effectiveness, in terms of dollars per ton is the only metric that’s used.

The next slide -- when we look at our 118 Program, which is a much more recent program, what we see is a broader set of goals that the program’s intended to achieve.

And with that come a broader set of metrics that we use to look at the projects.

In this particular program we look at projects not on the individual level. We don’t look at each car we fund through the Clean Vehicle Rebate Project. We look at the project as a whole and make funding allocations based on broad funding commitments that we make to individual projects within the program.

But when we look at that, we have always applied a number of different metrics in terms of looking at both the quantitative assessment, the cost effectiveness of the various projects we do, but also things like, such as what are the greenhouse gas co-benefits of the projects that we fund?

Are we moving the technology needle forward in terms of the development and deployment of the vehicles?

So, these are things that we have historically done since the program's inception.

With AB 8 last year, and the reauthorization of these programs, the bill contains specific metrics for us to begin to consider on an annual basis in our funding plan.

They included as its primary determinate benefit cost score, so very similar to what we've been doing in the Carl Moyer Program, and what we've done in the AB 8 program.

But it also provided six additional criteria for us to consider as we look at that. And that's everything from what are the ability to achieve GHG reductions, the ability to support market transformation, the ability to help on regional air quality improvements in areas that don't meet Federal air quality standards. And how can we better leverage private capital investments.

All of these we think are important metrics to look at as we determine what are the best investments for what is a very limited amount of money that we have in the AB 118 Program, only about $20 to $22 million for this upcoming fiscal year.

The next slide -- as we've begun to look at implementing the Governor's proposed $200 million investment of low carbon transportation funding, we've recognized that many of the same types of projects and many of the same metrics that we've used historically in our implementation of the AB 118 Program fit very nicely, fit very well with this investment as well.

And that's really been the model for us to map out and identify how best to invest those dollars.

While to date there are no specific metrics that we need to follow in that, we believe it's prudent and appropriate to look at, like I said, the same determining factors we've used in the AQIP investment projects.

One thing to keep in mind, though, as we look at these and recognizing moving forward there is an important need to consider benefits in disadvantaged communities, benefits for low-income consumers, and continue to implement and to recognize that.

As we've looked at how best to achieve our air quality and climate goals over the last several years, we've recognized today that investments today in the cleanest technologies are necessary, both from an air quality and from a climate perspective to meet those goals.

So, as we look at how best to do that, we want to make sure that we're prioritizing investments that will deliver both criteria and greenhouse gas benefits, and put us on that path to having zero and near zero technologies widely available and deployed in the transportation sector.

So, I'll stop right there as I quickly lightening through ARB's programs.

COMMISSIONER SCOTT: That's great, thank you very much, Erik.

Let's turn to Matt, welcome.

MR. MIYASATO: Thank you, Commissioner. The South Coast is very happy to be participating with you here at your IEPR workshop. So, I appreciate the opportunity once again to present before you.

And I do want to thank staff for kind of the batting order because that was a nice lead-in from both Amy and Erik on how the South Coast presents our incentive programs.

And I do want to touch, and I heard -- I think I heard all of the Energy Commission staff this morning, as well as Dr. Melaina from NREL, mention the difference between commercial technologies and emerging technologies. And I do want to highlight that.

So, as Erik mentioned, in terms of the

commercially available technologies, they have really well-established cost-effectiveness criteria and formula for which there are, you know, voluminous guidelines that have been developed through legislation, and now through the ARB, and how you apply those formulas.

But I want to really more direct my comments toward emerging technologies because I think that's where there is a quite a bit of discussion on how you would -- on how the Energy Commission can develop these markets, but also quantify in some fashion the benefits.

And so we, at the South Coast AQMD, we prioritize our investments based on many different factors; factors that were discussed at length this morning by Mr. Melaina and by your staff.

But the ones in particular that we have to focus on are the ones that are core to our mission as a regulatory body for air quality. And that is reduction of NOx emissions, toxics, and those which can give us the best shot at attaining the Federal standards.

This is a graphic that we've put into our research development demonstration, or Early Deployment Program, for many, many years. It is an embodiment of different strategies for getting along the technology evolution curve. So, we start from basic research, proof of concept, proof of technology, et cetera, as you

march down there.

And I think as Anthony Eggert mentioned, these aren't linear. They overlap quite a bit. In fact, you could be starting over in different phases depending on where you are on the technology curve.

But we show this because there are -- there's a timing issue and timing is critical in some cases for providing an influx of incentives or of support for that technology. And I think it's critical that the Energy Commission does that and continues to do that.

I also highlight this because I think it is important to note that we, at the South Coast, our programs align fairly well with what you're trying to do in AB 118 through your AFVRTP "XYZ" Program, where there are many co-benefits to be had by reducing not only criteria pollutants, but GHGs and petroleum displacement.

So, the big question, I think, that has been asked by the Commission is really, how do we, as a local agency, and how does everyone else at the table here, how do we prioritize?

And I've put it into kind of three distinct blocks. The first one is we have to prioritize based on the mission of our agency. So, we're a local air quality and regulatory agency, and our mission is to

bring our region, which is the largest air quality district in the nation, into compliance with the Federal Clean Air Act.

And so, we have to support technologies which give us the lowest possible criteria pollutant reductions.

We also support policies. And that's in terms of our Air Quality Management Plan, for the State Implementation Plan, but also we have local regulations. For example, our fleet rules, and so our priorities have to go along those lines.

But then the last two -- or the third and fourth bullet in that block is we also support energy diversity and co-benefits. So, looking at petroleum displacement is also one of the missions that we have at our agency. It's not the top priority, but it is certainly one of the things that we look at while we support projects, as well as low greenhouse gas emissions.

And then as we look further down this list, we look at the ability to enable the technology. So, for example infrastructure; if we put out more infrastructure will that help enable more consumers or more end-users to use that technology?

And we believe that is the case, especially for natural gas. We've seen the funding of natural gas

infrastructure and there's now been a proliferation of those technologies on the roads.

And we also look at highly leveraging our limited funds.

So, you guys have $100 million. Erik just mentioned about $20 million for AQIP, and they're going to get a big infusion for GHG in the cap and trade revenues.

We only have about $10 to $12 million a year. So, one of the hallmarks of our program is we really try to work with our sister agencies at the state and federal level, so the Energy Commission, ARB, EPA, as well as Department of Energy.

And then the final one I think is things that Marc had talked about for NREL's market transformation. What effect will our funding have and with the largest possible population of vehicles and technology?

So, is there a large inventory that we can then affect by having this technology take place?

In the last few years it's become crystal in the things that we should prioritize. And I've shown this plot many times throughout the Commission.

This is in 2023 the top NOx sources in our region. It's the inventory of different, typically goods movement-related sources. And in order to meet

those dash lines at 2023 and 2032, that's the Federal standards that we have to come in compliance with.

So, it's about a 60 to 70 percent reduction in NOx emissions if we have any hope of meeting the Federal standards.

And so by looking at this chart, I think it's pretty clear from our perspective what are the technology and sectors that we have to concentrate on?

And it's heavy-duty diesel trucks, off-road equipment, marine vessels, and you can just march on down the line.

Now, we don't anticipate getting 60 to 70 percent in every sector, so we've got to go for the largest emission reduction possible in every sector that we can possibly attack.

And that's why we have been focusing on near-zero and zero emission technologies in particular in the medium- and heavy-duty sector. And those duty cycles and rotations are related to goods movement.

And then my final slide in the lightening round is really just to highlight what our governing board has approved past March in terms of our research plan moving forward in the 2014-2015 time frame.

And you can see, based on the large portions of that pie chart, in investment, we're really looking at

investing in technologies that can give us this, again, near-zero and zero emission technologies. So, electric and hybrid technologies with infrastructure, hydrogen fuel cell technologies, and then near-zero engine systems. And that's like the ultra-low natural gas engine systems that we're working with the Energy Commission.

And I would just leave you with perhaps three points. In order to perhaps make the most use of the funding that you do have, and Commissioner Scott you mentioned that even though it is $100 billion dollars, it is for the entire State, essentially a drop in the bucket if we're going to get to the clean air that we so desperately need -- is having this portfolio approach is important.

I think Dr. Wallenstein mentioned that when he was at the IEPR workshop, previously.

We embody this in our Clean Fuels Program, which is our Research, Development and Demonstration Program, so having that portfolio.

But also leveraging collaboration, so maintaining collaboration not with just the local air districts, but also with your sister agencies at the State, and also reaching out to the Federal government such as EPA and Department of Energy.

And then the final point is that, and I think Jim mentioned it, it's been pretty evident, you need some kind of market pull at the end of the day in order to ensure that these technologies take root.

And we have often been pushing for not only an incentive or funding mechanism, but there's got to be a regulatory or policy backstop with sufficient lead time to show that the market is heading that way and early investment, early transition to that technology is going to be, at the end of the day, payoff for the end user.

And so, I know you're talking about investment and research plan here, but there's got to be some kind of regulatory backstop, we believe, and those have to go hand in hand.

So with that, I'm going to close, and then I look forward to Anthony's questions later.

COMMISSIONER SCOTT: Thank you so much, Matt.

Let's go on to Dean Taylor, welcome.

MR. TAYLOR: Hi, thank you very much for inviting me. I appreciate it very much.

My name is Dean Taylor. I'm a Principal Adviser in the Electric Transportation Department at Southern California Edison for the last 23 years, working primarily in the space of regulations and policy for both electric vehicles, as well as electric goods

movement and people movement.

I'm going to actually go just for the facilitated round and loan or give my time to my good friend, Jeff Rosenfeld. So, he may go a tiny bit over on his five minutes.

COMMISSIONER SCOTT: Excellent. Welcome Jeff.

