Senate Transportation and Housing Committee
Assembly Transportation Committee
Senate Transportation Sub-Committee on Ports & Goods Movement

Informational Hearing:
The Governor's Strategic Growth Plan:
Expanding Technology's Role in Meeting 21st Century Challenges of California's Ports and Goods Movement System

Senator Alan Lowenthal, Chair
Assemblywoman Jenny Oropeza, Chair

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State Capitol Building, Room 4202

SENATOR ALAN LOWENTHAL: Welcome everyone. This is the fifth of our series of informational hearings on the infrastructure bonds.

Just to say a little bit about the hearing today, both Assemblymember Oropeza and I represent the Harbor district and around the port areas of Los Angeles and Long Beach, and other surrounding areas. Assemblymember Oropeza and I were also on the city council of Long Beach, so we have been dealing with these health related and congestion related issues for 10 to 15 years. It is really exciting that what at one time 10 or 15 years ago, especially in terms of goods movement which was just seen by a few people in the port area, has now emerged in terms of the policy discussions in the state of California, as possibly our highest priority now to deal with. And so, we are here today to address the issue that has now emerged as our highest priority.

The question to both of us, and I will speak for myself first, is that we have been both attending conferences and listening to what the future is going to be. We have listened to new technologies. The issue is, what are we investing that is going to move us towards zero emission transportation systems? How do we get to a sustainable society in which economic development, public health, sustainable communities, coexist? And how do we

provide both jobs, and a clean environment? And so, what we are going to be discussing today, I think, is the glimpse of the future.

We have spent a lot of time talking about how we could enhance the existing systems that we have. How do we make those systems work better? How do we promote additional capacity on those systems? How do we look at alternative systems and options?

Today we turn our attention to the next step, to where the future is going to bring us. What should we be thinking about as we begin to invest into the future? What are the options for California? And how viable are they? The questions I am going to ask you are how viable is the information we are going to be presented with today? Are these issues that really should have a bearing in this bond structure, or are we talking about something that is down the road? What are the costs involved?

I am very excited to have people here today to talk about emerging technologies for the future—technologies that lead us into the twenty-first century. The discussion is not going to stop today. This is just the beginning of the discussion—whether it is in the bonds or not in the bonds. What we are going to be hearing today, hopefully, will be guiding us as we develop a vision for the future and shaping our transportation systems in the future.

So with that, I am excited to begin. And I will turn it over to my colleague, co-chair, Assemblywoman Jenny Oropeza.

ASSEMBLYMEMBER JENNY OROPEZA: Thank you, Senator Lowenthal. I too have a great deal of enthusiasm and anticipation about what we are going to hear about today. I really want to thank everybody for taking the time out of their busy schedules, both my colleagues in the Assembly and, colleagues in the Senate, to learn about this very important element of the Governor's bond proposals.

I would like to actually echo some of what Senator Lowenthal eluded to and spoke to in his remarks in terms of priorities. I think that what we will hopefully hear today is about some specific technologies that we can integrate and address in the bond proposals. Hopefully, we can develop these

technologies into partnerships for goods movement, that will increase the efficiencies of goods movement, that will improve truck and auto travel times, and most importantly, from my point of view, and I think this is not new news to anybody, improve air quality for our neighborhoods and for the port areas, as well as the entire basins where goods movement activities occur and are headquartered.

I do believe that this is a function—goods movement as an industry, is an area which is a cog in our economic wheels of progress in California that really do call for, are custom made for, public/private partnerships. The bond, as we may structure it will be a great opportunity to identify the proper technologies that will be, as Senator Lowenthal mentioned, operationally feasible in this timeframe and give us true value added. Because we know that this industry has goals already; have been called upon to be partners, active partners, and are already active partners as industry, to step up and be part of cleaning up our air, etc. But if we can gain value added, then I think that is a real plus.

I think there is no question that we need, as we move into the future, to really do something to enhance and beef up our opportunities in goods movement, otherwise we will lose market share to other states, and to other markets. There is no question about that. And so, we have got to be on the mark on this. And technology is a critical component.

I would like Mr. Co-Chair to ask the Assembly Vice-Chair of the Transportation Committee, who is with us today, if he would like to make some brief comments. Mr. Huff, please.

SENATOR LOWENTHAL: Absolutely.

ASSEMBLYMEMBER BOB HUFF: Thank you very much. I will keep my remarks brief. I have been working in some aspect of goods movement all of my adult life. As an elected leader for the last 10 years, I am fascinated with the technology that has become available, and certainly look forward to what we hear today to the extent that we can use these technologies to make our transportation system more efficient, save tax-payers money, and cleanup the

environment. I think those are admirable goals. I am pleased to be here today and to listen to these presentations.

SENATOR LOWENTHAL: It is wonderful to have you. Does anyone else from the panel wish to make an opening statement? Assemblymember Karnette.

ASSEMBLYMEMBER BETTY KARNETTE: I just want the presenters to keep in mind, that I am real concerned about security and would like for everyone to be mindful of security when making their presentations.

SENATOR LOWENTHAL: With that, the framework for what we work under and how we present, is the administration's proposal. We have Randell Iwasaki, Chief Deputy Director, and fortunately, we also have the Director of the California Department of Transportation, who has become a regular honorary member of this committee, Will Kempton. He is not a voting member, but he is certainly an honorary member.

MR. WILL KEMPTON: Mr. Chairman, Madam Chair, and members of the committees, I appreciate the opportunity to just say a few introductory words.

Mr. Chairman, in your opening remarks you talked about the future and what is coming in the future? In November of this past year, the Californian Department of Transportation (Caltrans) along with the other organizations around the world hosted the Intelligent Transportation System (ITS) World Congress in San Francisco. I know that a couple of the senators were there. I know Senator Torlakson was there and attended, and actually held a hearing at the congress.

One of the things that I thought was just an outstanding idea to take away from that congress was that the future is now. Much of the technology that we are talking about and that you will see demonstrated today is, in fact, available today. It is a matter of deploying that technology, and we are hoping to work with the state Legislature to accomplish that deployment.

I know that you are probably getting tired of having me appear before the committee, and so I am always happy to showcase the talent that we have at

the Department of Transportation. I wanted to be able to introduce our Chief Deputy, Randell Iwasaki, because he would not say these things about himself. I want to make sure that you understand that not only is he our chief deputy, but he is somebody who is nationally recognized, and in fact, internationally recognized, as an expert in Intelligent Transportation Systems. We are very pleased to have Randy's talent at the department. He is chairing our efforts with a research and technology panel that we have convened to help us pick the best strategies for ITS implementation. He is a member of many national and international committees. He is on the board of ITS America. And, as I said, Mr. Iwasaki has a very significant background in intelligent transportation systems. He is certainly the person to make the presentation to you today and to answer any questions.

MR. RANDELL IWASAKI: Thank you, Will. I appreciate that introduction.

What you have in your hands is a packet of photographs, and I will do some brief introductions and then I will go through these technologies one by one to explain what you are observing.

Caltrans currently has deployed about $3.5 billion in its capital costs to ITS field elements, which are things like the big changeable message signs you see out in the inventory. You will dial 1610 on your AM radio for the highway advisory radio ramp meters. We have weather information systems strewn throughout California to detect whether it is raining, snowing, icing, and those types of things. The department spends about $30 million per year to operate and maintain this investment.

As outlined in the Transportation Management System (TMS) master plan, the complete build out of the system is planned for 2013 and consisting of some of the same items that I mentioned before; it is just more so that we can spread them throughout California.

The $200 million figure contained for ITS in Senate Bill 1165 is only a down payment for the future investment that we need. Approximately $3 billion will be needed in order to achieve the vision set forth in our

Transportation Management System master plan. In return for this investment, Caltrans estimates a benefit cost ratio of about 7.5 to 1 based on a 20-year life cycle, and that does not include the safety benefits that you get when you have a more efficient transportation system.

The Caltrans ITS program is organized around four of its divisions. The Division of Planning plans programs and takes a look at the locations for the various field elements. After those elements are installed, the Division of Operations, or Traffic Operations, tweaks those systems to make sure they are operating at their optimum performance. The Division of Maintenance goes out every now and then and maintains them when needed—all the field elements that we have in our inventory. And then last but not least, the Division of Research and Innovation goes out and scours the area for the latest technologies to apply to transportation. It could not only be the latest technologies, but technologies developed for other methods, or other things, and we try to bring those into the transportation field.

California universities will continue to play a key role in advancing the state of the art in ITS research. We have five university transportation centers in California funded by the federal government, the Federal Highway Administration. They are the Mineta Transportation Institute in San Jose State; MetTrans, which is located at California State University, Long Beach; the University of California Transportation Center, Berkeley; the California State University, San Bernardino; and the University Transportation Center, Davis. University of California, Davis focuses on the environment and those types of activities. The five University Transportation Centers are going to play a strong role in the continued development of ITS elements.

We have also established, as Director Kempton referred to, the Research and Technology Expert Review Panel, and the panelists have to review some of the ITS strategies that we have in the past and also to take a look at our plan for the future. We have a number of experts in their field, and we want to create some subcommittee to make sure that we are focusing on the right types of technologies.

The use of emerging transportation technology will be a key component in the success of the strategic growth plan. California has been well known for the innovations that it is had, and a lot of states copy our innovations. And so, I would like to talk briefly about a few of the current and planned projects that employ innovative technologies to improve the movement of goods. This will be a goods movement panel. There is a lot of technology out there, but this presentation is for goods movements specifically.

The first item you see is a system called Pre-Pass. There about 250,000 trucks throughout the United States that have transponders on them, and if they are underweight, or at the legal weight limits, they can actually bypass the compliance stations. They can do this legally. What does that do when you have a Pre-Pass system?

It allows you to bypass the system; continue on at 55mph; you do not have to wait in line with a number of other trucks; sit there and idle for 10, 15, 20 minutes, depending on how long the line is; and then, get up to speed after you go through and waste fuel. You save about a gallon of fuel per stop when using the Pre-Pass system. If you do not go through a Pre-Pass system, you add that to 10,000 trucks a day and you have wasted quite a few gallons of fuel.

The next picture that you will see, is something that we are working on, it's called a Virtual Weigh Station. I will use two locations in California. The first one is the Interstate 80 and State Route12 interchange. It is a billion dollar project. The cost to rebuild a compliance station at Cordelia is about $400 million. Now, the estimate has come down a little bit, but the majority of the cost is the length of the ramps. Because of the future growth of trucking in California, the ramps have to be two lanes and two miles long. It is going to store a lot of trucks. So imagine two miles of trucks idling. I guess the people from down south can imagine that, because it happens in their region. Imagine the same thing at Cordelia.

I would propose, on the 710, they need a weigh station there as well. Imagine a day where you can use technology to weigh the trucks on the fly so

they do not have to stop. If you are out of compliance, they wave you back, where they take you to a smaller location, they weigh you, they do whatever they need to do to enforce. You will be able to automatically ticket that driver for being overweight. If it is grossly overweight, pull them over at a compliance station that is much smaller, and make them move their load or stop them and unload their loads.

I see technology here playing an important part in goods movement for California. I would use the example of the Skyler Hine Bridge on State Route 47; the bridge deck normally lasts about ten years. That one we replaced three times in the last 10 years and that is because of the heavy weights. So, you would ask, why do not you make the deck thicker? Well, the bridge is only designed for a certain dead load, and so you do not want to overweight that bridge.

The next technology that's in your package is Open Roll Tolling. However, let me address Smart Truck Parking first. We have deployed a reservation system at the Rockridge Bart Station that uses technology to count the number of people coming and out of the parking lot. It's called Smart Parking. And Smart Truck Parking utilizes technology that counts the number of truck in and outs. What we want to do is take that technology and allow it to notify truckers on the road and inform the trucker that "The next truck parking location in front of you has 14 truck spots available. Make your reservation and go on in there." There is a shortage of parking opportunities in California, and because of that, trucks are parked all over the shoulders of highways. You see a lot of that down on State Route 60 down south….so imagine the day when you can use technology to notify truckers that there is parking available ahead of you.

The other thing we are working on is air quality. If you travel Interstate 80 from Reno all the way into the Bay Area, there is only one truck parking location left, and that is the 49er Truck Stop. It is at the intersection of Interstate 80 and Interstate 5. The vendor is trying to install technology called Electrification. The vendor will provide the ability to hook trucks up to

electrical outlets and then run the air conditioner for a long period of time and not idle diesel engines, which cleans up the air.

UNIDENTIFIED: Where is that again?

MR. IWASAKI: It is at Interstate 80 and Interstate 5. It is called the 49er Truck Stop.