MR. ROSENFELD: Great, thank you very much. My name's Jeff Rosenfeld, Manager of Transportation Fuels at ICF International and I've done significant work looking at alternative fuels, vehicles and technologies. And then I have done some work with a few clients looking at benefit costs, understanding all the different benefits that can happen or that can occur with individual technologies and different ways to rank and prioritize technologies.

Some key messages from my presentation is that the metric formula and what benefits you include are extremely important and that when benefits and costs are kept constant, when all the values are kept constant -- when you change the formula, you change the ranking of technologies, you change the prioritization.

And through the presentation, we'll come to that, you know, all benefits, including greenhouse gas emissions, criteria pollutants, petroleum displacement should all be taken into account when ranking and

prioritizing technologies.

And then also the idea that private benefits, including fuel cost savings, should also be something that's considered.

Existing metrics usually take into account one type of reduction, whether it's dollars per ton of NOx, PM, greenhouse gas emissions, or per-gallon of petroleum displacement. Do note here that Moyer does take into account two different pollutants.

The metrics above don't account for the aggregate. And many times it is a disadvantage to technologies that displace all of them because many times those technologies don't displace one category extremely well, or displace a large amount in one category. They displace some in all categories.

And then the metrics don't account for technologies that have associated lifecycle cost savings, including reduced fueling and operating and maintenance costs.

And this is important because these technologies, hopefully in the future, as they receive funding and gain acceptance in the market, will potentially not need funding in the future because they do have operational savings for clients or for, you know, end-users.

Where technologies that don't have any operational savings most likely need to keep some sort of funding because it's hard for them to eventually move into the market and take shape because they don't offer a benefit to the end-users.

The benefit cost ratio, you know, it's a term that we've used a lot today. So, the benefit cost ratio that I'll be discussing in the next few slides takes into account the comprehensive societal benefits and private operational benefits, with the numerator being those benefits, and then the denominator being the incremental cost of the vehicle and infrastructure.

The societal benefits are monetized based upon literature values. Some of those are values developed by EPA, looking at diesel and NOx, in addition to the societal costs of carbon and petroleum reduction benefits.

And the way we've aggregated, you know, put them together is through monetization. Otherwise, it's very difficult to add what is the combined benefit of reducing a gallon of fuel, plus reducing a ton of NOx, plus reducing a ton of PM. And with monetizing them, you're able to combine them into a single value.

And then a value of greater than one in the ratio would mean that there's a greater monetized

societal benefit per incremental cost.

So, a private benefit cost ratio, if it is greater than one means that it has greater lifecycle life savings than what the incremental cost would be.

And there is a limitation in the benefit cost metric that we're discussing, as there is with any metric, is that there isn't a magnitude included in it.

So, there also would need to be some sort of magnitude of potential reductions that would need to be included with the benefit cost metric as you're determining, and ranking, and deciding on funding technologies.

So, here's a quick quantitative comparison between metrics. When -- I think in a few days I'll be able to compile all the spread sheets, and everything, and send it in with a letter that will accompany it, and be part of the record that will go over the quantification of these values.

But I did highlight certain values that were of importance.

If we look at a diesel particulate filter for a Class 8 truck, it does have the lowest value in terms of dollars per ton of PM.

And in the Moyer metric where PM is valued at 20 times higher than a ton of NOx, it does have the lowest

value. But there are no NOx reductions, there are no GHG reductions. It does have a societal benefit cost ratio greater than one, but it has no benefit to the actual consumer because it doesn't give them any operational cost savings.

If you look at SCR, it's a very similar way where it's low in terms of NOx, low in terms of PM. And it does actually provide some societal benefit costs.

But I guess conversely, if you look at an electric forklift, it has a very high societal benefit cost ratio because you are adding in all the societal benefits, petroleum displacement, NOx, PM, greenhouse gas emissions.

But on each of those individual metrics it wouldn't do very well.

And then that's very similar to the P-10 and even the CNG bus. We see actually as the highest societal cost ratio in this analysis, but wouldn't receive funding if you're looking at NOx, PM, or even a Carl Moyer metric.

And then in the next slide I do have in the appendix the values for all of these different technologies, but this is meant to go expansive.

Now, we're looking at potentially 16 different technologies and actually ranking them.

And so, I'm just going to highlight a few of them to show -- let's say if you look at the diesel particulate filter. This gets back to one of the key points is depending on the formulas you use, technologies rank extremely differently.

So, dollars per ton of NOx and GHG, DPF would not receive any funding. PM, it would receive funding. And, potentially, in a Moyer context it would receive funding.

But once you start looking at the full societal benefits or any type of private benefits, it moves to the middle to the bottom of the list.

CNG bus, in terms of individual metrics is around the middle of the pack. But then once you start taking into account all benefits, it starts moving higher up because it actually does have petroleum displacement, in addition to all the different pollution reductions.

And then the last one is looking at an electric forklift. And so, this one is highlighting a 19,000-pound forklift, which is a very large forklift which would displace a large diesel forklift, more like ones you'd see not quite at the ports, but of that size. Not a smaller forklift that would be more for internal warehouses.

And so, it is the same thing as kind of the CNG bus we're looking at, middle of the pack in terms of all individual pollutants, but then it starts moving higher up with a total societal benefit cost.

And then when you consider that it actually has a pretty high private benefit cost ratio, then that starts leading to maybe it's a technology potentially for funding because if you start at the beginning, investing in some of these technologies, then they can catch on into the market because they do have a private benefit cost. There is a reason for consumers to continue acceptance.

And so that is actually the end of my presentation. But the same thing, three, right, the same points is that even more than just the specific values here that were presented, the metric itself and the decision of the formula is very important because that dramatically determines which technologies are the ones that receive funding.

And then including all benefits of technologies from criteria pollutants, greenhouse gas, petroleum reduction is very important.

COMMISSIONER SCOTT: Thank you very much, Jeff.

I must note that it was music to my ears when you told me you were going to put a letter together and

send in the study. That's something I'd love to encourage all of our panelists.

And anybody, really, who has comments or thoughts on this, if you could write -- you know, get the details down, whether it's a letter, whether it's a study, or data that you just want to send us to make sure that we've got it in our docket and on the record, I would very much appreciate that.

And I know that we've done the lightening round and that there's lots of additional information that sort of underpins the things that we're talking about. So, that's another place we could hope to get some of those additional details.

I will now turn to V. John White, welcome.

MR. V. JOHN WHITE: Thank you, Madam Chair. I apologize for being late, but I had another engagement that ran over.

I'm not sure why I'm on this panel, other than because I have some experience with the history of these programs and also maybe a more qualitative judgment than some of the others.

But I had the honor of working with my friend, Tom Cackette and Carl Moyer on the original design of the Moyer program, and also on -- with Allan Lloyd and Paul Wuebben on the original legislation that created

the Office of Technology Advancement at South Coast.

And so, I'm familiar with the origins of these programs and some of the thinking.

And I guess a couple things that I would observe and opinions to offer is that we really need to keep our eye on the prize, which is we're going to need very, very deep reductions in GHG emissions by 2050, 80 to 90 percent.

And we have, even sooner than that, a need for very deep reductions in criteria pollutants.

The Vision Document prepared by CARB, and the San Joaquin Valley, and South Coast suggests we need 80 percent reductions by 2023, and 95 percent maybe by 2032.

So, the air quality challenge is very important to keep in mind because, while the greenhouse gas is important, the health benefits and the environmental justice benefits are disproportionately focused on the criteria air pollutants.

And so, I'm very glad just to have the pleasure of sitting here, listening to the fine work being done by all the agencies. And just looking at these programs together as a whole, as well as in their individual parts so that we can see what's -- where the overlap is, where the duplication might be, and so forth.

Second, with regard to storage, I just want to mention that I think a metric that the PUC needs to rethink and get right is that we need to be looking at greenhouse gas emission reductions per gigawatt hour, not just the power output.

Okay, because for storage it matters, particularly how much storage and how much discharge we're getting.

If we're going to minimize the use of fossil fuels, which is one of the reasons to do the storage.

I think, also, we need to keep in mind the potential reductions of the criteria pollutants and their community health benefits in terms of avoided sick days, hospitalizations, worker productivity and so forth.

We need to be transformative across all aspects of the economy, but we need to keep the under-served communities firmly in mind, particularly as we develop the portfolio of projects.

One of the things about the Moyer Program that Carl inspired in us was there was a lot of interest at the time in the support the program would give for relatively expensive emission reductions, mostly from natural gas.

But what Carl emphasized was that there were

some very significant reductions available from retrofits, which we hadn't even seen the technology for, yet.

But if we made that part of the program, we could end up having some very expensive tons associated with natural gas and electric technologies, and some very inexpensive tons associated with retrofits that would have near-term benefits.

And so, that kind of came to mind when we're thinking about this that we need to think about a portfolio, and then we need to think about some of the non-quantifiable variables, such as social equity and environmental justice.

I do think that it is a little passing strange that the folks from Tesla think they're entitled to the full amount of incentives no matter what their car costs, when we have a lot of -- you know, one of the things that concerns me about the EV program is we are building in these incentives as what is going to be there.

And if we're going to reach our goals, that's a lot of money. That's a lot of money.

And while AB 8 had a very good coalition of people working on it, it's a lot of money to start building in.

So, I think we need to think about, as we develop these incentives, how do we make them go down in time so that the money goes farther.

This is an example from our solar experience where we had 3,000 megawatts, $3 billion. And they're theory was you increase the volume then the unit of subsidy can go down.

And that's something that we ought to be looking for here and not give people a sense of entitlement that we're going to be there with the same amount of money, no matter what, because we expect this to lead to cost reduction.

So, the other thing that I think I would include in your vision of this -- of all these programs, and having Dr. Eggert here, and my friend, Tom Cackette, you've got some very important talent to advise you.

And it is we need to think about transparency of these metrics. We need to think about emission reductions, costs, I agree and, you know, societal benefits, and so forth.

But then, we need review and evaluation to see what we got with the money we spent, and then what might we learn from that, and then recalibrate and adjust in response to those evaluations.

Okay, but if you don't have the criteria and the

transparency built in, then the valuation is harder to do and then it becomes arbitrary.

I think, also, one thing we haven't talked about too much, but I think given the lack of progress we're making on reducing carbon emissions, I'm happy that everybody's happen about the President's plan.

But there's an article today that said, you know, it's not nearly close to getting us to the 2030 goals that we agreed in Copenhagen to try to pursue.

So, we're going to need additional reductions. And the utilization of CO2 in the creation of technologies, there's -- my friend, Paul Wuebben's working on renewable methanol in Iceland, where they're actually using CO2 to create the fuel. We may need to think about that as an additional --

So this is why even though people's dreams sometimes have a way of becoming entitlements in this world of incentives.

And so, I think we need to keep everybody understanding that these are programs that are not locked in. These are not guaranteed incentives. Although, we want certainty, we want to build in a valuation, an adjustment and recalibration so that we can optimize as we go forward.

And also have a story to tell when it comes time

to try and reauthorize this money.

And the Legislature, most of whom won't have been here when the program was original developed, have a basis for judging the progress that has been made and the adjustments that need to be made.

Thank you.

COMMISSIONER SCOTT: Terrific, thank you so much.

And last, but certainly not least, Tom Cackette, welcome.

MR. CACKETTE: Well, thank you, Commissioner Scott and staff for inviting me today.

Given the lightening round format here, I'm going to focus on a very narrow, but I think important part of this overall metric and evaluation process.

And that's going to be looking at mainly the greenhouse gas aspects of it, and the proposed projects, sort of the up-front part as opposed to the valuation after the fact.

So, the next slide -- so just to check against -- my ideas against some of the statute, you can see here that AB 8 says that, "The Commission shall provide preferences to those projects that maximize the goals based on the following criteria", and Anthony showed the long list.

And I picked out the ones, since I'm talking about GHG, that says, "consistency with climate policy".

And, of course, we all know that Governor Brown and Governor Schwarzenegger have adopted the 80 percent GHG reduction by 2050. So, that's clearly one of the climate policies that we need to be consistent with as we go forward with these projects under AB 8.

And so what I'm going to suggest is that we sort of spin this a little bit more away from hard analytical numbers. I know the statute says you got to do dollars per ton, and tons, and things like that, but it also suggests a lot of other things, and there are other policies that aren't very amenable to this idea of coming up with an exact dollar-per-ton type number.

And it's really hard to quantify and then combine those. Like it's very hard for ARB, I think, to even come up with the idea that they could combine cost effectiveness of PM versus NOx. They had to come up with a formula that, you know, people may not agree with.

And it's certainly true in other areas. When you try to do energy with climate change, you know, they don't always match up in an analytical way.

So, I'm going to suggest that we need to have a more of a qualitative ranking of the proposed projects

and that -- against the various goals and in this case, my example against the GHC goal.

And that these should be clearly stated and the investment plan should provide, I think, some more elucidation into what these policies are, and more transparent, and how they might be done in this qualitative manner.

So, I just have one slide, the next one, which gives an incomplete, but maybe sheds some light on how such a qualitative evaluation can occur.

And I think this should come first, before we get into the tons, and the dollars-per-ton type thing.

So, for example, you'd have to ask the question of will the project contribute to achieving the goal?

So, one of the first things is does it appear to be necessary technology, fuel or infrastructure to meet the GHG goal?

Sometimes we have lots of different ones and maybe some of them are really great on the short term, but they don't necessarily benefit us towards the long term.

And then another one is can it have a big impact? And do we really want to spend our money on something that could reduce the total sector emissions, GHG emissions by five percent, when there might be

another one that, if it's potentially successful, could maybe do 50 percent.

So, that's a factor that you could qualitatively take into consideration.

Even if it's successful, even if there's a fuel, for example, out there that could completely take over the transportation sector, light duty for example, does its performance fall short of the goal?

And we could eliminate petroleum and go to something else, but if it had a 20 percent GHG reduction, and that's the only potential, it obviously falls very far short of the goals that have been set on greenhouse gases.

You know, is it the best option or are there other approaches that are more likely to be successful?

You know, we might have multiple ones to look at and sometimes they have a lot of merits and a lot of supporters, but maybe certain ones are just better to follow from a qualitative stand point, than other approaches.

And then, is it realistic? You know, we can invest in something that might have some short-term benefit, but is there really a business plan that would allow it to be sustainable.

And so, I think you can combine these things

into sort of a -- well, even before that, I think we have to rate the risk of success. And that should be done transparently in the program.

And I say that because of a principle that I believe, and I know not everyone does, but it is that there should be a balance in these funds between things that are low risk that we know are going to pay off with, you know, high probability, and things that are high risk that have a good chance of failing, but could have enormous benefits in the long term.

So, some balance by assessing this risk in your overall portfolio, I think, would be a very good thing.

Now, you can assess the specific benefits of the projects, like has been done, the tons to be reduced. And I want to point out that doing it only in dollars per ton isn’t too helpful if a very, very cost effective project only has the potential to get a one percent reduction. And it is really the tons that count, as well, so you have to balance those two factors.

But this more analytical metric is really better for comparing similar projects, you know, maybe a couple of different infrastructure projects, or a couple of vehicle subsidy projects. Compare them together based on some cost effectiveness.

But then only include that as just one other

factor compared to the ones at the top. It's sort of like when we do some competitive bidding that's very technical, we don't say we're going to pick the cheapest project. We take the cost benefit as one factor out of five or six other rankings that you do to determine whether that contract is better than another one.

And so, I think that kind of a process would be far superior to just relying on the hard metrics that we have now. But the key to it is making it transparent so that everyone can see how the decision making's being made.

And to have the investment plan be a good setup and a real good analytical discussion of these policies and how the Commission wants to go forward with applying them to the projects.

So, that's it, thank you.

COMMISSIONER SCOTT: Excellent, thank you so much.

So, we have just an amazing set of metrics, and ideas, and thoughts on the table here, so I'm going to turn it to Anthony, now, to help us facilitate a good conversation to think about how -- how some of this can be applied to the Alternative and Renewable Fuel and Vehicle Technology Program as we go on .

And I'd like to invite Dr. Melaina, if he

wishes, and Jim McKinney, yes, and Charles, if you'd like to come and join the conversation, I think that would be terrific. Anthony.

MR. EGGERT: Excellent, thank you very much, Commissioner. And that was a very informative set of lightening presentations.

And I do have questions. I have a number of questions here, but I would also invite yourself, if anything -- you want to sort of chime in with any additional questions or comments.

I'm going to maybe go right to the most provocative here to get things moving. And I think V. John sort of raised the point, which is -- oh, sorry.

COMMISSIONER SCOTT: Just a quick interruption before he does that question. There will be a transcript of this, so that's kind of the best way that this will be captured. But the rest of us will be kind of taking notes and everything as we go along. So, I just wanted to make sure folks knew that.

And for the people who are on the WebEx, if you can say your name before you answer the question that would be really helpful for them as they're trying to follow the conversation. Thanks.

MR. EGGERT: Excellent. I thought maybe you were forewarning there was a transcript from the

provocativeness of my questioning. So, maybe it's not that provocative.

(Laughter)

MR. EGGERT: So, V. John, you know, mentioned this idea about the need to avoid entitlement. And so, I guess this is sort of a question open to the full panel which is how do we know when to stop? You know, how do we know when the public investment either has been so successful that the private sector, you know, can carry the load under whatever sort of market or policy conditions might exist at that point?

Or, sort of the flip side of that is how would we know when to stop when something maybe isn't panning out in the way that we might have anticipated or hoped for.

So, if anybody's given -- had any thoughts on that or --

MR. ERIK WHITE: Well, I'll say a few.

MR. EGGERT: Erik.

MR. ERIK WHITE: Because, you know, I think we wholeheartedly agree with that comment. And it's a question that we've struggled with in our AQIP program, for the CVRP, in particular.

So, we look at light duty rebates. When is the right time to start ramping those down? When is it time

to start looking at whether or not we've invested sufficiently in one technology and can begin to look at other technologies that are emerging in the marketplace, or shifting to a completely different sector of the marketplace?

And so, the plan that we've developed this year really strives to start to lay out -- I don't think we have the answers, yet, but start to lay out the questions and the discussion about how to start to do that.

Is it looking at market penetration, manufacturers in the marketplace, technology costs, consumer uptake and acceptance?

How do you start to quantify some of those so that you can look at many of them, because I don't think any one of them, individually, is ever going to give you the answer you need as to whether or not the market is self-sufficient and those investment dollars could be shifted someplace else.

But I do agree that if we don't start looking at that and having the conversation, there is going to be a belief that those incentive dollars are going to be there in perpetuity. And they become part of both the pricing of the technology in the marketplace and, ultimately, could lead to a slowing of development and

reduction of costs because those government dollars are always there to prop things up.

So, I think it's very much something that the Energy Commission should take a hard look at. It's something that ARB is looking very closely at.

And I would expect and hope for the next couple of years we'll have better information to start to make those, to lay out that case and look at multiple years ahead and start planning for transitions in our incentive programs.

But, certainly, I agree, the project that is the one that comes to mind is the one that is really getting to that point where we need to have a serious dialogue on that.