UNIDENTIFIED: Forty-niner?

MR. IWASAKI: Yes, ma'am. I believe it is a joint effort between the Air Board and the owners of the facility.

UNIDENTIFIED: So it is cold ironing, but it is for trucks. But it is not Caltrans projects?

MR. IWASAKI: No.

SENATOR DENISE DUCHENY: Is that a private truck stop that somebody built to be a truck stop? Is it a gas station?

MR. IWASAKI: It is a huge gas station, but they allow truck parking there.

SENATOR DUCHENY: And do they already have this electrification or not?

MR. IWASAKI: No. They are working with the Air Board to get the funding.

UNIDENTIFIED: There is one on Highway 99.

MR. IWASAKI: Yes, exactly. So you can apply that technology to the port, as well.

The next technology is called FAST (Free and Secure Trade Lanes). This is in the San Diego region. If you are from San Diego, the Free and Secure, the Fast Lanes enable trucks to bypass at the border. Once again, the trucks are not idling at the border and they are able to legally bypass the border clearance process. It is an electronic pre-clearance program that uses integrative technologies, such as vehicle transponders to safely and securely expedite the border clearance process. Cars can do that, as well.

Open Roll Tolling is the next picture. What you see is a series of… minivans crossing underneath an area that will detect…electronics that will

detect a transponder. Open Roll Tolling allows an electronic toll collection transaction to occur under normal highway driving speeds. This is going to be the technology that we are going to have to use in order to implement hot lanes. You can not stop a person getting into the HOV lane and pay a toll. They are going to be traveling 55 miles an hour—you are going to have to tool on the fly. The Open Roll Tolling allows for the hot lanes that dramatically increase speeds through that area. You do not have to decrease speed, which causes cueing, idling, and all the air emissions that occur.

The next item in your packet is called the Vehicle Infrastructure Integration Initiative (VII). What you see is a 5.9 gigahertz antenna mounted on top of a vehicle. The Vehicle Infrastructure Integration Initiative is a cooperative effort between automobile manufacturers and transportation officials to deploy vehicle to vehicle and vehicle to infrastructure communication.

Why is this important?

If you think in terms of….part of this is goods movement and safety. Imagine a day when cars refused to run off the road, cars refused to crash, cars talked to each other. This is an opportunity that if you looked at some of the technology occurring in vehicles today, you have lane departure warning systems in Nissans, so it will warn you that you are running off the road and to get back on. You have adaptive cruise control in cars that will not allow your car….if you have it in cruise control, it follows behind a certain speed, it calculates those speeds and it keeps you back at a reasonable distance.

The whole Vehicle Infrastructure Integration Initiative works off of a frequency that was recently allocated by the FCC at the 5.9 gigahertz and it has 75 megahertz of spectrum.

So why is this important?

If you are a car manufacturer you do not want to build technology into your car that is going to change tomorrow. Because that is not the way car manufacturers work. They look five years out. And so, you want to make sure

the technology is stable. So the communication between a car to car, or car to infrastructure, will be stable because they have the spectrum reserve forever.

Currently we have a Vehicle Infrastructure Integration Initiative test in the Bay Area, and we are going to install it on the interstate for Highway 101 and on the El Camino Real.

Travel time on the Changeable Message Signs (CMS) is your next slide. It sounds simple, but in fact, takes a lot of effort and a lot of time and helpful technology to successfully put accurate travel times on Changeable Message Signs. We have done it in Los Angeles. We have done it in the Bay Area. The next area that we are going to roll out is in the San Diego region.

And why is this important?

There are many benefits in getting accurate travel times on changeable message signs. The most obvious, is that drivers will benefit from knowing their estimated time of arrival and plan their trips accordingly. In the case of traffic congestion, they will use this information to decide if they should delay the trip, take an alternate route, or take transit, therefore minimizing their travel time and frustration. This also applies to the goods movement. Why leave if you know you are going to take two hours to get someplace, if you can get there in an hour? And so those choices will be available through travel time messages.

511 systems, is the 511 call you dial on your telephone or your cell phone to get real time information on transit opportunities. It calculates shortest routes, shortest distance. It is currently up and running in the San Francisco Bay area. We have deployed it in the Sacramento region. And the next deployment is the San Diego region.

Why is this important?

Travelers with accurate real time information about their trips, including haulers and suppliers, can plan ahead to avoid unexpected traffic congestion, road work, and weather delays. They can find out how long the trip is going to take and make travel choices. If they do not want to go on the 10, they can go on the 60 or whatever the route is, and they can make those kinds of choices.

UNIDENTIFIED: How does that work?

MR. IWASAKI: The 511 system? The 511 system uses information gathered from the highways, through our embedded loop detectors, through our travel.com partnership…

MR. IWASAKI: If you have a cell phone, just dial 511.

UNIDENTIFIED: What happens?

MR. IWASAKI: They will ask you….there is four areas: highway, transit, rideshare. There is one other area. And you click one. Let us say, you want highway information. It is voice operated. You will say "I would like information on I-5," and it will tell you, where do you want to go? It is voice activated. It gives you real time information. It tells you your travel options.

UNIDENTIFIED: So you say "I want to go from…

MR. IWASAKI: It is automated.

UNIDENTIFIED: It is all automated. It is not a live person?

MR. IWASAKI: No. You do not call someone. It is not like 911. No, this is an automated system. You ought to try it. It is available right here in Sacramento.

The next technology is the San Diego County Regional Communication System (RCS). It is a fully interoperable radio system. You hear about security. You need a fully interoperable radio system. We have one deployed in San Diego County. The Regional Communication System is going to be expanded to the Imperial County. This is where you have a fully trunked interoperable radio system that the safety, fire, highway, emergency vehicles, are all on the same system and can talk to each other—one to many, or one to one. That is a model that can be deployed elsewhere in California. And we are very excited to be one of the founding members of that the Regional Communication System partnership.

The next slide you have in your pamphlet is called the Crash-Less Intersection. It is actually a picture from the ITS World Congress. Those of you that went to the ITS World Congress saw this in action. Basically, it uses technology. If you look at the guide wires between the poles, you will see radar

technology that senses how fast the oncoming car is. And you are stopped waiting to make a left hand turn, it will do the calculation in a nanosecond, very quickly, and it will tell the driver "do not make that left turn," even though you have a left turn move that you can make, because the oncoming car is coming too fast. It helps you judge the distance between the oncoming vehicle. It is technology that we are testing right now.

MR. IWASAKI: Everything is not proof perfect, but this is a technology that if you look at the sign, the sign that is mounted to your left, depending on where it is going to be in the intersection, but basically you will have a green motion, a four-way signalized intersection, the green light is for you to go through. You want to make a left hand turn. You are in that left turn pocket. It's not protected. And so you are going to make your left turn. The oncoming car is coming too fast. Another sign will come up and say "left turn" and it will have a big X through it. It was operational at the ITS World Congress. I think Senator Torlakson saw it.

SENATOR TOM TORLAKSON: They also can have signals that turn off your stereo, radio, and vibrate your seat and a warning light at the same time. So you can have multiple signals to get your attention not to make the turn.

MR. IWASAKI: The next technology that we have for goods movement is, we have a system set up in Northern California on Interstate 5 that basically tells a trucker that there is a curve ahead; you are going too fast; you need to slow down. This helps to make sure that the roadways are….at least it provides some information feedback back to the trucker or the driver that "You are going too fast. Slow down. You are not going to be able to make the curve."

The last slide is what we call the Bay Area Security System. In 2001, September 12, we started a security system….

SENATOR LOWENTHAL: It looks like a prison.

MR. IWASAKI: Well, what you see there is a wireless transmitter mounted on top of the Bay Bridge that signals not only….it coordinates all the detection systems. All the piers on the seven toll bridges have detection systems. The cameras are there to make sure that people do not try to do

anything near the anchorages. The information is all relayed wirelessly back to the transportation management center in District 4. In the time that it has been operational, the California Highway Patrol (CHP) has been able to catch people trying to get onto the anchorage at Yueba Buena Island to climb onto the bridge.

The Caldecott tunnel and another tunnel, I do not remember exactly which one it was now, but was these tunnels were outfitted as well. We spent about $20 million on the Zamper Bridge and Devil's Slide and the Fourth Bore and the Caldecott tunnel. The technology is deployed to ensure the protection of critical infrastructure. If somebody tries to access a pier and places a bomb there, in theory, you can catch them in advance. Because once they break a certain plane, we are going to be notified in Traffic Management Control (TMC) and the California Highway Patrol gets out there immediately and catches these folks.

Those are some of the technologies that I selected to present to you today in the areas of goods movement and security and safety. Hopefully that helps you. Thank you.

SENATOR LOWENTHAL: Any questions from the members? Assemblymember Mountjoy.

ASSEMBLYMEMBER DENNIS MOUNTJOY: I am going to go back to the beginning. The Pre-Pass: What does it take to qualify for Pre-Pass? And who would be qualified today, the large trucking companies, or can the small guy, the guy with one truck, can he qualify for Pre-Pass?

MR. IWASAKI: I can read you the information from the Pre-Pass company. Basically, it is a company that permits various truckers that apply through an application system. I believe that the qualified motor carrier has to have certain criteria and a clean driving record and those kinds of things. Help, Inc. is based out of Arizona and it is run by, Dick Landis, who is also on the ITS America Board. I can get you the exact application process if you would like to see that.

ASSEMBLYMEMBER MOUNTJOY: I would like to see that. I just want to make sure that the small guy, that independent trucker, if he has a clean driving record and he has shown proof that he carries a lesser weight than allowable, that he has the same ability to get on a pre-pass as does Dick Simon Trucking. And not using any name in particular, but I know Dick Simon he has the same ability to get on a Pre-Pass schedule as a large carrier. And I would love to see that, if you have an opportunity, if you can get that to either the chair or my office.

MR. IWASAKI: I will.

ASEMBLYMEMBER MOUNTJOY: My second question is a transponder put on the top of a vehicle?

MR. IWASAKI: No. It is a test. I mean, that is a 5.9 gigahertz. That is a floating Vehicle Infrastructure Integration Initiative van that we used to test the Vehicle Infrastructure Integration Initiative technology.

ASSEMBLYMEMBER MOUNTJOY: And my last question: With regard to the Curve Speed Warning technology, is this is a number that would change?

MR. IWASAKI: Yes, absolutely. That is a number that is going to change daily, depending on the road condition

SENATOR LOWENTHAL: And depending on how fast you are driving.

MR. IWASAKI: Yes. That feeds you back. You are going 50 miles an hour on a 35 mile an hour curve. It is telling you are going too fast.

ASSEMBLYMEMBER MOUNTJOY: This is telling me the speed at which I am traveling—as though I do not know?

MR. IWASKAI: Why do people run off the road on curves?

ASSEMBLYMEMBER MOUNTJOY: I have never known when I have been speeding. I have always known what speed I am traveling.

ASSEMBLYMEMBER MOUNTJOY: This tells me how fast I am traveling. I wonder how important this is. I always believe that drivers know how fast they travel. They may tell the police officer that they had no idea, but I believe that to be different.

MR. IWASAKI: Yes. The signs were installed on Interstate 5 in the Shasta region near Mount Shasta because there is a number of run off the road collisions. When you have an accident in that area, given the severity of the accident and the contents of that truck, you can stop that whole Interstate 5 northbound for hours.

SENATOR LOWENTHAL: Assemblywoman Karnette.

ASSEMLYMEMBER KARNETTE: I was wondering about the drivers. You can check the company or the driver who applies for the okay to use this Pre-Pass. What about the individual driver? How do you know who is driving that truck?

MR. IWASAKI: In Europe, what they use is what they call a "tack-a-graph." And because their laws are a little more stringent than our laws, each of us has a card in Europe, a driver, and you actually have to physically put that card into that "tack-a-graph" and it will monitor how far you drove, how long you drove, and who you are, to make sure that you meet the criteria in Europe …eight hours is all you can drive. At any time, a police officer can come into that "tack-a-graph," plug in and get a readout on your driving, and how long you have driven and those kinds of things.

Here in the United States, it is not that way. It is all paper logs—right?

The technology is there.

Here is an excerpt from the write up: "Motor carrier participation is strictly voluntary." That is why there are only 250,000 of them so far. "And it is subject to state safety qualification standards."

ASSEMBLYMEMBER KARNETTE: If you were sitting somewhere monitoring this, you would not really know who the individual was unless there was something in that truck itself that identified the trucker holding onto the steering wheel. I know there is technology that can do that. Right now we do not have it.