MR. CACKETTE: Well, one thing I think to keep in mind is this classic valley of death problem. I mean that's what we're dealing with is we've got technologies here that are either still in development, like some of the fuel projects, or the technologies are here but the market's still in development.

And so, you can look at sort of the valley of death. If you think they're getting through the valley of death, and assuming you still have money -- or don't -- if they're still in the valley of death and assuming you still have money, then they still deserve

some incentives because we're trying to get them to the early commercialization stage before stopping.

Of course, if you don't have enough money, you then have to do a little bit more of a projection and decide whether or not this technology might have enough legs to do it on itself, to actually get into the commercial market.

But I don't think anybody expects that we're going to have incentives forever. I mean that's one of the principles I had is does this thing have a business case for the long-term future?

If it's going to be, you know, a $20 fuel that might come down to $15, and we don't project the gasoline or diesel, or any of the other ones are ever going to get above $5, that sort of tells you what the problem is, and that that's probably not something you should be pushing towards.

But yet other ones, like on the vehicle side, we do know that the electric vehicles and the fuel cell vehicles, from looking at the latest National Academy Report, can become cost effective with internal combustion engines, the same price or even cheaper over time. So that helps you also look at the threshold of when these incentives clearly should end.

MR. EGGERT: Dean and then Marc.

MR. TAYLOR: Just two quick thoughts. No alt fuel has ever made it to a million vehicles in the United Sates and I think all of us have been trying for decades, out of a vehicle stock of 250 million. So, it's a really daunting, you know, number to achieve.

The Federal government, I thought on tax credits, instead of picking a year did it by manufacturer so that the tax credits start phasing out once an individual manufacturer reaches 200,000 units.

So that's, I thought, a very creative way and it also gives you a sense of scale, too, I think, of the problem given that there's probably 20 or 30 manufacturers.

MR. EGGERT: Right. Marc Melaina.

MR. MELAINA: So, I think I'll try and complicate the answer further. I think another thing that was mentioned in the National Academy Study was that if California, the U.S. and other countries start being successful in displacing petroleum, global petroleum prices will drop.

And then our reference for what is competitive in the market is going to change based on what we're thinking now, if the price of oil goes up.

And so that's -- it's not just a moving target, we should expect that to happen with success.

MR. EGGERT: Great. Sure, go ahead, yeah.

COMMISSIONER SCOTT: Okay, so the question that I had was based on something that -- or I have lots of questions, actually -- but that Amy mentioned in her presentation.

And that was about if you just look at population, all the Federal dollars would end up going towards California.

And so they -- you took into account how to get money to other places, for example Nevada, with the rural school buses.

And we have actually a very similar issue, I think in California, in terms of wanting to be sure that we've spread the benefits of the program to all regions of the State. And there are, as you can imagine, certain regions of the State that are much more populated than other regions.

So do you or others at the table have advice for the best way to kind of make sure you're capturing a good geographic diversity as you're making investments?

MS. ZIMPFER: I don't know if it's the best advice, but I can tell you how we do it with the Diesel Emission Reduction Act Funds, the DERA fund.

So, we recognize, and it's not unlike other national decisions that are made, that there are state

differences.

So, when we allocate the dollars, we provide some into the competitive pot and that's where we use the calculation that I described.

And then each state gets a certain percentage based on a formula that we have. So, every state has a certain amount of money that they can use for diesel projects.

And then we have a category, if there is a certain sector that we feel needs some additional emphasis, for us this year it's the ports throughout the country, recognizing that there are disadvantaged populations, very often, that may have a combined impact from pollution in and around ports.

So, that's how we've done it. And we could provide some exact numbers, and so forth, and the way we went about coming up with those figures.

But that's the way that we felt. It spread about the benefits. We addressed some of the facts that there's difference in terms of there's risk numbers from state to state to state.

And also that, you know, it is a program that has national acceptance and I think has consistently had almost unequivocal support from almost all members of Congress, and that's been important to keep the funding

going.

MR. CACKETTE: Well, I want to comment a little bit on that in that that makes a lot of sense to me when you're dealing with local impacts. But from a global stand point, you know, if you spend some money, wherever it is, and it benefits in a GHG reduction it, arguably, benefits everyone everywhere in the world.

And so I could see a pathway in which if you have too strong of a factor in these rankings that says everybody should get a little bit or we should spread it, you know, rural versus urban, or something like that, that isn't necessarily the most efficient way to achieve the greenhouse gas goals.

And I guess we do have one in the new bill that talks about disadvantaged areas, so there's some need to respond to that.

But I wasn't aware that actually, you know, a spreading out so much for each county, or something like that was not in the bill as I remember reading it.

MR. ERIK WHITE: The only thing I would add to that is as you look at trying to, you know, make investments throughout the State, and I agree with Tom, you know, GHG reductions wherever they are achieved are working towards meeting the State's goals.

Recognizing, though, that not all technologies

will have applicability in all parts of the State, and so recognizing infrastructure limitations, how vehicles are used, where things are produced is very important in deciding where certain programs might have applicability and where -- and be successful, and where others just simply don't have a strong opportunity for success. So, I think that's important to consider.

MR. MC KINNEY: This is Jim McKinney. And I think one of the topics that several of the agencies are kind of responding to the recent legislation is the San Joaquin Valley.

So, we know from our program statistics that, you know, not a lot of our program dollars go there.

But then I look at the slide that Matt Miyasato presented and I think the inventory is somewhat similar to the San Joaquin Valley.

And if you're really looking at the off-road sector and then long-haul trucks as kind of major contributors, what's the potential effectiveness of our program dollars because those are not things that we focus on, per se.

And I think some of the medium-duty trucks, or the light-duty vehicle investments where we do have a much bigger impact, you know, how great a role might that play in the San Joaquin Valley for starting to

transform some of the preferences there for vehicles and fuels.

So, I think that's challenging. But one thing we have experimented with is our geographic, say, preferences or set-asides, and we did that for our centers' solicitation, recently, and perhaps that's something we could apply for other parts of our program.

MR. EGGERT: Excellent. Yeah, that just sort of -- one specific example that could apply here is those investments that are trying to simultaneously reduce emissions of greenhouse gas emissions and NOx, specifically, given the challenges that we know we're going to have in those specific areas around the State.

So, I guess the next question here goes to kind of an issue that Matt Miyasato brought up with respect to the regulatory backstop.

And I guess that's a question about -- certainly relevant here in the State, where we do have a policy landscape which includes programs that are very germane to AB 8, AB 188, like the Low-Carbon Fuel Standard, like the Zero Emission Vehicle Program.

And I guess I'm curious, maybe Matt, you could start expanding on what you meant by that regulatory backstop and thinking about public investment in the context of other regulatory programs?

MR. MIYASATO: Well, thank you, Anthony.

I think that the ones you mentioned are good examples, right. So, knowing that there is a regulation in place that will, in some respects, drive the market toward the zero tailpipe emission technologies, or cleaner technologies, that certainly helps, at least at the local level us to do a plus-up, and say, hey, this is coming down on the pipe. We need to ensure that you're prepared and we're prepared to offer, and send this for either further infrastructure or further buy-down.

So, that's helped us with medium-duty trucks, for example, where it's been the EPA, the Energy Commission where we've helped fund these medium-duty UPS trucks.

And much to Jim's point, those are manufactured in Stockton. So, some of those trucks also got a plus-up from the San Joaquin Valley.

So, you know, in areas where we can collaborate and provide further incentive funding for these typically small, entrepreneurial companies to get over the hump, I think that's important.

But having the end-users know that there's a date certain at which they will have to move to a cleaner technology gets them thinking about how do they

then plan on a five-year, ten-year timeline, rather than just this next year.

So, a good example was the truck and bus world, where the truckers knew or they purportedly knew that they were going to have to go to a cleaner technology, and then incentive funding was provided by Prop. 1B.

So, you know, that was a perfect example of how to transform that market. Now, we’ve got all post-2007 model year trucks running around the ports.

And by the way, we agree that population density should be one of the primary candidates for incentive funding.

But also, from the broader perspective, from EPA, and ARB, and CEC you have to look at where can your funding be provided that it has the greatest impact.

You know, that’s why we always push for looking at that kind of broad spectrum, but ensuring that the places with the greatest need are the ones that should be prioritized first. So, that’s just a pitch for the South Coast.

But I think we’re seeing a lot of regulatory activity that is pushing toward cleaner technology. A good example is also our port is going through a process now where it’s an indirect source. But the intent is really to say if you’re not going to meet your targets,

we need to have an opportunity to come in and work with you to help you establish or meet those targets, maybe not by the plan that you had originally required.

But knowing that there is going to be some stick with the carrot, I mean it's an important hand-in-hand, push-pull mechanism that we've seen work time and again.

MR. V. JOHN WHITE: Yeah, this is actually a point that I wanted to make, to emphasize that Matt made earlier, and that there needs to be a synergy between the regulatory strategy and the incentive programs.

And we need to be careful that we don't back ourselves into a situation where the availability of the incentive money becomes a requirement for regulations to be adopted.

I think in the Moyer program we were successful. And the origin of the Moyer program was the case that we had a Federal implementation plan coming down on us to get tons from the diesel sector that we didn't feel like we could directly regulate without a street fight and potential litigation.

And so the idea was, well, let's just buy some of these tons and get going on it. But also, use the money to drive down the cost of compliance so there's a relationship between -- and I think South Coast has been successful in this regard, also, with the Office of

Technology Advancement -- is you use the money to prove out the reductions being feasible, and to help reduce the costs. But also, use the prospect of direct regulation as an incentive to drive participation in the program.

Because the money may not be there forever, so you value the early adopters and reward them, but you also use the program to drive the market so that you can regulate it.