ASSEMBLYMEMBER MOUNTJOY: I mean, that could be Dick Simon Trucking, but Mountjoy's driving.

MR. IWASAKI: It could be. But Dick Simon Trucking, the truck that is registered is safety approved.

SENATOR DUCHENY: My only question related to the Curve Speed Warning technology…Assemblymember Mountjoy was talking about telling people their speed and some of these elements. Do we have any data that says we have stopped accidents? To what extent we are using this technology, and do we have any data to show how they work?

MR. IWASAKI: Yes. At the five locations that the technology is deployed, in my recollection, there has not been a truck accident caused by excessive speed at those corners since the implementation of the technology.

SENATOR DUCHENY: And there were before?

MR. IWASAKI: Yes. That is the criteria that we use.

SENATOR DUCHENY: With regard to the deployment of the ITS you have presented, to the extent we know how they work, we ought to get that data for ourselves. I mean, you could do a million different things, but relative effectiveness must be established.

SENATOR LOWENTHAL: Could you get this information back to, as members ask questions, this is going to be very important. I think that what we are saying is, when we are talking about any of this technology, the more information you can provide both the Assembly committee and the Senate committee with data, the more we are going to be able to be supportive or not of any particular technology, and it would be very helpful.

MR. IWASAKI: I would be happy to do it.

SENATOR LOWENTHAL: Senator Torlakson.

SENATOR TORLAKSON: On the same point, can you provide the data regarding the healthcare costs were that avoided (death, injuries, and property damage, etc). I think this is going to be tremendous from what I was able to see of the technology. You have only scratched the surface of what we saw demonstrated in terms of other ways that cars can avoid colliding. How the automatic systems that can help you stay in your lane if you have an unexpected lane change because you looked down, or you are not paying

attention, or you actually pass out, your car can be directed back into your lane and you can communicate with other cars, and blind spots can be detected. So, all of that is what the data could help us understand more fully, as Senator Ducheny just asked: could we get the insurance companies to look at this if they have not done so; what is the experience in other countries?

One of the issues we talked about in the other hearing was, Mr. Chairman, to what degree do we allow the marketplace to install these features in the normal competitive process versus mandated? Most European countries are letting the marketplace do it, from what I understood, but they are looking at some point of setting a higher standard and trying to centralize that.

SENATOR LOWENTHAL: There also are requirements, as was pointed out, that what drivers must carry in cards.

SENATOR TORLAKSON: Some of it is mandated, and some of it is not.

MR. IWASAKI: There are different rules and regulations in Europe that allow them to do it. Automated speed enforcement in France, President Chirac said enough is enough. There are too many people killed on highways. We are going to automated enforcement as soon as we can. Within the year, if you looked at the fatality rates, I think it dropped by 35 percent. That is a large number of people whose lives are saved each year.

SENATOR LOWENTHAL: Again, the more data you can provide to us the better off we are.

I am going to draw this part to a close. I would like it if Director Kempton would like to make final comment.

MR. KEMPTON: Thank you, Mr. Chairman.

First of all, knowing that you have a deadline for submitting input to the Conference Committee, we will try to turn your information request around quickly. I will see what we can do to get you your staff information by tomorrow.

I also wanted to underscore the importance of the transportation research and technology expert panel. This panel was created by the Secretary of Business Transportation and Housing. It is a high priority of the Governor,

and it is a group that we convene on a regular basis to help guide our research and technology programs, and I wanted to make sure that we recognize the importance of that element of the program.

I also wanted to take this opportunity to thank both committees for the courtesy extended to me and the Department in terms of being able to cover with you the Governor's Strategic Growth Plan as it relates to transportation, and for the forum that your committee hearings have provided for discussion on infrastructure investment in California. I really appreciate it.

SENATOR LOWENTHAL: Thank you. We are not asking to move on because we are not fascinated. We are. But there is just a lot to hear today, and it is going to be a fascinating hearing. I appreciate those kind words. It was done because we have great respect, and we are partners in this, and we need to come up with a product together.

Next, we are going to move onto electrification, as we move in that area, Ed Kjaer, who is director of Electric Transportation for Southern California Edison, is here. It is a pleasure to have you here before our committee, Mr. Kjaer.

MR. KJAER: Thank you, Mr. Chairman, Madam Chairman, and distinguished members. It is a distinct honor for me to appear here before this committee and discuss my perspective on some emerging transportation technologies.

As we begin, what I would like to do is just ask a rhetorical question: What is changing the way we think about transportation and the energy security, energy storage, energy efficiency, emissions and the gas station?

Electricity and the grid: What we are really beginning to see is this fundamental convergence of transportation and the grid. And more and more, transportation is moving electrons around onboard the vehicle, or is using electricity in one form or another. We are seeing it with the hybrid vehicles today, the engine hybrids that you are seeing successfully marketed, sold, and operated on the road. And the emergence of plug-in hybrids—we have heard a lot of discussion about plug-in hybrids over the last couple of weeks,

particularly with President Bush's reference to our oil addiction and the need to get off imported oil as quickly as we can, and the promise of plug-in hybrid technology, battery technology, battery UVs; electrification of marine ports, which I am going to talk a little bit about; truck facilities, we heard from the previous speaker a little bit about that; airports; rail yards; and the emergence of technology telematics for communication, navigation, entertainment; the use of ITS onboard the vehicle in terms of communication; and as I have just learned here today, vibrating seats as well. They are all requiring electricity in one form or another.

So increasingly, the state is focusing on electrification to reduce emissions, particulates and petroleum usage. And really, the way we tend to look at this is, that it is the petroleum usage, again, as the federal government is now acknowledging with the oil addiction that we have. Petroleum usage and reducing imported oil is very critical to the future success of this nation.

Along with petroleum reduction, comes significant emissions reduction and greenhouse gas reduction, depending on the kinds of emerging new technologies that we use.

With regard to the electrification of transportation, there is now, to varying degrees, reference of electric drive technologies in the draft of goods movement plans, the draft climate action plans, there is a whole section in the energy action plan, the integrated energy policy report, and there are a number of compliance options that exist in regulations today through Californian Air Resource Board (CARB) rules, particularly in the area of truck idling, truck refrigeration units, as well as rules for buses, cars, golf carts, that all acknowledge the viability and the benefits of electric technology.

As the Chairman will acknowledge, we were successful last year with SB 467(Lowenthal), expanding the Moyer grants to include forklifts and other non-road electric drive technology.

It is really a lot more than just the automobiles that we are starting to see today. It is everything from forklifts to garden care equipment to golf carts, neighborhood electric vehicles, city electric vehicles, electrified airport ground

support, electric truck stops, electric truck refrigeration units, electric ports, heavy duty rail, light duty rail, personal mobility, and plug-in hybrids.

I am going to spend some time and talk a little bit about several of these areas. I know some speakers following me are going to be talking about rail, etc., so there is, I think, a great opportunity here with a lot of these technologies. A lot of them are mature technologies.

I think one of the points that I would like to leave with the committee today is, that I am not talking about technology that is unobtainable. This is not 20, 30, 40 years from now. In some instances, and a lot of instances, this is technology that absolutely exists today and is absolutely viable in the marketplace.

Benefits from the grid: We are, after all, talking about the opportunity to connect more transportation to what we consider is a significant energy asset in this state. The benefits of the grid are quite well known. It is 100 percent domestic based, 100 percent petroleum free, and there are multiple feed stocks. We have excess off-peak capacity. The grid is sized to meet on-peak demand, but that means that there is also then this opportunity for excess off-peak capacity. We believe it is quite significant in the state of California.

Electricity is about 20 to 30 percent the cost of a gallon of gasoline equivalent. So, you can really see that at the pump in terms of the cost differential between electricity and petroleum.

We know that the more miles that are derived from the grid, the more that that helps to reduce urban air pollution because of the zero emission miles that are delivered to the vehicle. And we know that each generation is only going to get cleaner over time, and it is going to get cleaner because of ever increasing regulation and ever increasing technology development.

Some near term opportunities: There was a little bit of mention about port electrification before I got up here. This is part of Governor Schwarzenegger's $2 billion Strategic Growth Plan and it is in the draft Climate Action Plan, and it is in the California Energy Commission's Integrated Energy Policy Report.

There is something like 2,000 ships that come in to L.A. and Long Beach each year. About 1,000 of them are frequent travelers to our ports multiple times throughout the year. And it would be those 1,000 ships that present the best opportunity.

What we have done is, using a well-known consulting firm here in California, we projected out through 2020 the potential for these emerging technologies and electrification technologies. And so over the next few slides, what I am going to do is, try to give you a visual picture of what it would be like to electrify some of these technologies, what they can deliver, and what it means to us. What we have done is we have presented it in terms of, so we can equate to this, the numbers of vehicles that it is potentially equal to in terms of removing them from the road.

The other thing that we did is, again, we are being quite conservative in our opinion we have taken a look at model year 2005 vehicles. Those are the cleanest technology available today on the market.

If you were to look at vehicles from 10 years ago, these numbers obviously increased quite significantly. So we are being quite conservative here. From a port perspective, if we electrify just a hundred ships coming into the ports throughout the year, that is like taking 535 automobiles, model year, 2005 vehicles, off the road in terms of Nitrogen Oxide (NOx), Reactive Organic Gases (ROG) and Sulphur Oxide (SOx). That is pretty significant. And actually, the few examples of these emerging technologies that I am going to describe today, kind of add up to upwards of two million vehicles off the road on an annual basis.

Truck stop electrification: I know that the committee has heard a lot about this technology. There are basically two solutions. There is kind of a near term solution, and a more long-term solution.

The near term solution is off board technology. The company that is a leader in this technology is a company named Idle Air. The photograph in the slide basically gives you an idea of what that technology looks like. The truck pulls in; there is a template that is provided to the truck driver; he rolls the

window down; he puts the template in; rolls the window up; then the HVAC hose is brought to the template; twisted into place; the truck driver goes inside the cab and opens up the door of the HVAC system; he has computer, internet, TV, communications equipment on one side, and then HVAC on the other side.

A typical diesel truck today idles in a truck stop or on the side of the road somewhere between 8 to 13 hours a day, consuming a gallon of diesel an hour. These kinds of technologies are absolutely ideal for shutting down that large engine that is basically driving relatively little electricity onboard the vehicle. It is shutting down that engine, shutting down the emissions and the petroleum consumption and using a relatively clean source of energy, namely, electricity.

The other solution, the longer term solution, is off board technology. That requires OEM participation, the development of technology that would be built into the truck. The truck, when it comes into the truck stop, can then connect to the grid. I think that that is probably a longer term, but perhaps more sustainable solution down the line.

There are 76,000 sleeper cabs in the state today. Only about 400 spaces, though, are electrified. There was some discussion about a truck stop electrification project in northern California. There is one in San Joaquin Valley, I believe, which is part of the Idle Air project.

We are projecting by 2020, there is the potential to electrify somewhere in the neighborhood of 35,000 spaces, and that could be equal to removing about 360,000 model year 2005 vehicles from the road.

The other point to note here is that these are pretty conservative estimates, and they are only based on the diesel Auxiliary Power Units (APU), not based on the main engine idling. There are new Californian Air Resources Board (CARB) anti-idling rules that have come into play now, so what we have done is, we have taken those numbers out of the equation and are just focusing on the diesel Auxiliary Power Units. So, this number of 360,000, if we were to electrify those 35,000 spaces, and prior to the Californian Air Resources Board rule, you would be looking at somewhere in the neighborhood

of 3.6 million cars off the road. It is that kind of significance that we are talking about with truck stop electrification.

It is also worth noting that it is more than just the truck stops. It is the rest stops, the border crossings, the private yards, the ports, and the warehouse staging areas, all part of the goods movement network in California.

Electric Truck Refrigeration Units (ETRUs): There are about 70,000 ETRUs on container ships worldwide. The container ships, when they are on the ocean they are electric and putting electric power through their own onboard grid into the containers to provide the necessary power. When the ships come into port, the containers are offloaded at the port and they connected to the grid on the ground. They are loaded onto trucks and a diesel generator or a Gen-set is then attached to the vehicle and that, which provides the onboard electricity needed for the container as it drives along the roads.

In California, there are about, we think, 4,000 to 7,000 electric Auxiliary Power Units on the tracks today. Again, that is very small. What primarily is used is this strapped on, or bolted on, diesel auxiliary power unit.

The opportunities are in the inland warehouses where you can, and large distribution centers, where you can electrify the distribution center, the truck comes in, shuts down the APU, and basically connects to the grid.

Looking forward to around that 2020 period, we believe that it could be, if the system was electrified, you could be looking at somewhere in the neighborhood of removing 400,000 model year 2005 cars from the road.

Other opportunities in the non-road Electric Vehicle (EV) area, this is primarily forklifts, golf carts—there is about 300,000 pieces of electro-drive, we believe, already in the state today, which are primarily forklifts, burden carriers and small trucks at the ports. As that market naturally continues to grow, we think by around 2020, it could be the equivalent of taking 580,000 model year 2005 cars off the road.

That is a summary of the near term trends that we are seeing in the marketplace, primarily the ports, electric truck refrigeration, and truck stops.

Mid-term, as I acknowledged in the beginning of my presentation, there is a tremendous amount of work on plug-in hybrids. One of the most significant growth areas in transportation today is hybridization, and that is where you are basically taking electric drive and internal combustion engine technology and merging them together. As the vehicle drives down the road, it is using both sides of that power train to provide propulsion in a very energy efficient way.

Plug-in hybridization is the next technology. Plug-in hybridization is really pushing the hybrid technology to its natural conclusion in terms of realizing its full potential for reduction in petroleum use.

We have a number of programs on plug-in hybrids at our company. We have a prototype of a plug-in hybrid commercial van from Daimler Chrysler, and that is part of an extensive program with Electric Power Research Institute and other utilities around the country. The Air Quality Management District (AQMD) as well is involved and is funding that program.

There are also lots of work, substantial work, in the medium duty plug-in hybrid area and the heavy duty hybrid area. This technology, I think, holds great promise in the volume of applications in the state of California and other states across the nation to help us achieve the president's vision of energy independence from imported oil.

Other electric options: electric gantry cranes at the port, and freight rail, light duty rail, heavy duty rail and high speed rail. I noticed on the agenda there is some discussion about Maglev. I think one of the areas that is kind of interesting to us is, not necessarily pure electrification of rail, but partial electrification of rail, and we are calling that, in essence, plug-in hybridization of rail. Where, perhaps in environmentally sensitive areas, or in areas where there are steep grades, that canton areas can be provided and additional electric power can be provided to the train hybridization, to help reduce emissions and reduce petroleum, and I think that that may be an emerging opportunity for the future.

The long-term: We are all, I think, very familiar with the long-term prospects of getting off oil completely—total petroleum independence with the promise of hydrogen and fuel cell technology. Again, this is in the future. We have prototypes of this technology today. Fuel cells have actually been around since the 1800s. Hydrogen is an attractive energy carrier. It is not technically a fuel. It is an energy carrier. It can be made from multiple feed stocks through reformation or electrolysis, and then it is converted to electricity to basically drive the wheels. And the interesting thing about this technology is that the cars that you see there today, those are basically the Electric Vehicles of the 1990s without the battery, but they have a fuel cell. They are absolutely an electric vehicle. Contrary to popular opinion, the electric vehicle is not dead.

As I said, this is conservatively speaking, I think somewhere in the neighborhood of 15 to 20 years away in any kind of commercial volume. Again, this is a laudable goal for the nation and for the state, and to get to true zero emissions, as the chairman referred to at the beginning—to get to true zero emissions in a sustainable way.

Now, bringing it all together, this eye chart here really takes a look at some of those key technologies that I described throughout the presentation and tries to kind of quantify the Nitrogen Oxide (NOx) and Reactive Organic Gases (ROG) and Sulphur Oxide (SOx) particulate reduction potential from electrification of those technologies and the petroleum reduction.

If you look at it from the pollutant's perspective, we estimate again by 2020, somewhere in the neighborhood of 86 tons per day of reduction in pollutants, and that is somewhere in the neighborhood of taking two million cars off the road—model year 2005 cars. Again, electrification is the best technology on the market today.

The petroleum reduction is somewhere in the neighborhood of 1.7 to 1.8 billion gallons of gasoline equivalent. That is somewhat equivalent to taking almost three million cars off the road. This is a substantial opportunity for this technology, and I think there are great prospects for the state with this technology.

In summary, the benefits of the transportation and goods movement electrification are very large in reducing the air pollution particulates, and it is petroleum dependency that I think is so critical to this nation. Again, with significant reductions in petroleum comes the reduction in emissions and greenhouse gases.

The California grid has excess fuel capacity off-peak. And I stress, off-peak. The trick here is, if transportation is going to connect more and more to the grid, we have to make sure it connects to the grid off-peak. We do not want to exacerbate the on-peak demand situation in this state.

Near, mid, and long-term solutions exist. As I said before, this is not something that we are talking about just 20 years from now or 30 years from now or 40 years from now. There are things today that the state is doing, and can do, to make a difference with these technologies and deploying these technologies. This can maintain economic growth and reduce emissions at the same time. It is good for industry. It helps with jobs. It absolutely targets and addresses environmental justice areas, particularly, for example, truck stops. A lot of truck stops are actually located in environmental justice areas. If you reduce the emissions and petroleum at truck stops, you are benefiting the environmental justice.

There are obviously challenges. I do not want to be Pollyannaish about this. You know, we can not just do this all tomorrow. There are obviously issues of cost and funding. I think the bond measure is a wonderful mechanism to help to fund some of these emerging technologies.

This concludes my formal remarks. Thank you.

SENATOR LOWENTHAL: Questions, members? That was very interesting, Ed. The question I have is, let us say we are focusing on goods movement in terms of moving us both in terms of the short and long term. We know we have tremendous traffic congestion and air pollution now, and we are talking about how we are going to invest in the future. You said there was a warning, and that is, if we are going to go towards electrification as a major

source of energy in movement of goods and people, we have to use it off-peak hours—how do we do that?

MR. KJAER: I think what has to happen are a couple of things that are already happening in the state. First, the advent of smart meters, or Advance Meter Initiative through the Public Utilities Commission needs to occur. That is a technology that will give customers the ability to know and understand what they are paying hour by hour, or at certain times throughout the day. And at that point, they will be able to modify their behavior—understand what they need to do to modify their behavior.

SENATOR LOWENTHAL: We could do that with trucks and cars also?

MR. KJAER: Customers will be able to understand the impacts of that exactly at any given time throughout the day. The other issue is that the pricing signals have to be clear. The off-peak rate has to be cheaper than the on-peak rate so that we do encourage customers to charge off-peak at the right time. Again, with real time pricing, that is what is going to happen. It is cheaper to make the electricity off-peak than it is with making the electricity on-peak.

SENATOR LOWENTHAL: A number of members also have questions.

SENATOR BOB MARGETT: I am very much intrigued by what you had to say. I think that regardless whether it is in the area of transportation or medicine it seems that technology has taken over. I think that there is probably a technological answer virtually to anything that we have in this society today. And I think that is a wonderful tribute to our science and those who are directed in our universities and so on and so forth, looking for new measures. I think that is all wonderful.

I guess there is a couple of buzz words that you used. "In a sustainable way," now when you say sustainable to me, I am thinking in terms of economics. I mean, I think that we have technology to do many things, but I think that we also have to say, *that is wonderful, but can it really be put into my operation to be efficacious economically so that we can do some of these*

wonderful things that technology is providing? That is one question, maybe you can incorporate with the next question.

I noticed that you are employed by Southern California Edison Company. I think the crunch on Southern California Edison Company, of course….and you are doing a wonderful job, there is no question about that, but you know full well that the whole grid, I mean, it seems that we are almost imploding still with regards to energy in California, regardless whether it is supplied by Southern California Edison Company or PG&E, wherever it is coming from, we have not really solved that to be honest with you. Are we adding to the dilemma that we have with our energy now in introducing this at this moment in time, or are we just kind of tantalizing everybody with what you had to say?

MR. KJAER: In terms of the two parts of the question, the sustainability, your definition of sustainability I think is correct, and that is why this is the last point that I left on my slides was, this is all predicated on cost. The technology is advancing ever more rapidly. You are quite right, what generally happens with electro drive technology, depending on the technology, is the upfront cost is more expensive. The lifecycle cost or the operating cost over time, are cheaper than internal combustion engine technology—generally speaking.

SENATOR MARGETT: Can you give me some numbers on that?

MR. KJAER: No, but I can follow up with you and discuss that further with you. However, I was very careful to say that we absolutely; if more transportation is going to connect to the grid; if regulation is going to drive to more and more near zero and zero emission technologies, significant petroleum reduction, greenhouse gases, etc.; and transportation starts to connect more and more to the grid, we have to make sure it soaks up the excess capacity first. We have to make sure that the market structure is in place to use the excess off-peak capacity first. We do not, to your point, want to exacerbate the on-peak situation. In a lot of cases with truck stops and truck idling at night, that is good because it is off-peak. With plug-in hybridization, again, you can

be fueling the vehicle because it is a biofuel technology. You can be putting in the electricity fuel at night during off-peak, when the rates are cheaper.

You can go down the technologies in a lot of cases and say we can shape this so it is off-peak, and absorbing that excess capacity power plants are already doing that. For instance, we think that there is enough excess capacity, you could connect in California somewhere in the neighborhood of four to six million plug-in hybrid electric vehicles at night and not build one power plant.

SENATOR MARGETT: But what do we do, when we have interstate travel with these trucks and you enter into some states that are not as far advanced as what you are proposing for California. What do we do with a vehicle that is all prepared to be able to receive those off-peak hours and then we do not have a state that is participating in the program?

MR. KJAER: Well, for instance, if you had to look at the off board technology, the Idle Air technology that I talked about for truck stop electrification, that truck does not care where it parks. So as long as there is that electric infrastructure, that is fine. Even if it goes to a truck stop that does not have the electric infrastructure, then it has its existing onboard technology to sustain its heating and cooling.

You are right. But you have got to start somewhere. And so, I think that biofuel technologies, certainly in the early years, where you have a choice, like for instance, plug-in hybrid fuel cell technology is being looked at the moment and is being....potentially it is attractive because you have the ability to not only use the existing electricity infrastructure, but then you will be able to use a hydrogen infrastructure as well. And maybe there will not be enough hydrogen out there in the early years, you can still use electricity. We need to be thinking about it in those terms.

SENATOR MARGETT: And the compatibility of those.

MR. KJAER: Absolutely. I mean the issue of plugs and connection to the grid that has all been discussed and debated now. There has to be standardization. We learned an awful lot from the Electric Vehicle battery

experiment back in the nineties with regard to compatibility and the need for infrastructure and how much infrastructure. But your point is very well taken.

SENATOR LOWENTHAL: Assemblymember Pavley.

ASSEMBLYMEMBER FRAN PAVLEY: I appreciated your presentation and your goals to reduce greenhouse gas emissions and air pollution, etc. I was wondering if you could compare and contrast for me briefly, the value of going this direction with plug-in hybrids, etc. And I appreciate the electrification of truck stops and ports, to also exploring alternative fuel uses, flex fuels and other kinds of things which may be more readily available during that mid-term phase as we look to the long-term. Compare and contrast them not only environmentally, but use of fossil fuels and other comparisons you wish to make.

MR. KJAER: In two or three minutes?

ASSEMBLYMEMBER PAVLEY: Well, just briefly, have you done an analysis? You have one answer, is there an analysis to look at other options?

MR. KJAER: Again, the electrification is not the only solution. There is not a silver bullet out there. I think we need to have a mixture of solutions to meet both the state and the federal goals.

Biofuel, combination of biofuel with plug-in hybridization is, on the surface, extremely attractive. A lot of the question is going to be, how is the electricity made and how is the biofuel made? Do you use food and land to make fuel for transportation? That is a big debate at the moment. How much coal is there in the generation mix on a regional basis, and what implications does that have from a greenhouse gas perspective or emissions?

There is no simple solution. There is a wealth of work and evaluation and research going on at the moment to study these very issues. But again, I think that one of the issues with regard to the grid and coal, and this is being validated or being studied at the moment is, when you have got to project far enough ahead when there is enough transportation that is going to be negatively impacting the grid in some way. I mean, you can not look at it today, just like we can not be looking at the fuel cell technology today and the

efficiencies that we are seeing today and say *well that is what it is going to be like when it is ready for primetime.* There is no simple answer to the complex question that you are asking. But these have to be debated and they have to be researched an evaluated. You do not want to negatively impact, particularly on the greenhouse gas issue, the system by adding more transportation and coal then further perpetuating the problem.

SENATOR LOWENTHAL: I am going to draw this to a close and move to the next panel. Any data and information that you can provide us would be greatly useful. I am going to ask that to all participants. It would be very helpful for us. I thank you very much. You have stimulated a great deal of discussion.

MR. KJAER: Thank you.