Because again, the depth of the reductions that we need, both on criteria pollutants and GHG, are such that we can’t imagine doing this entirely with incentive programs.

And so we need to think about the strategic -- and this is where I also agree with Tom that the qualitative judgment, rather than some pseudo-quantified, you know, thing that in the end is as arbitrary as a quantitative judgment -- a qualitative judgment, should figure out what’s the strategic value of what we’re doing here.

And, you know, a rigorous cost-of-benefit analysis is fine, particularly on stuff like comparing costs, well-to-wheel, those kind of things where we really see what the value proposition is for the technologies.

But at the same time we should look at how the incentive programs help us make the regulatory programs more successful.

MR. MIYASATO: Can I just add to that?

MR. EGGERT: Yeah.

MR. MIYASATO: John, thank you for reminding me. So, the very specific example I want to bring up is our fleet rule. So, we have limited mobile-sourced authority over a public fleet. So, if a fleet is greater than 15 vehicles, when they purchase the next vehicle greater than that 15, they have to have the cleanest available technology.

So, having that in place for our transit fleets within our region really drove LAMTA, Los Angeles Metropolitan Transit Authority, the sixth largest transit authority in the nation, to go to all natural gas. And I think they completed that conversion two years ago.

But that was a combination of not only having a fleet rule in place but also, on the other side of the coin we were offering incentive funding for the purchase of vehicles for buses, as well as infrastructure.

We saw that also with the waste-hauler fleets, so Waste Management. They have a huge fleet of natural gas vehicles and we were able to incentivize them with

infrastructure, as well as assistance with the vehicles, themselves.

So, having both of those in tandem, we believe, is able to achieve this turnover that John was talking about.

COMMISSIONER SCOTT: Well, I would add, too, when I think about sort of a specific metric, maybe based on what you said, Matt, when you were first speaking, is that one measure of success might be how the percentage of trucks that were transitioned from, you know, the older trucks to the 2007 or post-2007 trucks. You know, that’s kind of a specific metric that goes along with what you said earlier.

So, I think my next question here would be based on Jeff’s excellent slide that he did on number five. And I don’t know if Heather or Lynette could help me pull that up from Jeff Rosenfeld’s presentation, and it was slide number five.

And, basically, this is the one, though, that showed the ranking comparison between the metrics. And I think it’s a really important point and it just captured it really well, all on one slide, with the different yellow highlights that you had.

And Tom mentioned a great way for how we might want to think through, and John echoed it as well, an

idea for how to think through how do you sort of sort through all of this and decide what is the right metric as you're ranking -- I don't know if it's a charging station, or ranking a hydrogen fueling infrastructure, or ranking the value of a medium- and heavy-duty truck versus some other things.

And so, I would love to know if other folks have, or Tom, you could reiterate your last slide, too, if you like, suggestions for how we might take some of this -- because this, I think, illustrates really nicely how complex it is to just pick one thing.

But it also shows if you pick a couple of things you'll probably get to the right answer in terms of picking some of the top technologies that you want to focus on.

So, my question is how would you take something like what Tom suggested as sort of a how to rank your way through this and apply it to the Alternative and Renewable Fuel and Vehicle Technology Program.

MR. ERIK WHITE: Well, I'll say a few words on that because -- well, ours didn't look quite that complicated, but we went through a similar assessment as it related to implementing AB 8 and the metric requirements in that.

And to Tom's point, the importance of

qualitative considerations as you look at what to fund, we ultimately determined that we somehow needed to quantify those qualitative considerations in a way that would allow us to come up with a ranking or a score amongst the various projects that we wanted to.

Recognizing that on a purely benefit cost score perspective certain projects, you know, may not look very attractive on a dollar-per-ton or ton-per-dollar basis because they are in that valley of death. They are early in their development process and the potential future benefits are significant, the potentially expected near-term benefits are small.

And so, how do you start to try and bring those in? And so some of the ways we looked at that was accounting for both expected current and future benefits as it related to price reductions in the marketplace for the dollars we were investing today, expected, deployment rates of the technology in the future and the benefits that those would provide.

But also looking at I think just some of the things that Matt showed on his bar chart, you know, for instance how does it contribute to regional air quality issues?

And if it’s an important contributor, providing greater weight to that because it was going to get at a

bigger piece of that pie, so to speak, for certain regions as they needed to identify emission reductions.

But at the end of the day we ultimately decided that trying to quantify and come up with a score to rank our projects on an equal footing was the best way we could go because some of them were so different and so diverse.

How do you compare light duty with heavy duty? The investment needs and the benefits are so different and, yet, we need to move both forward.

And so we didn’t want to -- as that chart would show, if you only went on a dollar-per-ton basis, we would be funding diesel-to-diesel replacements as long as there were diesel trucks to take off on the road.

That does not put us in the position to meet our long-term air quality or climate goals. So, we need to find other ways in which to incorporate those metrics into what we did.

So, you might look at that. We thought that was a reasonable and prudent way to try and take various metrics and put them together into a meaningful comparative document.

MS. ZIMPFER: Yeah, I would like to just give a little more of a depth of the types of criteria that we use in our DERA program, or Diesel Emission Reduction

Act program.

The public health benefits and the monetized benefits is just one of many. We have about 10 different aspects that we score each project on.

Some of them, they're things like location and, again, we want to try to have some geographic diversity of the project.

We look at the regional significance. How significant is this project in terms of our Region 9 EPA requirements?

Things like how does it fit with other types of programmatic priorities?

And this can be or some of it is public health-based, but some of them may be more intangible.

So, we could provide this to the Commission and you can take a look at it, that there are ten total. So, it does try to get at some of the societal benefits that are here.

This is pretty complicated. I'd need a lot of more time to kind of understand it. But it does seem like you've done a really interesting -- taken a really interesting approach to try to quantify even the private benefits. So, this is interesting and it would take a while to kind of work through it.

MR. TAYLOR: Hi, Dean Taylor, Southern

California Edison.

I think what this slide is, in a sense, trying to say is people talk about being fuel neutral, everybody agrees on that. That performance standards are important and everybody seems to agree on that.

But this is kind of saying which performance standard?

This is just showing -- basically, I think the punchline on this slide is over on the far right is that is a better solution. The broader your metric, you know, the better. You know, you're being fair.

If you just pick a narrow metric, like dollars per ton of PM, you're going to end up with PM traps. And that won't do any -- it will have become very frustrating, I think, to both the public sector and the private sector.

I think what the private sector is looking for is, you know, stability and consistency over time so that we don't, you know, move from one fuel to another, and then ten years' later to another, and then to another.

So, obviously, that leads to stranded investments and probably a lot of frustration overall.

Maybe you could go to the prior slide, slide four is a simplified version of this, a little easier to

digest.

And that kind of illustrates how this -- if you just see that the ones in yellow are kind of the best ones. And so, the ones that -- you know, you tend to find that the cleanest technologies are, in the case of the plug-in hybrids, BEVs, forklifts.

We don’t have hydrogen on here, but I would suspect hydrogen, biofuels, all of them would do very well on the technologies on the far right, where you have a benefit cost.

And in a sense I think the AB 118, ARFVTP, I don’t know what you call your program is -- it has that. I mean if you look in the section, it says you have to do climate change, you have to do alternative fuels, and then it lists 11 preference criteria, everything from jobs, to multi-media impacts, and water quality, and on and on.

So, in many ways it reminds us what we all learned in school about an environmental impact report. You really need to look at the broader picture and that becomes a better, you know, metric.

So, one of the key conclusions of all of this is that metrics really matter, and it sounds like many of us are all doing that.

But maybe to answer your question about the

qualitative side that Tom was raising is that certain things that you do in the alternative fuel commercialization area are not very prone to metrics.

I think most agencies love hardware. It's really -- you know, and I'm sure the Legislature is probably saying we want metrics, we want proof, you know.

But there are certain categories that are not very prone to that and maybe that's more of what Tom is talking about especially is useful.

So, you know, I just note in the ARFVTP part of AB 118 there's some of these things that aren't about the hardware like infrastructure or vehicles, like market education and outreach.

I think Southern California Edison was saying dramatically increase that, in our prior testimony to you, from like $1 million a year to like $10 million a year.

I saw some of the other slides saying how important that was throughout the whole process. You know, it's just amazing how hard it is to get people to think about alternative fuels.

Stakeholder engagement, I was at a CEC-funded thing just last week on the PEV dealer ecosystem. I mean the whole dealership thing is really a crucial area

where you need users groups and a lot of deep thinking on how to solve that.

Another, you know, I think CEC funded a used battery, the first time every that the used battery community came together down at UCLA, about a month ago.

And those are all very, very useful things in the ecosystem.

The broader analytics are another example of something that is, you know, crucially important to do both in planning ahead to ask these kind of questions that Tom is asking, as well as the post-review data collection. All of that kind of analytics is very necessary.

Manufacturing, how do you -- you know, that’s a whole different -- how do you rank those proposals? That’s a whole different process.

Fuel production, jobs training, yeah, I’m glad you mentioned on one of the slides codes and standards. There’s a whole bunch of other, you know, removing of barriers.

I mean I think that’s why alt fuels commercialization tends to fail sometimes is we don’t pay attention to some of these other little details or give enough money to them.

And again, I would encourage you not to go crazy

on the metrics on this because it's going to be really, really hard. So, I don't know what the answer is, maybe it's the proverbial 80/20 rule where you kind of protect some of these hard-to-do programs and just don't do such rigorous metrics.

Save the more rigorous metrics like this maybe for the infrastructure, for the vehicle rebates, and for those things.

And I like how, Anthony, you mentioned the two things of policy versus projects. So, one of the key -- I think I'm mostly talking about the front end, the policy stuff, how do you figure out what to do in the beginning stages? How do you correctly bucket the monies?