SENATOR LOWENTHAL: Next, we are going to move onto emerging transportation technologies. Presentations will be by the Texas Transportation Institute (TTI), Maglev, and Skytech. These are built upon what we have just heard. We are going to look at what potentially does the future hold? The first panelist will be Dr. Stephen Roop from the Texas Transportation Institute.

STEPHEN ROOP: Good afternoon.

SENATOR LOWENTHAL: Good afternoon. Welcome to the Senate Transportation and Assembly Transportation Committees. We are excited to have you. Anything that you can do to help us, as we move forward in getting California moving, especially in terms of how we move freight, will be fascinating for us. And, what we can support.

MR. ROOP: Thank you very much.

Mr. Chairman and members, thank you for the invitation. It is a pleasure to be here today. I am very excited about the work that we are doing at the Texas Transportation Institute.

Obviously, the stage has been set nicely this morning with the discussions of electrification. Because the technology that I want to talk about today, is an electric technology moving us away from what everyone knows is a very serious dependency on oil with 99 percent of our transportation

infrastructure dedicated to oil. And it is a vulnerability that is national in scope. It is something that is becoming very critical. And as time moves forward, it is going to raise the price of transportation inordinately, and affect consumers as well as the freight transportation industry.

I hope you can see the other list of things that we all are aware of in transportation safety clearly is one, air quality and environmental impact, second to none in California.

When you look at the dynamics of the freight transportation industry, you can bisect it by distance, is one way to do it. Currently, the two modes that operate on the surface, truck and rail, kind of split the market down about a 500-mile distance measure. Railroads operate at 500 miles and greater, compete with trucking on long distance moves. Trucks completely dominate, and have virtually 100 percent of the freight market share at distances below 500 miles.

And as you can see in this photograph, which is a fairly famous photograph of Interstate 710,

SENATOR LOWENTHAL: That looks like the I-710 freeway.

MR. ROOP: It is the I-710 freeway. It is the best single photograph of the kind of congestion that is being created from our ports as international goods are moved in intermodal containers into the country. We are aware that 40 to 45 percent of the containers moving into the country, nationally, come in through L.A./Long Beach.

A point that I have to make in talking about emerging technologies in freight transportation, something that is very important to understand about freight transportation is that it is a minimum cost industry. It seeks to provide a minimum cost service to the purchasers, the shippers. Freight behaves a lot like water. It is going to seek that lowest cost wherever it is. I have heard some comments earlier today about the goods market share going elsewhere away from the state of California and it is precisely for the reason of cost. And so, I am going to walk through a list of things that I believe are a must, not optional, but a must, for emerging freight transportation systems for the

twenty-first century, because we have to move beyond the two modes that currently form the backbone of our freight transportation industry.

First of all, they have to be low cost. They have to have a long operating life. It must be rugged and simple. And I think you see that expressed in the current modes. They are rugged. They can take the harsh operating environment that you see in the freight transport business and stand up to the weights and the pressures and the cycle times.

A new freight transportation system has to be based on known and understood technology. We have to know what we are about in moving forward. I will speak a little bit about that later in the presentation.

The system has to be well suited to the task. It has to be designed to move the kind of freight that you seek to move. In the case of our system that we are putting forward today, it is intermodal containers. The system is geared around intermodal containers and moving as much material as fast and as safely as possible. Reliability is a key component. The supply chain and logistics firms and the focus on this part of the freight movement industry really are most troubled by the uncertainty that is creeping into the supply chain not knowing when your shipment will arrive. And that is a function of congestion on the highway. So, reliability and getting the uncertainty out of the supply chain is very critical.

It has to be high capacity. We are not talking about moving just a few intermodal containers. We are talking about moving an unending supply, thousands a day 365 days a year. It has to be a high capacity system with a tremendous amount of velocity capable in its design.

It has got to be interconnected with the existing intermodal transportation system. It has got to work with trucks. It has got to work with rail. It has got to interface with the current crane configurations that lift boxes. And it is very fundamental.

Environmentally clean is an obvious thing. I think we are going to have to move away from diesel and reliance on petroleum and oil as our propulsion systems. So electrification is clearly, I think, the short-term way to go here.

Also important, among my other duties at the Texas Transportation Institute, I run the Center for Transportation Safety. I believe it is very important to segregate freight from passenger travel. I think this is something that is lacking in our transportation system nationally. Accidents occur because of that. And I think at the point we are making decisions about new ways to go in the twenty-first century, separating freight and passengers clearly makes sense from many perspectives.

Security is another key element in what a new system must employ.

So I am going to talk to you today about a new approach to intermodal freight transportation. We have developed this over the last six years at the Texas Transportation Institute beginning with some funding emanating in 1999 through the Federal Transportation Act (ISTEA). It is based on a known and understood technology. It is our belief, and I hope to communicate that to this joint committee today, that it addresses both the community and commercial needs associated with freight transportation. That is, it gets the job done for commerce, but it does not adversely impact communities to the extent that we see today.

We call this the safe freight shuttle, the Secure, Automated, Fast and Environmentally Clean (SAFE).

Now a picture is worth more than a thousand words. This animation shows how this system looks in operation. See the interface with a truck and a standard intermodal lift.

MR. ROOP: I wanted to point out a couple of features of the safe freight shuttle. You notice it is a single unit transport and it has an aerodynamic leading edge that cuts down wind resistance and improves the economics of the operation considerably. It operates straddling a center guide way. And this center guide way serves four fundamental purposes in the design. It serves the guide vehicle; it serves to deliver power to the motor elements that reside on the vehicle; it serves as a braking system; and it serves as the power pickup for the unit. It serves as the other half of the linear motor. Now, a very fascinating thing about this system is the size of the wheel bearings, and I will show you

this in a few in a moments. You can see the steel wheeled vehicle, except for the steel bearings on this device there are no other moving parts. It is a capacity system. The mechanical reliability of this system is very high. It is a non-contact, no moving part system that provides linear motion created from the interaction between the vehicle and the guide way.

The container does not lock. It sits down in a recessed area in the vehicle and does not have to be locked into position. Therefore, it keeps an operator from having to physically approach the device and lock it.

I want to emphasize that these are single unit transports. In many respects this is a hybrid system. It borrows features from rail transportation that are proven to be sound and effective, like steel wheels and a steel running surface, and it borrows features from the trucking industry, like the single unit moves. So as soon as a container is loaded on a freight shuttle, it can exit the terminal and be on its way, which means there is absolutely no delay. The other benefit of that is you can keep your cranes at the destination terminal operating with a constant interval of containers arriving, very much like machines operate on a factory floor. The timing of the delivery is such that your cranes can stay in continuous operations.

I want to talk very briefly about the four elements that interact to make this system operational; the vehicle, the guideway, the communications command and control, and the terminal layout and design.

On the vehicle, it is an automated vehicle. I think it is obvious from the look that there is no onboard driver. The aerodynamic leading and trailing edges radically reduced air resistance, and with the low rolling friction that you achieve with a steel wheel/steel running surface, you have very great economy of motion with a device like this, even at the 80,0000 and 90,000 pounds gross that you may have involved.

In developing this system, we recognized the idea of reliability of freight transportation movements, rather than shear speed. A moderate speed system on the order of 30 to 70 miles an hour depending on the scenario is perfectly adequate to move goods inland 100 or 150 miles.

Predictability and reliability are the key indicators. And frankly, the slower you go, the more moderately you operate these, the better your energy consumption profiles look like. The less energy you use.

This operates on steel wheels and I have got a picture, I think, coming up next that demonstrates that very clearly. This is a linear induction motor. The propulsion system is a linear induction motor. It is very similar to a rotating ceiling fan that you may have in your home.

SENATOR LOWENTHAL: Senator Kehoe.

SENATOR KEHOE: The demonstration you showed us on the slide would not be at the Port of Long Beach or any other port; it would be inland 50 or 70 miles—is that what you are saying? Because you were putting it on a truck, so it was going out on the street after this—right?

MR. ROOP: That particular view was loading from the shuttle to the truck. The opposite could be shown as well—loading from the truck to the shuttle. A demonstration project at the Port of L.A. or Long Beach would require terminal facilities at the port, as well as an inland facility, with a connecting line.

SENATOR KEHOE: Has anyone built one of these?

MR. ROOP: No. We are in the process of moving towards a prototype of this system.

SENATOR KEHOE: Thank you.

MR. ROOP: This shows a little more clearly the steel wheel configuration of the system. And I hope you all can see that it has a flat profile, and it operates on a flat steel rail, which is a departure from traditional railroad engineering designs. It further reduces the rolling friction involved. And a unique feature of ours is it is a derailment proof system. The center guideway will not allow the vehicle to come off the track. We are not relying on the rail to serve as the guideway, merely as the surface upon which the vehicle rolls. A very small number of moving parts in an automated control system make up the balance of the vehicle design.

I want to talk a little bit about the infrastructure, because everybody's concerned about the cost of the infrastructure. The design that we have employed for the freight shuttle system is known technology. It is called a slab track. It is a reinforced concrete element upon which you place your rails and your center guideway.

This view shows half of the slab track with the center guideway, and shows the flat wheel on the flat rail as some of the key elements in this design. Now, the reason we have done this is, because of the stability of a concrete surface. The fact that we can control geometry; the fact that the life cycle is very good; and the ability to support weight is obviously proven. It is a low cost infrastructure.

And to the grade separation point made earlier, we believe that the grade separation structures built to allow this vehicle to move over existing roadways can be about half the cost of normal grade separation structure because of its small size, because of the known dynamics and weight associated with this system, because of the single unit transport concept, and the ability to prefabricate these components offsite and move them into location.

Another unique feature that we have for system reliability moving away from traditional railroad technology is an expansion joint on the steel running surface. This will allow the steel rail to expand and contract with the thermal conditions in a particular environment and not result in track buckling or a discontinuity in the surface.

Communications command and control, since this is an automated vehicle it is key. We have done a lot of design work on this. It is a very well known and well understood technology. There will be onboard intelligence on the vehicle as well as a central dispatching center where the vehicles will know where to go, and the central dispatching area will know exactly where every asset is in the track.

There have been a number of questions brought up about inland terminal design. We spent a good bit of time designing an inland terminal that is different from the way things are normally operated in this country.

Normally, containers are stored on their trailers in very expansive yards that amount to hundreds of acres.

And the European model is to stack containers. We have gone with a high density facility. Let me explain this diagram a little bit. This is a bird's eye view of an intermodal container facility. With stacked containers, these are stacked six high. The yellow are stacked four. This row is stacked one high. And the blue elements are shuttles moving in for the loading and unloading process. The blue bars represent overhead cranes. And we had eleven overhead cranes in a high density, 25-acre facility that has a 3,000 unit through put on a daily basis.

This is another animation that I wanted you to see. Not that we want to run this down the highway right-of-way, but to demonstrate the small footprint of the guideway. We can operate two directions of shuttles in a little more than 25 feet, or a lane and a shoulder. So, it is very space economical in terms of the distance that you really require laterally to put this into place.

Infrastructure cost: I wanted to talk a little bit about this last bullet because of the low rolling friction and the linear motor. The result in operating costs and energy consumption cost of less than ten cents a mile for a loaded container based on Southern California rates today. Very much lower than the amount that it costs to move the same material by truck.

In terms of cost to the infrastructure, we would like to offer that many of the elements in this system are comparable to traditional railroad engineering components in terms of the track, in terms of the vehicles command and control, and so on.

It is important to note that there are huge public benefits that accrue for pavement damage, safety, air quality on the order of 62 cents per mile. With a system that moves 6,000 boxes a day 100 miles, the public benefits accrue at over $500,000 a day, and that is a significant amount of money to attempt to capture.

SENATOR SOTO: I noticed on the slide before this one that you have a space for grade separations.

MR. ROOP: Yes, ma'am.

SENATOR SOTO: Could you elaborate a little bit on where we are going to add those and if we are?

MR. ROOP: I certainly could talk to you offline about that. Grade separations, as was pointed out, are a mandatory part of any system that is automated and a system that is designed to operate in the way this one is. There are some grade separated corridors that you could gain access to. So the question boils down to, where do you put a system like this? And if it is going to be crossing roadways at grade, how is that best done? We have designed a low cost grade separation structure that would bring it up over roadways in an economical and effective fashion.

SENATOR SOTO: As you know, the Alameda Corridor goes to the Inland Empire. I would appreciate knowing more about them and what we have to do to implement grade separations effectively.

MR. ROOP: I would like to stop on this slide because this is a nice graphic that shows how this system is a continually circulating system, conveyor system of shuttles moving from the red terminal; it could be an origin terminal; the blue terminal is destination terminals; and these move in a continually circulating path. The length of this network can be whatever you wish it to be.

I would like to thank the Chairs and committees for the opportunity to make this presentation.

SENATOR LOWENTHAL: Next, we are going to hear from Maglev—Ken James and General Atomics.

KEN JAMES: Thank you, Mr. Chairman. I will be explaining and presenting the Maglev technology because it meets some of the requirements that we had primarily for moving a great number of containers out of the Port of Long Beach and L.A. and into the continental United States, as well as locally in the port. In fact, I wanted to make sure that everybody understood this technology is already proven and demonstrated in both Germany and Shanghai.

"The Transrapid Maglev System", an entirely new train system, is the first system to overcome the limitations of wheel and rail. Because the vehicle moves entirely without contact, it makes train travel faster, easier on the environment, and more economical. In any case, the Maglev system's guideway requires less land and space than other transportation systems.

Transrapid has very favorable alignment parameters with small curve radii and a grade climbing ability of 10 percent. The Transrapid guideway can therefore be adapted to the landscape instead of the other way around.

The Maglev system requires significantly less energy than other transportation systems. Used under similar conditions, the specific primary energy requirement of a car is three times higher than that of an airplane, five times higher than the Transrapid."

Basically, this is a very real technology that exists today. The first Maglev in the world was built in Germany and Shanghai by Transrapid International. And so of course a couple of years ago when we had the idea of moving containers using the Maglev, we invited them in to speak with us. We explained where we wanted to move large containers, and they said *Oh, we already do that.* They were referring of to the small containers you put in the cargo bay of a 747. When we explained we were talking about 40-foot containers that were weighing 35 tons, they kind of stared at us for a while and then we went through the process of explaining it in terms they understood—namely in terms of passenger economics.

At the port we have basically a ridership, a known ridership that is constantly increasing. It runs 24/7. And these riders are only going to specific sites, such as Intermodal Container Transfer Facilities (ICTFs) or rail yards, or warehouse districts, or inland ports, and the technology is completely compatible with existing rail and highway. And not only that, but it also essentially complements this existing technology by adding support to what we have already.

I want to point out also that when the Transrapid people went away excited about actually having the addition of freight Maglev to their dialogue,

we went away excited because we saw the chance of our paradigm, which is basically there is no reason California can not have both economic growth through the continued expansion of the ports through put, as well as having good paying jobs from that port expansion. And at the same time, have a high quality of life that makes those jobs worthwhile. I think everybody understands the importance of our port in terms of the income it produces for the region and the state, and also it basically that half of the U.S. imports come through the Port of L.A./Long Beach.

Most importantly though, we were looking for a technique that balanced this economic growth with the needs to have zero impact on pollution, zero impact on neighborhoods, on the existing infrastructure, on vibration, on noise. This thing runs absolutely silently. So it has all the advantages of adding the quality of life, and at the same time, can move the number of containers we are considering.

I think the little adage at the bottom kind of makes our point. Namely, you cannot solve the problems with the same technology that caused those problems.

All right, so what we are looking at here is the problem, of course, since we are using a stationary, very low polluting power source, an electrical generator to power these vehicles, and you can see that we are going to eliminate the use of diesel trucks. The Air Quality Management District (AQMD) has a map showing where the diesel particulate pollution, which is probably the most injurious and dangerous pollutant that there is, is concentrated in the Los Angeles area, and you can actually see it running out through various arteries of the freeways and the rail. It is not necessarily just at the port itself, but actually run several miles inland. The residents go to community meetings to talk about this black soot that occurs in their back yards and in their school yards, are in fact referring to these places as a death zones.

The first application that comes from the Maglev technology comes at the port directly. And what is happening there is, the various terminals at the port are not geographically located for near dock rail. So they end up hauling

numerous containers, quantities of maybe millions per year, out of the terminal and up to the Intermodal Container Transfer Facilities (ICTFs) at the rail head at the Alameda Corridor, even farther into various rail yards in Southern California. So those number of truck trips are what's adding these pollutants to that area around the port, and this we see as an opportunity.

And this opportunity is, if we can put in a Maglev conveyor system. A Maglev conveyor system would basically pick up containers at the port, move them up at first to the Intermodal Container Transfer Facilities close to the port, maybe farther up to some of the rail yards, and then come back to the port. Some of the advantages we have on that: it is going to increase the utility of the Alameda Corridor; it is going to eliminate the short haul trucking from the terminals; and it is going to be the first….it would literally be the feeder system to a more advanced structure which would actually carry containers not just to the local rail heads, but also to the Inland Empire, to the warehouse districts, where the 30-acre warehouses exist, out to Victorville, where the BNSF has a rail head, out to Beaumont where the UP has a rail head.

We have an animation, which shows how this would operate at the port.

First of all I want to point out you can see there is a double deck train moving underneath the Maglev. Maglev's preferred embodiment is as an elevated system. This is the most important thing. It has a very small footprint, namely those pedestals that hold it up. And it works best in form of an elevated system rather than an at-grade system.

What is going on there, of course, is the Maglev is not only allowing the trains from the port to leave, but also the trucks. And then we are loading various things onto a small siding. It could be anywhere from one, two, or three flatbed carriages that could actually be loaded.

I should apologize we are using top loaders here for a very good reason. They are probably the oldest form of loading on-dock rail. What we have decided to do, in order to convince the terminals this is the way that they want to sit there, and start considering allowing a Maglev onto their facility, is to use the most common means of actually loading on-dock rail at the same time. We

could have more advanced cranes and even some more advanced automated warehouse systems for containers that would actually connect the various terminals or the Maglev.

Some of the points we want to make about Maglev: it has no moving parts—zero; no wheels; nothing; it floats on a magnetic field. There are a lot of advantages besides the fact that it is a very low polluter because it uses fixed sources. One of them is it replaces the steel wheels with a raise of magnets.

Steel wheels have a problem. Basically to reduce the friction, they eliminate or minimize the amount of area of contact they make with the rails. It is about four centimeters, maybe about a square inch. The problem with that, that is what you have to pay for, is that when you load a double deck container on that, you are talking about putting 70 maybe 100 thousand pounds on that one square inch. That is what damages the infrastructure and the rail. The rail becomes misaligned. The cost of maintenance goes up. It is putting all that pressure on that single point.

Whereas in Maglev, the magnets are distributed over the full length of the car, so you have maybe upwards of 50 to 100 square feet where that weight of the containers is actually resting on. What that does is, allow the carriage to be, should we say, less stressed so you can make a lighter carriage. At the same time, the track itself, or the guideway (we don't use the word track), is less stressed. In fact, Maglev has been proven to have the highest payload to carriage ratio of any ground technology.

Another point is the system uses a linear synchronous motor, which is similar to a linear induction motor. The difference is that instead of putting the power onto the vehicle itself, the power is in the entire length of the track. And there were studies done at the Los Alamos Lab that show that when you use a Maglev…you can use either a linear induction motor or a linear synchronous motor. If you have a fairly long track and only a few vehicles on it you use a linear induction motor because the motor is then on the vehicle itself and the track is passive. But if you have a lot of vehicles, such as we would have in a container conveyor system, then the power source is actually on the track itself

and all the vehicles themselves are passive. So that really reduces the cost of that system.

There are several other points here. It has a very small footprint. I want to make sure that gives you a lot of options for right-of-way, and it is elevated. This is a real difference. Instead of worrying about digging trench for a rail, or instead of having to worry about elevating highway or widening highways, this has a number of rights-of-way, such as long riverbeds, interstate medians along unused rails.

Another point is the security. The security is there. And as you are talking about a system that is elevated, it is moving relatively fast all the time and it is totally automated—all done by computer.

One of the points that I wanted to make earlier about linear synchronous motor is, while the track is powered it is only powered at the place where the computers recognize there is a carriage, so you do not sit there and electrify the entire track—only that place that is used by the vehicle. So again, that brings down the cost of operation.

Now, I mentioned earlier that Transrapid, which is a German company is a consortium of Krupp Corporation and Siemans Corporation, were the first builders of the Maglev. There is an Americanized version of the Maglev as well, and it is almost an entirely California enterprise.

About 1980, probably after the Transrapid people began developing their Maglev, Livermore Labs was researching and developing things called hold back arrays which were developed for the purpose of the particle accelerators. What it does is basically make a magnet that only has one pole that is emphasized. About five years after that, another scientist at Lawrence Livermore, recognized this could be used for Maglev as well. What he did is he invented something called the Inductrack. General Atomics, which is a worldwide technology company centered in San Diego, bought the licensing right to the Inductrack, and in fact, have built a full scale system of an Americanized Maglev, if you will, and it is the only full scale system in the United States right now. And they are probably online to be the very first

producers of the first passenger Maglev in the United States some time in the next two years. General Atomics, as well as Transrapid, has been a technology provider, if you will, to Cal State Long Beach.

Let me get back to this point I was mentioning. The Maglev at the port, the conveyor belt at the port is only the initial step. In fact, what you need to do is you need to have a total solution to the problem of removing the containers from the port and from the Los Angeles area. Almost half of the containers that come into the Ports of L.A. and Long Beach end up on transcontinental rail, which means they have to get through the entire Los Angeles Basin before they can ever get, essentially, on that journey. We are talking about millions of containers a year that are flooding the Los Angeles area that do not necessarily have to be there if you can divert them with something like a, what we call, the Trans L.A. Maglev System. There are a number of advantages here. Mainly that what you will be able to do is, you will be able to open up the infrastructure that does exist, namely the roads and the rail that we can use in the Southern California area. That is what we need for the manufacturing base. That is what we need for the commercial base. That is what we need for the commuters. And if you can sit there and actually remove those millions of containers that are just going to the rest of the United States anyway, you are going to have an advantage to your infrastructure that might mitigate some of the costs of basically expanding it by basically diverting all of these containers.

I was going to say that basically one Maglev bidirectional guideway across the Los Angeles area would basically divert a full 10 years anticipated growth of container traffic at the Port of L.A./Long Beach.

Here are some of the routes we are talking about. Basically they follow almost like the Alameda Corridor up through to the Los Angeles area. And then if you go out either the 60 or the 10, and then they bifurcate over in the warehouse district where you have these gigantic warehouses in Ontario, up the Cajon Pass to Victorville where the BNSF is located, and down maybe to Beaumont where the UP is located.

The point I want to make about this, is when you talk about the Cajon Pass, the rails that go up the Cajon Pass have a maximum climb of 3 percent. What you see when you drive through there is you will see them winding back and forth and going through very expensive tunnel structures.

The Maglev has the ability to climb at 10 percent grade with passengers. The one that was designed for us by Transrapid is a 6 percent grade, which fortuitously is the same grade that the interstate highway system requires—the maximum grade of all the interstates. So, any interstate median strip can basically run a Maglev right up the middle of it.

Now we get to the costs. The first thing you notice is the transit time. I think earlier on the slide the present systems of Maglev, which have operated for like 2.2 million miles, carried five or six million passengers, have a 99.9 percent on time limit. When you are talking about delivery cycles using a Maglev system, you are talking a highly reliable system, and it can do it in less than an hour. We were very kind to the rail, which I have known has actually taken three days, in some cases, to get containers out of the basin, and the truck, which is about eight hours in good traffic.

More importantly, I want to mention the operating costs. We looked at the rail costs for the Alameda Corridor's proposed shuttle train to the Inland Empire, we are looking at the operating cost of a typical….and this is a few months old, so it has not taken into account the increase in fuel cost for the trucks, but if you notice, the Maglev has a very minimal operating cost. And not only a minimal operating cost, but it also has a very minimal life cycle cost. It is very low maintenance. So that difference between the Maglev cost and the cost of these other items is what it can produce, and I go back to what is called the passenger economics, this is where the fair box pays for the system, and this is a big deal. And so, this is the thing that will invite private investment, because of the potential for profit, and maybe even public money may be seeding this and the private money following.

In terms of the total cost, what we are talking about here is that, and this is in terms of the entire system, what we have tried to do is compare if you

want to move about, I think we are talking about three to four million containers a year with the Maglev system, you have to build a Maglev system. If you want to move three or four million containers additional to what we are doing now in terms of highway and in terms of rail, then you have to expand those two conventional means.

The rail expansion we were looking at because of the grade separation issues is the Alameda Corridor East, which I have understood needs several hundred grade separations at a cost of about $4 billion. Highway expansion is problematic as well; using the 710 expansion...because of the difficulties they are having in terms of the community response, and the consideration of elevating truck routes down the 710 into Los Angeles at a cost of $250 million year, which is rather exorbitant.