COMMISSIONER SCOTT: Let me just add, before Tom starts, the AB 8 criteria, and thanks for raising those again, I think are a really good lens by which to view these through, and we certainly do that as we are putting together our solicitations. A lot of the scoring criteria are based directly on some of those criteria, as well.

And even though public health benefits aren't -- or I think that's something that we should also really capture. I think, you know, I used to work at Environmental Defense Fund and that was oftentimes very

much the lens by which I looked through to see whether we thought rules were good, whether the projects were good and things like that.

And I think to the extent that we could at least take some of the benefits, and Jim did this in his presentation, and you can kind of add them up. Well, we know because we have this many new all-electric trucks versus this. You know, if they were the same types of diesel trucks and you could actually see what, you know, the pollution reductions are and then translate those into health benefits.

And I think that's an important piece for us to continue to do more, as well.

So, I'll go to Tom and then back to Amy.

MR. CACKETTE: Well, I was just going to give an example of kind of the structure or the concept and it's -- you know, I don't want people to laugh at this because it's a car performance magazine concept. But it sort of encompasses what I was trying to suggest.

If you look at comparison tests in *Car and Driver*, for example, you'll see when they test a Mustang versus a Camaro versus a Charger, or something, a Challenger, what they do is they have various categories.

For example, they give a possible 20 points to

zero to 60 time because that's what they're about, you know, how fast can it go?

And then they might give only five points to ride comfort and NDH for the vehicle.

And then they rank the vehicles together using that kind of a concept.

Of course, the challenge is why does one get 20 -- on goal get 20 points at maximum and the other one only get 5? And that's where it would really get huge pressure on the CEC to try to evaluate that in some way, and to put its judgment forward.

But I think that judgment is -- if you don't put it forward, it's really buried in here anyway, it's just that nobody understands what's really happening, what you really value the most versus don't value the most.

So, that's just an example of how it could be done on a number scale, like 1 to 10, or high, medium and low rankings for some of these categories, but then you have to weight the various goals and that is judgmental, but I think it's necessary.

MS. ZIMPFER: Hi, Amy Zimpfer, again. I just wanted to take the opportunity to build on what you were saying about public health impacts and building that into the decision criteria.

With your new requirement under AB 8 to look at

air quality, I want to really significantly emphasize that potential for NOx reductions in 2023 and 2032.

Matt Miyasato put up the slide. The task before us in California is profound to meet the national ambient air quality standards.

And the potential that you have to really couple your previous objectives on petroleum and greenhouse gas reduction, coupling that with NOx reductions is going to have great benefit for the State.

And I really do think that is one of your potent criterias that you can bring in, public health evaluation.

When assigning human health value for EPA to any particular action, it’s generally driven by PM2.5.

And the linkage between PM2.5 and NOx, NOx is a precursor.

And so focusing on NOx in San Joaquin Valley and in the South Coast, and its ability to reduce ultimate public health exposure via PM2.5 is the key.

And we can provide some more examples to you and your staff, but that diesel emission quantifier is one methodology you can use to maybe really get at that criteria you need to look at with respect to public health under the air quality parameter.

COMMISSIONER SCOTT: I think it -- and it’s

interested because AB 8, it says, “The ability to reduce air quality pollutants, toxics, and avoid multi-media impacts.”

But it doesn’t actually say public health benefits, but I think that’s an important -- most people don’t know, okay, if we’ve reduced 100 tons of NOx, most people don’t know what that means.

But if you translate it into public health benefits, that helps explain what that means and why it’s so valuable.

MS. ZIMPFER: And then just it can be monetized so easily and you can do a comparison of the public health benefits that are monetized against the costs and the dollars you’re putting towards that modification.

MR. MIYASATO: So, Commissioner, Matt Miyasato, South Coast AQMD. I just want to make a few comments because you did want to -- you did put the slide up on these different comparisons between -- or quantitative comparison between metrics.

I just want to go back to Anthony’s original comment that you really need to know what your goal is before you design or develop that metric.

And so, these were developed under different -- I think Erik mentioned, different conditions, and different time frames, and different goals.

And so, I would just echo an earlier comment that I made is you really -- I think it's fair to judge technologies based on a metric for something that's verified and commercial.

And so, when you're looking at these emerging technologies, as I'd mentioned in my presentation, I would have to agree with Tom and Dean is, you know, don't go metric crazy. Look at these quantitative -- qualitative, rather, valuations for the program and its ability to get to the end goal.

And echoing what Amy just mentioned is there's a deep need in both the South Coast and the San Joaquin Valley for these zero and near zero emission technologies. And your program has helped tremendously in us being able to develop those technologies and continue to develop those.

The final comment is that this is a -- I really like this chart and I'm anxious to dig into more of the study.

But, you know, a lot of these technologies are on different places on their cost reduction curve, or as Tom was saying, different places in the valley of death.

And so, it's a bit unfair to judge them on the same -- you know, it's apples and oranges and they're not on the same playing field.

And that really gets back to that first question you asked, Anthony, is how do you know when to stop? And it's difficult to know when incentives don't -- no longer play a role.

So, a good example is these single truck drivers that still need an incentive to go to natural gas even though over the course of a certain period of time it's a positive payback, but they just can't afford the initial capital. And so, the incentives in that case still make sense, we believe.

So, it's a difficult question and I think you need to take it on a case-by-case basis as these conditions come up.

MR. V. JOHN WHITE: This is John White, from CEERT. I would say, first of all, just recognize there's no substitute for judgment, okay. And that in the end that's what you're paid to do.

The metrics, and the data, and the quantification are to inform your judgment, but they're not to substitute for your judgment.

And we've seen this in modeling exercises of various kinds. That's why the evaluation and feedback loop is so important so you can see what you've done. You see what it costs. You see what you didn't get to do because you spend the money here.

And then just to emphasize the point about the role of regulation, we have been blessed with an abundance relative to other states and countries, of these funds. And in some ways, I think, people are giddy about how much money there is.

But if you look at the rest of the society's needs, and areas like education, and water, things -- you know, we have a lot of needs on assistance.

So, it's encumbent upon us to spend this money wisely and, as I said before, to use it as leverage with our regulatory program.

And I'm grateful that the car companies have abandoned their attacks on the ZEV mandate, in light of all the incentive money that has been made available, but the ZEV mandate is not going to -- and my hope is it will exist and drive the technology, and the cost reduction along with the incentives, and that we will use the incentives to go further with the regulation, rather than using the incentives as the ceiling on the regulations.

Okay, I mean, you know, and I understand we live in a time where direct regulation, and command and control are not as appreciated as they should be, but that's how we got here, as far as we have, is with a direct regulation that was supplemented by incentives.

And I think it's a slippery slope to be on. My earlier comments were designed to have us keep in mind that these resources may be finite and so thinking through how they help us get to the deeper reductions, combined with other tools in the box, as opposed to being the whole universe of what we're doing I think is an important distinction.

MR. EGGERT: So, this is a follow up and I -- this is my last question, and I think it really builds upon something you just said, V. John, now, and then actually when you were making your comments earlier I thought you might actually be reading off one of my slides about this need for sort of do, learn, adapt. Those are my words. I think you used a slightly different version.

But this gets to the point of how do you know if what you're doing is actually having a difference.

And how many people here have either read or seen the move *Money Ball*?

So, there's a -- I've mentioned this to the Commissioner, there's an initiative underway right now called "Money Ball for Government". And it's all about how do we use data collection, analysis, statistical assessment to understand sort of which government programs are working well, versus which ones maybe

aren't working well and either need to be adjusted or ended.

And so I guess, you know, I think there's a huge, huge role, potential here for undertaking a fairly extensive program evaluation through data collection and analysis. They advocate within this initiative for at least one percent of program funds.

So, I'm curious if anybody has any thoughts about how this program might do that in a way that does provide sort of that feedback loop, that ability to sort of adjust and improve the program over time.

Dean?

MR. TAYLOR: That's one of our comments on a prior workshop where the EV Infrastructure Plan was -- we were planning on saying just that is to form some data collection, or almost like users' groups, or the different stakeholders, be it universities, research institutes, national labs can better compare and collect all the data.

So, that's just one small example. You could take that basic idea and apply it in a bunch of different areas.

It's really easy for all of us to get very siloed and, yet, data is what we really, really need. I think most of the private sector is saying let's -- we

need much more data before there's more -- don't over-regulate or don't over-legislate, let's get more informed.

So, at least one percent, maybe more of the money can be easily spend and just have a whole lot more collaboration between all the different parties because the data really is, seemingly, hard to find.

I'd also just chime in, maybe going off what Matt said, is that we haven't talked a lot about RD&D, but that is an important bucket within the program.

I mean, I think we've talked a lot about infrastructure, or vehicle incentives, or some of the other things.

But RD&D gets to the emerging thing and it should be treated very differently.

So, if any of these up there are in the beginning stages, and they're at the first 10,000 units or something, by all means that's in a very different category.

Because one of the struggles is how do you quantify that? Do you look it over the first -- you know, eventually, hopefully, they'll get into the millions of units, so what is the cost for time?

You know, do you amortize all that RD&D money over the first hundred vehicles or the first million

vehicles? You get very different dollar-per-tons numbers.

So, it's very challenging to do RD&D metrics.

MR. MIYASATO: Yeah, I would -- Anthony, I think, so Money Ball I keep thinking about statistics and a lot of things that -- I can't remember, was it learn, do, adapt?

MR. EGGERT: You start with do and then --

MR. MIYASATO: Okay, that's probably better.

MR. EGGERT: Yeah.

MR. MIYASATO: But that's very similar to, you know, the sigma philosophy on -- you know, where you design, measure, analyze, improve control, so it's a similar process.