The Maglev which we have put at the high end of based on the actual Chinese experience of 200 million a mile. But I think General Atomics, during the question period might talk about that further, because it has reduced that markedly by a new manufacturing processes. So, you are talking here about the Maglev for $25 billion for the entire system. The difference is, and this is something I want to point out, the rolling stock, so to speak, is already, or the gliding stock, is already on the Maglev system, and that is what you are paying for. You are paying for the entire system. What I am talking about is the cost of the rail and the road I am not talking about the cost of the engines or the trucks. In this case, I think overall, even with our very conservative estimates, it turns out to be the most cost effective approach to handling the volume of containers we are projecting over the next ten years.

In conclusion, let me just point out that Dr. Gurol is anxious to have anyone call if they would like to see this Maglev system in action. It makes a very nice demonstration you can actually see the technology and understand how it can move these trucks without any moving parts.

Thank you.

SENATOR LOWENTHAL: Thank you very much. The next panelist is Bruce Danke of Skytech.

BRUCE DANKE: I want to thank you all for inviting me.

What I am going to show you is a fully automated cargo handling system. This system here is a rail head right now. And what we did is automate it, and that way there are no trucks involved whatsoever. It eliminates all the pollution. We put it on this beam, which is a reaction bar for our system. It does use an electromagnetic propulsion system; other people call it a linear induction. The system goes above the railroad tracks, and the reason we do that is to utilize the land more efficiently.

The system hangs the container underneath and one of the byproducts is it actually floats. The system will also handle trucks. The engine has no working parts. Therefore, the system is eliminating traditional over the road trucking and is pollution free.

This is a quick look at the way we load and unload a traditional truck. It just goes underneath the grail and we have cranes. It comes off of this grail system and this grail system actually was designed and invented by Malcom McQueen, who is the father of containerization.

Your ports do between five and six thousand containers per acre. With this grail system, which is outlined in the material I gave you, you can do 25- to 30,000 containers per acre. And you can see right now what it is doing. It takes a container out to the ship. The system eliminates all of the trucks that traditionally run by the ship and loads the ship as well.

Now I am going to reverse it and show you how it unloads. Instead of the trucks running down below, it takes the container and places it into the grail system. The system would either stack it, or it would take it to the train and mount it without traditional cranes. No pollution whatsoever. It is efficient. It will reduce congestion. It is maintenance free because there are no working parts. We address the problems of usage, congestion, road damage. It reduces truck traffic, noise and air pollution, and it increases the through put which makes the containers more secure. One of the key security problems with containers is dwell time. The system can expedite the dwell time and send the containers out 60 miles out to the distribution centers.

The way we do our cost, is we take what a traditional truck charges to go to the rail head and come back. With that information and the cost of the lift that the railroads traditionally do at the ports, this has a return of investment.

In Chicago, between the Northfork Southern and BNSF Railroad, it is about 4.2 miles. We automated both sites on paper. And it had a return. It cost $180 million to do it. It had a return of 2.7 years.

And like I said, there is no pollution. It eliminates chassis and provides better land utilization. And not only can we put the trucks up there, but if you were 70 miles out to the east of here, you could put a commuter train on the system and efficiently match up to your existing services.

That is a really quick overview. Both gentlemen before me basically demonstrated that electricity is probably the most efficient way to go. Our cost of building this, like I say, you have three undersides, three vehicles hung under and three on top. That gives you six lanes of traffic and our cost is about $5 million a mile, and that is traditionally what one lane of highway, I guess, costs.

So this is truly a multi-modal system. Over the road trucks can be taken off the highway. All the containers can be eliminated off the highway except for local deliveries. All the trucks that circle that port can be eliminated because it goes into the grid.

This concludes my presentation. Thank you for this opportunity.

SENATOR LOWENTHAL: Thank you. Any questions? Assemblymember Horton.

ASSEMBLYMEMBER SHIRLEY HORTON: Has this technology ever been used?

MR. DAHNKE: If you have ever ridden on the subway underneath the Capitol of the United States uses this technology. If you have been to Ireland at Dublin Zoo, the monorail system there is an application of this technology. And if any of you have ever gone to Disneyland for the last 50 years, Walt Disney uses this on a daily basis in their parking lot, to move stuff. It has had

one breakdown in that timeframe. It is very efficient. It does not breakdown. It is cost effective, and it is mature off the shelf technology.

ASSEMBLYMEMBER HORTON: And I missed, what is the maximum speed?

MR. DAHNKE: On this system, we envisioned that if you were going more than 100 miles, you could probably get it going up to 100 miles an hour.

SENATOR LOWENTHAL: So with that, are there any other questions? If not, we are going to move onto the next panel. We are going to bring in some folks from the trucking industry and the rail industry.

The first panelist is Cheryl Bynum, who is the technical manager of the U.S. EPA's SmartWay Transport Partnership.

CHERYL BYNUM: Good afternoon, Mr. Chair, Madam Chair, and members. I appreciate this opportunity to speak to you today about the U.S. Environmental Protection Agency SmartWay Transport Partnership with the freight industry and how it can complement any programs that you are contemplating, including the Governor's Strategic Growth Plan.

The counter behind me right now is tracking the number of diesel fuel that has been consumed by trucks and locomotives since we started SmartWay two years ago. It is over two billion gallons. These idling trucks and locomotive engines consume about a billion gallons of fuel each year.

You are asking, what is the SmartWay Transport Partnership? It is a pro- business, pro-environment approach to significantly reduce fuel consumption and emissions from freight transport by accelerating the deployment of new and emerging technologies that are currently in the market, but for various reasons have not yet achieved a significant market share. SmartWay started in 2004. We had 15 charter partners when we started. We worked with the Business for Social Responsibility and the American Trucking Association. By the time we launched it in February of 2004, we already had 50 partners. It is a public private/partnership.

The way that SmartWay works is we achieve fuel and emission reductions through corporate partnerships. We have partnerships with

carriers and shippers, both rail and truck, intermodal and logistics companies. We have a national transportation idle free corridors project. We have advanced rail and intermodal solutions. We have testing and technology verification. And we have innovating financing approaches.

In just two years we already have had 323 companies that currently are SmartWay Transport Partners and these represent some of the largest multi-national companies operating in the United States. Together, our partners represent all of the class one railroads and we also represent 4 percent of the rolling truck stock in the United States, responsible for 7 percent of the total amount of fuel consumed by the trucking industry in the United States. So it has been quite impressive, the growth that we have had.

And these 323 companies, how they reduce fuel consumption and improve emissions? They use a combination of technologies and best practices in their operations that are available. Again, I want to emphasize, available today.

I want to go through just a few of these technologies. You have heard about idle reduction. You can have idle reduction technologies that include auxiliary power units that go onboard, or plug-in systems. And these systems supply electrical power and/or heating and cooling to the truck or locomotive so the main engine can be shut off, and this saves fuel and reduces considerable amounts of emissions.

Trailer aerodynamics, I would like to bring your attention to that. It is an emerging technology. Now, about 75 percent of all trucks on the road already have tractor aerodynamics. You are familiar with the roof fairings and the integrated side fairings that move air up and over the truck. But then trailer aerodynamics has been an area that has not been well recognized, although there has been considerable work done in the area over the past decade or so. And I think, personally, the time is right for trailer aerodynamics.

Some of the technologies involved, you can see behind me, involve side skirts, gap reducers, which cut the amount of space between the trailer and

the tractor and avoid turbulence, and also air deflectors that, again, help move the air up over the trailer.

And these are two of our SmartWay Transport Partners that are using combinations of trailer skirts and using gap reducers.

Now, another technology that I personally am very excited about is the single wide tires. This is an extremely promising technology available, again, today. All four major tire manufacturers offer this technology.

What happens is you generally have on a class-8 tractor trailer two tires at the end of each axel except for generally the steer axel. And these are replaced with one single wider tire made of much more fuel efficient materials and architecture, which significantly reduces rolling resistance and cuts weight, both of which contribute to significant fuel savings.

This is an example of one of our SmartWay Partners using single wide tires on the back of its tractor. And I must say they are also very attractive tires.

ASSEMBLYMEMBER OROPEZA: What kind of savings?

MS. BYNUM: If you put these on a class-8 tractor trailer you can save anywhere from 4 to 8 percent fuel economy. It is a no brainer. This is the low hanging fruit.

We do have some experts here that will be speaking after me on rail technology so I will not go into that other than to say SmartWay also promotes very innovative rail and intermodal solutions.

Now, I am the manager of the SmartWay Test Program, and what we are currently doing is, we are demonstrating that retrofitting a truck with idle reduction, single wide tires, and aerodynamic equipment, can significantly improve fuel economy and reduce emissions by up to 20 percent or greater, and these are emission reductions and fuel savings you can get today using non-exotic technologies currently available on the market, quantifying the emissions reduction potential of these fuel savings technologies. What we actually did was say that we measured the fuel savings, but at the same time we measured what are the NOx reductions possible from these technologies,

and the PM reductions. And this opened the door for the U.S. Environmental Protection Agency to issue some very innovative air quality guidance.

In 2004, EPA issued guidance for states that want to include idle reduction projects in their State Implementation Plans (SIPS). And we plan to issue additional SIPS in the future to cover some of these additional innovative technologies that we are testing.

So to make it easier for states and trucking companies to adopt fuel saving technology, the EPA developed the concept of the SmartWay upgrade kit which bundles the most cost-effective technologies together in a single retrofit package that typically pays for itself in three years or fewer.

SmartWay upgrades will be specific to the application for which they are designed. For example, a port dray truck would have different upgrade options than, say, a parcel delivery truck. In this example, a line haul truck would have a SmartWay upgrade kit that could include some form of idle reduction, single wide tires, aerodynamic fairings, and a diesel oxidation catalyst.

In this illustration, a truck fleet purchasing this kit with a low interest 6 percent loan would realize a per truck fuel savings of over $180 per month. So you may ask doesn't every truck fleet do this, right now it seems to make a lot of sense. One reason and we have struggled with this, when we started SmartWay, most of the partners that we attracted, the ones that were most active in ATA, were the larger fleets. We did that purposefully because we wanted to develop traction for the program by getting all the big named fleets, the big name shippers. But the reality is, most trucking fleets in this country are small to medium sized businesses. These are the small business owners, and they often lack the resources to handle the upfront decisions and cost required to retrofit their trucks, so they need a little bit of help.

The U.S. EPA is stepping into educate fleets through our SmartWay Transport Partnership program. We have a national outreach campaign. I would be happy to send you the materials. We have numerous technical publications, and we have a very informative website which features this online

calculator. Using this calculator, any fleet can customize its planned purchases and calculate the payback period and the monthly savings.

ASSEMBLYMEMBER OROPEZA: Ms. Bynum, before you go on, your outreach program, do you have any of that information available in Spanish?

MS. BYNUM: Well, it is wonderful that you asked that. We are currently working with the federal government of Canada to translate many of the driver training materials that they did into Spanish and offer it as a web-enabled package.

ASSEMBLYMEMBER OROPEZA: For California, and for the California trucking industry, we have a great number of Spanish speaking owner/operators, and I think it would….some, like you said, are not in a financial position to be able to participate in this, others, owned small fleets. And access to that information in Spanish probably would make it possible for them to understand how this can be a win for them and their companies.

Do you know what kind of timeframe that is going to be coming in?

MS. BYNUM: That project was scheduled to happen in this fiscal year. But I will bring back what you said to my boss and let him know that for the state of California is very important.

ASSEMBLYMEMBER OROPEZA: It would be extremely helpful. And I think probably for other states, Texas, and other border-states, I would imagine, and other states that have large numbers of Spanish speaking in the industry.

MS. BYNUM: Thank you so much for that suggestion. I would like you to also know that EPA has been working with the Department of Energy and the Department of Transportation and others, to research additional financing options.

States can help to bridge this gap. Arkansas and Minnesota recently instituted some low interest loan programs for truck fleets to purchase SmartWay upgrade kits. And Pennsylvania and Oregon are considering similar programs. This may be a direction that California might consider going as part of its Strategic Growth Plan.

California has led the nation in innovative retrofits for emission reductions with your Carl Moyer program. California is again stepping forward with its Strategic Growth Plan. This growth plan, I believe, could and should take advantage of the technical support that EPA offers to states and to industry through SmartWay with fuel saving SmartWay upgrade kits for trucks, innovative financing concepts, like the low-interest loans to fleets for retrofits, and our outreach program.

This is my contact information. I would like you to know that I sincerely believe that working together we can achieve strategic growth as we simultaneously conserve fuel, protect air quality, and save money. Thank you.