But I think it comes back to what John has mentioned is all these statistics are no substitute for judgment.

Right, so you need to -- you can apply that, I think, on verified technologies, such as Dean was mentioning, on things that are concrete, you can get a dollar-per-ton value and a metric.

But for these other things, these more quantitative, long-term planning that Tom was mentioning, I think it would -- you can have these qualitative discussions with the investment to give us,

you know, where are these priorities and how do they mesh in the other needs in the local areas, as well as the State?

MR. EGGERT: So, Erik, maybe just one, a couple of examples. You know, we -- one of our partners within the Plug-In Electric Vehicle Research Team, they do a lot of work on infrastructure for plug-in vehicles, of course.

And the need to understand how the existing infrastructure is being used, you know, how often people are using it, what types of vehicles is something that is very, very difficult to come by.

And I think that does present a barrier even, you know, for these emerging technologies where we're just starting to learn about how that market evolves and the customer behavior that aligns with it.

And another sort of really compelling point that came up during the Governor's ZEV Action Summit was the need to help guide some of the private investment, particularly in the medium- and heavy-duty sector where they don't have a tremendous amount of RD&D dollars, themselves.

Where if these demonstration programs, funded through the government, can provide compelling, credible information about what's actually working they -- it's

much more easy for them to sort of pick up the ball and guide their private investments towards the best technologies.

So, Erik?

MR. ERIK WHITE: The only thing I would add is that, you know, we have been blessed with having substantial investments to make here in California to support, you know, the various goals that we have, whether it's the air districts at the local level, at the State level, CEC, ARB, at the Federal level EPA, DOE.

But we have to recognize that there are limited budgets. While we have a tremendous amount of money, I don't think there's anybody that believes we have enough.

And so having data to help inform how to invest, how much to invest in particular projects is absolutely critical.

It doesn't substitute for judgment and an ability to look at a technology or look at the marketplace and provide insight that the data doesn't necessarily reveal.

But at the same time it should be, I think, the foundation for which funding decisions and investment decisions should be made.

And so to the extent that as projects move forward having mechanisms in those projects to collect that data, to help inform future decisions is absolutely critical.

MR. EGGERT: V. John, did you have -- you had your marker up there.

MR. V. JOHN WHITE: Oh, that was from a previous one.

MR. EGGERT: Okay.

COMMISSIONER SCOTT: I had one last question, I think, for the panel and then I know -- I recognize we're just a little bit over time, but I'm so excited to have all of you experts here to get to ask these questions to.

And one of the questions, and it was raised, I think Marc Melaina mentioned it, I think Anthony mentioned it, how do we attribute the project benefits, right?

And I think it's something we talked about in terms of if South Coast, and EPA, and Energy Commission have all put some money together and it means that we've got, you know, some new charging infrastructure and a few new cars, you know, how do you kind of attribute those benefits as we're working our way through them?

And I wondered if folks have some thoughts or

suggestions on that?

MR. MIYASATO: So, the clarifying question is the concern is how do you attribute the dollar per benefit from the Energy Commission?

COMMISSIONER SCOTT: Yes. So, do we get to take credit for all of it?

MR. MIYASATO: Well, what we do at the South Coast, we take full credit for everything.

COMMISSIONER SCOTT: There we go.

(Laughter)

COMMISSIONER SCOTT: Yeah, that was going to be my answer.

MR. MIYASATO: But the reason for that is because oftentimes a project would not go forward if all the funding was not in place.

And so, if you're the last in that helps that project go, you should be entitled to that full benefit.

COMMISSIONER SCOTT: There we go.

MS. ZIMPFER: This is Amy Zimpfer with EPA. We also take full advantage of emphasizing how much we've leveraged.

So, very often, our contribution is the smallest amount. So, when we go forward and talk about what the results are, we too will take -- will share information about the results of the total project, then go into the

cost sharing and the dollars leverage.

So, for every Federal dollar how much was leveraged. That's been very useful in our communication.

COMMISSIONER SCOTT: Great. Go ahead, John.

MR. V. JOHN WHITE: I think one of the ideas that you might have in mind in a broader sense is South Coast, some years ago, at the instigation of one of their most important and influential board members, who laid the foundation for a lot of the work that we did subsequently, who's Dr. Larry Berg, and he commissioned -- he got South Coast -- there was a lot of cost in those days about the cost of the air pollution regulations.

And so he got the South Coast Board to commission a study, by Dr. Jane Hall, then with the California State University at Fullerton, which was what's the cost of not cleaning up the air?

And that work proved very influential and very important. It really pioneered the whole analytics of the health cost, the lost employment.

Things that we now take for granted as being part of the debate were not considered, it was just the pure cost of doing the regs.

And I think in this case, because our

transportation sector is 40 percent of the greenhouse gas target that we need to reduce, and in the case of criteria air pollutant even greater, we have to examine the cost of not doing these things, also.

And, particularly, the embedded costs we're paying for the petroleum fuel cycle, including the fact that despite the current book in the Bakken shale, which I was noticing this week all the talk about the trains coming through Sacramento from -- without even knowing what's inside the cars, and whether the cars have any safe -- have enough safety equipment.

This is odd to me that we would not -- so, to me, when this program was considered for its cost effectiveness, the cost of not having it, and of not making these changes, and particularly the cost of our continuing dependence, and what might happen to us if that dependence, both from a security stand point, as well as from a GHG, not-getting-to-the-target stand point that's an important overriding consideration in terms of why we're doing this. And why, while the money may add up to a lot, it may seem like a lot, it's purpose it to avoid even greater costs than those which we are expending.

COMMISSIONER SCOTT: Dean. Thank you.

MR. TAYLOR: On the attribution question, if at

all possible I would actually agree with them and suggest avoiding it. In other words, it's a proverbial rabbit hole because it's very similar to double counting issue between -- and if you look on the regulation side, there's a lot of potential double counting between different -- let's say CARB programs like, you know, LCFS, or SB 375, or ZEV programs, et cetera.

And I think the best way -- I think the best way it's handled is you keep a whole separate ledger called the CARB inventory and there is no double counting over there.

But when you get into the programmatic areas of either regulations or grants, I think double counting and attribution are things that you just don't want to do there.

Do what EPA and South Coast are doing is probably the best.

COMMISSIONER SCOTT: I like the idea of mentioning how the funds were leveraged, as well.

MR. TAYLOR: Right.

COMMISSIONER SCOTT: Okay, I will turn to Anthony for some closing remarks, and then I'll make some and we'll go from there.

MR. EGGERT: Great, thank you, Commissioner. I'll be very brief.

So, again, just want to really, really thank the panel. This has been an excellent discussion on these topics.

I know it's something with our partners at Davis we sometimes debate on an academics basis. But having people that are actually, really involved in implementing on-the-ground programs, you know, struggling with these questions and coming up with, I think, excellent suggestions, insights based on real-world experience, I think this is -- I'm hoping you found it to be as useful for your purposes.

And I think, I mean my observation is that I think to a large extent a lot of what's been suggested is -- has been part of the program.

Not everything, but a significant component of it. It's not always been explicitly articulated in the context of the program, but certainly a lot of the different types of information that have been suggested as being relevant to program decisions have been coming into the program through program staff.

Certainly, you know, providing sort of an expert judgment, again both at the staff and at the leadership level, I think has been very much a part of that program.

So, I think you're starting with, I think, an

excellent foundation.

At the same time, you know, I think always we should be looking for ways in which to improve.

And so I think, again, there's been some great suggestions on how to even further improve upon the ways in which both the decisions are made about the major investment program types, and then also the project evaluation.

And, ultimately, I'm very hopeful that it -- there's an increased enhancement on some of the program evaluation, as we've discussed.

So, I think probably my last point is just this idea of really thinking about, you know, what it is we're trying to achieve. Keep reminding ourselves, you know, what the major goals for this in the context of the overall policy landscape in California.

I think, again, some of the things that some of the panelists have mentioned about putting this program in the context of the ultimate goal allows us to both see how critically important it is, but also the challenge of making it -- leveraging it to really contribute to those much broader and bigger goals for greenhouse gases and the other criteria that we're setting out to accomplish.

Thank you.

COMMISSIONER SCOTT: Thank you. I would just add, and actually I have a lot of the same points as Anthony did, that as we saw from our lightening round of presentations, and also the presentations that we saw earlier this morning, there are lots of good metrics out there that we could be using.

You know, whether it's dollar per ton of NOx, dollar per ton of PM, dollar per ton of greenhouse gases, you know, petroleum reduced, number of jobs created, there's a lot out there.

And as Anthony highlighted, many of those things are things that we already employ at the Energy Commission as we put together are solicitations is that we do the scoring criteria.

I think one of the things that we've heard pretty loud and clear is which metric or what metrics you pick matter.

That we need to do, learn and then adapt, or review and then evaluate to see what we've got, so that we can continue to learn and grow, so that kind of -- that loops back in on itself.

It is important for us and me to use good judgment, and to be qualitative, but to be transparent about what it is that we're doing here at the Commission, as well.

I've heard that we should not go metric crazy, but to make sure that we have robust foundation so that we have a good story to tell, so that when people are looking at the program they do have something to judge and evaluate it by.

And that we should remind ourselves of what we're trying to achieve and what the ultimate goal is.

So, I'd like to say thank you so much to our expert panelists for just a fascinating conversation. I really have been looking forward to this all week and you all certainly delivered.

And also to say thank you to Anthony for his excellent framing of this and his thoughtful facilitation, I think this has just been fantastic.

So, many thanks to all of you.

(Applause)

(Off the record.)

COMMISSIONER SCOTT: I want to thank you again for joining us.

If you'd like to make a public comment, please make sure that you get your blue cards over to Heather or Lynette so that they can get those cards up to me. I have a few here in my hand.

But I look forward to additional comments. So, I will start with Chuck White from Waste Management.

MR. CHUCK WHITE: Thank you, Commissioner Scott, Chuck White with Waste Management.

It's really been an interesting session for me to get all these different perspectives. You have quite a job ahead of you, as if you hadn't already, to balance all these interests.

I would like to just briefly discuss, hopefully briefly discuss two issues. One is tying in with the Low Carbon Fuel Standard.

But first of all, I'd like to talk about the greenhouse gas benefit cost. During one of the presentations, I think it might have been Charles' or perhaps Jim's, when you started doing the new rating criteria for using the greenhouse gas cost analysis. I thought it was about -- ranged between 5 and 13 percent of the overall score.

And it seems to me later on Jim made the point that the greenhouse gas reductions are really kind of the core purpose of the entire program. So, it seemed to be a little bit inconsistent that perhaps the greenhouse gas cost effectiveness was only 5 to 13 percent.

And so, I would just ask you to reconsider, amid all of the other cost benefit things you have to evaluate, I guess I would ask you to consider that if,

in fact, greenhouse gas reductions are a key component, finding cost-effective greenhouse gas reductions and benefit cost ratios is pretty key.

And why do I say this? Well, I guess it's probably a little bit self-serving for Waste Management and our industry because we are sitting on a lot of waste that actually can product the lowest carbon fuels in California.

If you look at all of the low-carbon fuels that CARB has evaluated, the waste-derived fuels are by far and away the lowest carbon intensity fuels.

And we've recently discussed the potential to produce low-carbon fuels with the University of California at Davis, and they think that there's enough biomass from urban, ag, and forest resources to produce about 2.1 billion gallons of low-carbon, virtually zero carbon fuel very cost effectively to existing technologies.

And waste-derived biofuels have a number of secondary benefits. In the case of agriculture it could be reduced open burning of agricultural wastes.

In terms of forests, it can be reduced forest fire dangers.

And in terms of urban waste sources, of course reduce landfill disposal and methane reduction and

beneficial use of methane.

So, again, I just would ask you to keep in the back of your mind that based on the fact that there's a lot of information about the very low-carbon fuel nature of waste-derived fuels, and the fact that it can be very cost effective.

I'll go into this a little bit later because the biofuels that we can produce, biomethane from landfill gas, anaerobic digestion we can probably make work if we have a revenue stream at about $15 per MMBtu or, hopefully, more.

But right now diesel at the refinery is about $25 per MMBtu.

So, I mean you can produce, really, a lot of biofuels very cost-effectively, very competitively with the existing fuel infrastructure.

The problem we have with biomethane, for example, is the very, extremely low cost of natural gas, which is even lower.

So, you've got to figure out a way to bridge the gap between the low cost of natural gas, at $5 MMBtu and the cost of producing biomethane at $15.

Even though it's still cheaper than diesel, it is much more expensive than natural gas.

And that leads to me to the -- really, the LCFS

here, in California, that's -- and that really ties into what Dr. Melaina from NREL said.

And he pointed out in his chart, with that big, sweeping green curve that markets are really the most important driver that are going to result in the conversion to low-carbon fuels.

Not to say the CEC's AB 118 and AB 8 program isn't very important, but it's really going to be the markets. And either the markets for the fuel or the markets for the credits, which are designed to internalize the externalities, in this case the greenhouse gas emissions.

So, it's really the issue of developing these markets. And the market mechanisms are absolutely necessary.

One of the sad things that Jim and I have talked about a lot is that Waste Management had to turn down a very large grant from the Energy Commission to do a second landfill gas to LNG plant in Southern California.

And the problem was that the market wasn't there for the resultant fuel. There was no certainty.

The only thing that was certain was we knew what the revenue stream would be from the gas we could produce, but we couldn't meet the $15 per metric ton cost it would take to produce the fuel in competition

with natural gas.

The LCFS and the Renewable Fuel Standard Credits at the Federal level were so uncertain, and continue to be uncertain to this day that it's very hard to make an investment in these technologies to get a return on investment.

So, I guess my point to you is while the AB 118 program, AB 8 program is so important and necessary, there really has to be attention to the actual market of these fuels and the market of their attributes going down the road.

COMMISSIONER SCOTT: Thank you. Everyone gets their time to make comments.

Do you have something in writing that you can submit to us to make sure that we --

MR. CHUCK WHITE: I will submit comments, absolutely. I work with the Natural Gas Vehicle Coalition that we're a member of.

And I would urge you to clarify some of your existing regulation, the 3103 that implies that perhaps your grants are conditioned on not generating -- or you can't use your full -- get your full credit amount under LCFS if you get a grant from the Energy Commission which is kind of, in our view, a contradiction between the purpose of the program to transfer to the LCFS. Not

penalized for taking advantage of the LCFS.

COMMISSIONER SCOTT: Okay great.

MR. CHUCK WHITE: Thank you.

COMMISSIONER SCOTT: Thank you.

And thank you for having me up to visit the site. It was a terrific day. We got a chance to go and see how the methane is being captured from the landfill in Altamont, and then a lot of that was being made into liquefied natural gas, and also compressed natural gas that was then going to fuel the waste haulers that were bringing the waste back. And that was just a really neat thing to see, so thanks for that.

MR. CHUCK WHITE: Yeah, and we'd like to do more of those. And your grants are very helpful in getting that to happen. But the problem is we need to have a market for both the fuel and the credits that can be produced from that in order to make it a financially viable venture.

COMMISSIONER SCOTT: Yep.

MR. CHUCK WHITE: Thanks.

COMMISSIONER SCOTT: Thank you, Chuck.

Our next person is Joe Gershen. Hi Joe.

MR. GERSHEN: Hi. Thanks for letting me speak. I'll try to be brief.

So, here on behalf of CVA, and also sit on the

advisory committee, and spoke with a couple of other members.

As you guys all know, I've been talking about metrics since I've been on the advisory committee, so really happy to have had this workshop today.

So, we appreciate that the Commission staff is addressing all of these topics of metrics.

While we're enthusiastically supportive of metrics, as I just said, being used to determine funding criteria, we also encourage the ARFVTP program team to also use actual and real metrics to evaluate investment priorities in current and future investment plans.

We believe the direction given in AB 109 to, "Provide analytical rational for all proposed expenditures" is clear and unambiguous, and it supports the use of actual metrics and quantifiable benefits in addition to the expected benefits that we've talked about today.

Our concern in this workshop brief, and the recent IEPR is that the intent seems to be shifting with transformative benefits, in particular, from analytical rationale, which are objective, to only estimates and expectations which are a little bit more subjective.

Ultimately, we are investing hundreds of millions of taxpayer dollars in this program, which I

support, and have an obligation to those investors to do right by them.

Through the Legislature there's an expectation of giving those taxpayers a return on their investment in the form of real production of petroleum use, carbon emissions and criteria emissions.

We want to make sure that we are objectively assessing these metrics and doing so on a regular basis.

So, we're going to prepare some more comments and some more detail with some of the other folks on the advisory committee who have also been talking about metrics, and we'll submit those in the docket, and look forward to continuing to work with you guys.

Thanks very much.

COMMISSIONER SCOTT: Thank you. I look forward to receiving that and continuing to work with you, as well.

So, if you have blue cards, be sure to get them to Heather and Lynette.

My next person is Tim Carmichael, who I don't see here anymore

Go ahead, Joe.

MR. GERSHEN: Tim texted me and said he was going to try and make it back, but he couldn't, but he also supported -- he's read, you know, my comments

earlier and he supports them as well.

COMMISSIONER SCOTT: Great, thank you.

So, that's all the blue cards I have from folks in the room.

Do we have comments from the WebEx or from the phone?

MS. RAITT: We have one WebEx comment that I'll read in just a moment here.

COMMISSIONER SCOTT: Okay.

MS. RAITT: This is from Eileen Tutt, and she wrote, "I am surprised to hear Mr. White suggest that incentives for clean technologies are taken for granted and we need to start scaling down. Electric vehicles have only been on the market for three years and we are very grateful for the State's support of this technology. The industry appreciates the State's, both Legislature and Administration, support in this very early market phase. The oil industry incentives far exceed anything received by alternative fuels and have been in place much longer, with no end in sight. We cannot lose perspective so early in the introduction of clean transportation technologies."

So, that was it.

COMMISSIONER SCOTT: Thank you. Any other comments from the WebEx?

MS. RAITT: That's the only comment we had from WebEx. So, we have folks on the line. If you are on the phone and wanted to make a comment or ask a question, now is the time, the lines are open. Go ahead and ask your question.

I don't think -- it sounds like we don't have anyone on the lines making comments.

COMMISSIONER SCOTT: Okay, well thank you for the public comments. And thanks just again to everyone who participated in today's workshop. I thought it was a terrific workshop.

I want to say thank you to Jim McKinney, and to Charles Smith, and to -- you mentioned Jennifer Masterson, right, and Andre Freeman for their terrific work helping put all of this together.

Thanks to my terrific advisors and to the IEPR team, and all the other staff who's working to make sure that we have terrific workshops and get good information.

The comment deadline is up here on the board. And I don't know if Heather has any closing remarks?

MS. RAITT: Just encourage folks to submit written comments by June 26th.

COMMISSIONER SCOTT: Excellent. Thank you, everybody, we are adjourned.

MS. RAITT: Thank you.

(Thereupon, the Workshop was adjourned at 3:24 p.m.)

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REPORTER'S CERTIFICATE

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

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IN WITNESS WHEREOF, I have hereunto set my hand this 8th day of July 2014.

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