SENATOR LOWENTHAL: The next panelist is from Union Pacific, Mike Iden, General Director of the Car and Locomotive Engineering.

MIKE IDEN: Thank you, Chairman and distinguished members of the panel. My name is Mike Iden. I am the General Director of Car and Locomotive Engineering from Union Pacific Railroad. I am essentially the lead technical representative for Union Pacific Railroad on emissions issues, and I have been working on issues regarding railroad emissions in particular, here in the state of California for the past three years. I am also Chairman of the Association of American Railroads Technology Scanning Committee. We fund basic research at three university labs which includes the Texas Transportation Institute. The work which we fund does not, I want to mention, include the technology which was presented earlier this afternoon. I am also a member of the Transportation Research Port Committee on Railroad Technology, and the Transportation Research Board (TRB) is part of the National Academies of Science.

People ask me, well, what do you do? And to boil it all down, basically I consider myself to be a railroad propulsion technologist.

What we are talking about, of course, is the intermodal engine of America, which is primarily based at the Ports of Long Beach and Los Angeles. And this, as we all know, is an extremely important factor economically, not

only for the state of California and the local residents, but for the nation as a whole.

The L.A. area is a hub for nationwide rail freight, and there are three points that we have to consider here.

The first is there is a key requirement in goods movement to reduce in-route delays and to reduce emissions. And going from one mode to another in transporting a container, for example, from Los Angeles to Chicago or New York, will increase the transit time and the delays in handling that traffic.

The second is, that the railroads operate around the clock and can not be linked to off-peak sources of energy, which is a point that the Chairman brought up in one of the previous commentaries.

And the third point is, that railroad intermodal transportation is already three to four times more energy efficient and therefore less polluting emissions wise than over the road trucking.

To put things in perspective, we are dealing with three different types of locomotives in the L.A. basin. We have relatively small fleet of passenger locomotives operated by Metro Link and Amtrak California and these are essentially very high speed shuttle type operations. There are switching locomotives operated by Union Pacific, BNSF Railway and the Pacific Harbor line, and these are all low speed locomotives which do local work in and around the rail yards. And last, are the long haul line locomotives which operate the trains, many of which are transcontinental between Chicago and L.A., New York and L.A., Jacksonville, Atlanta, etc.

I want to point out that Union Pacific is in the process of acquiring 71 ultra low emitting locomotives. Eleven of them will be the green goat hybrid locomotives, and 60 will be the new Gen-set locomotive, which we just announced.

ASSEMBLYMEMBER OROPEZA: Can you explain what those are?

MR. IDEN: Yes. The green goat is a simple hybrid. It uses a small 290 horse power truck type diesel engine to charge two very large batteries which then provide power to the traction motors on the wheels. The emissions

reductions that the green goat is capable of producing come not from the fact that it has large batteries, but from the fact that it uses a very small truck derivative diesel engine, which is very low on emissions.

ASSEMBLYMEMBER OROPEZA: Very good. And how many of those are you purchasing?

MR. IDEN: We have eleven coming to the L.A. basin. And we also have ordered 60 of what I call a Gen-set switcher. And I will be talking about that a little later. It is a larger locomotive which uses three very large truck derivative diesel engines. It will achieve an 80 to 90 percent reduction in locomotive emissions, vis-à-vis the existing switching locomotives and save up to 40 percent of the fuel required.

And the last thing at the very bottom, regarding the line haul locomotives, Union Pacific and BNSF have both been making major investments in the latest EPA state of the art low emissions line haul locomotives.

There has been some discussion both during this hearing and in the past, regarding electrification of freight railroads. And I would like to make some points to, in our opinion, set the record straight. Electrification of freight railroads is not a new idea. There have been more than a dozen studies made in the twentieth century, and every one of them basically failed for one principal reason, an economic hurdle.

There are, at the current time, only two electrified freight railroads of any significance in the U.S. One is 78 miles long. It is landlocked in the state of Arizona, and it operates between a coal mine and a power plant, and the other is another utility owned railroad, 38 miles long with seven locomotives in the state of New Mexico.

The impact of freight railroad electrification, particularly if you do it on a regional or balkanized basis, can be very severe. First of all, the disruption to the movement of freight trains in and out of the Port of L.A. and Long Beach area, threatens a modal shift away from rail because of the introduction of even

more time in handling the containers between the origin and the ultimate destination.

Electrification, particularly on a regional basis, will also result in more capital investment for locomotives and deterioration in train schedules and customer service, and rail yards themselves, and will still be diesel operated.

The top graphic shows the operation of a typical intermodal train between Chicago and Long Beach or Los Angeles. One set of diesel road locomotives operates the train from the origin yard in Chicago all the way into the destination yard in the L.A. area. If we were to do a regional electrification, at the very bottom, you would have a very short haul, which is represented by the red line where the train would be powered by electric locomotives, but we would have the long haul to and from Chicago, for example, with diesel locomotives, and the ultimate operation in and out of the actual rail intermodal yards would still be with diesel locomotives.

We operate approximately 80 trains per day in and out of the L.A. Basin, and we operate over three routes. I have graphically portrayed them here. So you can see that if a scheme were developed to regionally electrify the freight railroads in the L.A. Basin, we would end up with multiple changes of locomotives on all of these trains, which would increase the amount of time. This in turn would result in a major disruption to the national rail network. I want to point out that North American diesel locomotives operate transcontinentally and internationally often across two or more railroads per trip. Electric locomotives have to stop operating where the overhead wire ends.

Now, to talk very briefly about why rail yards themselves can not be electrified, particularly in the intermodal world, container and trailer unloading and loading requires overhead clearances which would interfere with the installation of 25,000 or 50,000 volt overhead wires.

And the last point is that electric locomotives therefore would be unable to operate in or out of intermodal rail yards necessitating yet another power swap between diesel and electric locomotives.

In the lower left photo you can see a typical straddle crane which is used to load or unload double stack container cars in an intermodal yard, such as is found in numerous places inside the Los Angeles Basin.

In the right hand photo you can see the top roof view of an electric locomotive, the pantograph reaching up to the 25,000 volt overhead wire. You can imagine installing that kind of a wire on the tracks inside the rail yards, it would be in conflict with the loading equipment used to load and unload the intermodal cars.

In 1992, a study was performed by Bosial and Hamilton and De Luke Hather, two major consulting houses. The report is now 15 years old, but we can take the numbers which were published in their report and escalate them by 41 percent, which is the increase in the consumer price index since 1992. That results in a cost of about $1.25 million per track mile using 1992 dollars, and $4 million in 1992 per electric locomotive. If we take those numbers and scale them up for the rise in the consumer price index, you can see that electrifying Metro Link alone would cost roughly $1 billion, and for a fleet of 45 diesel locomotives operated by Metro Link, that's an equivalent cost of about $44 million per diesel locomotive to be eliminated with an electrified operation. The cost estimate for the freight network with in the Los Angeles Basin is about $3.25 billion, and that, of course, would be a regionalized system east of, perhaps, Beaumont, Barstow, and south of Mojave.

There are some distinct advantages to electrification. One of them is that by feeding power from an overhead wire into an electric locomotive, when the locomotive is going downhill in what we call dynamic braking, which is an electric braking mode, the power generated by the motors can be fed back into the catenary, or the overhead wire, and used to help propel other trains up the hill which has just been climbed. There are, however, disadvantages. And key among them is that there is a massive investment required in infrastructure: overhead wire, parallel supply wire, substations, control apparatus, and one of the biggest issues is, mitigating line side electromagnetic interference with

telecommunications installations. And last, every track on every possible route must be electrified if electric locomotives are to use them.

I want to point out here four pictures of locomotive technology, and I am going to keep this very simple.

The first is a diesel electric locomotive such as we currently now operate, roughly 4,400 horsepower, a market cost of about $2 million. They are physically about as big a locomotive as we can get. They are currently manufactured and sold to the railroads of the U.S., Canada, and Mexico at about 1,000 locomotives per year. And these are not mass produced machines. Anything that is manufactured at a rate of a 1,000 a year can not be defined as mass produced. But they are, essentially, standardized products.

The next is a straight electric locomotive. And using some of the previous cost estimates, these locomotives would cost about $6 million per piece. The technology is feasible, but in the past 30 years, only 30 straight electric freight locomotives have been manufactured for service in the U.S. and Canada.

The next is what I call a dual mode diesel and electric locomotive, and this was referred to one of the previous presentations. We are making a rough estimate that this would cost between $6 and $10 million each, which is three to fives times the cost of a conventional diesel locomotive. This would be an extremely complex locomotive and a very large engineering challenge.

The last technology that I want to bring to your attention is what I call a regenerative line haul diesel battery locomotive. One of our locomotive manufacturers is working on this technology. In fact, they had a prototype locomotive of this design which operated an intermodal train from Chicago to Los Angeles and back in 2004. They are currently trying to commercialize this technology.

What this technology would allow, for example, is a train descending from Cajon Summit into the Los Angeles Basin, in dynamic braking or electric braking, instead of dissipating that energy to the atmosphere as heat, we would be able to pump that electrical energy into high efficiency batteries onboard the

locomotive, and then when propulsion is needed, instead of using the diesel locomotive, we could, for example, substitute power from the batteries at the rate of 4,400 horsepower, the same rating of the diesel engine, for up to 20 minutes. This is truly a regenerative form of technology which is very comparable to, for example, the Toyota Prius as a true regenerative motor vehicle.

I am not going to give you a price. The manufacturer has not set a price, and I am not going to venture as to what their price is going to be because that simply invites them to set a price. Our hope is that the technology will cost not much more, if not the same as what we already pay for a locomotive, and it fits very easily with our infrastructure.

And the last point to keep in mind is that this manufacturer is estimating that this technology could further reduce existing EPA Tier 2 locomotive emissions by another 15 percent. Therefore, we see a jump from conventional diesel technology to a diesel battery as perhaps the next big thing in locomotive propulsion.

We have heard a lot about different technologies. And again, we have seen a lot of very high numbers being thrown about.

Diesel technology continues to improve. I want to point out that Union Pacific is currently focusing all of our tier-two line haul locomotives on trains to and from California. We are pioneering the introduction of the Gen-set switchers in the Los Angeles Basin. And we feel that the regenerative line haul locomotive may be the next big thing in locomotive technology.

Regarding technology approach: We have invested money to the extent where 47 percent of our locomotive fleet is now EPA certified, and that is since the year 2000. And in terms of emissions technology, one double stacked train is equivalent to 280 over the road trucks.

The last point, Union Pacific is on target to meet the requirements of the 1998 MOU for the south coast region, and the 2005 rail yard MOU for statewide.

The last slide shows the Gen-set switcher. And we started this as a bright idea, and I want to point out, in your briefing paper, there is discussion about how technologies are implemented. This locomotive started in the year 2002 as a bright idea. By 2004, we had approval from our senior management to build a prototype. The prototype locomotive entered California on January 4th. On the night of February 1st, after being demonstrated in Roseville and the City of Industry, it went to work in our intermodal yard at Carson, California near the Port of Long Beach. On February 9th, Union Pacific announced the acquisition of 60 Gen-set switchers, which will be delivered between June of this year and Labor Day of 2007. When all 60 of these locomotives are delivered by Labor Day of next year, this fleet of 60 locomotives will have eliminated between 8 and 9 percent of all locomotive emissions in the Los Angeles Basin.

The challenge facing California today in this particular issue is not necessarily finding machines which think, but gathering responsible business leaders, technology innovators, and community leaders, to make intelligent decisions on transportation technologies which are readily implementable and have a high probability of success.

Thank you for your time.

SENATOR LOWENTHAL: Thank you very much. Questions? If not, we are going to move to your competitor from the Burlington Northern Santa Fe Railway, Mark Stehly, Assistant Vice President, Environment and Research Development.

MARK STEHLY: Thank you for inviting me here to talk about technology. Union Pacific, while a competitor, we are also partners, and we are partners in technology, so we share a lot of what we do. There are a lot of programs that we work on together.

First, I want to bring us back a little bit to air quality. Nationally, a number of people think that perhaps the South Coast has the worst air quality in the nation, and they certainly do have poor air quality. The San Joaquin Valley also has poor air quality. A number of air districts have poor air quality.

We operate in Houston. A few years ago they claimed to have the worst air quality in the nation. There are a number of regions and municipalities with serious air quality problems.

SENATOR LOWENTHAL: We are not racing towards it. That is not something we want, so this is not a competitive process you understand.

MR. STEHLY: That is right, and we do not want it either. We have a lot of people who live in these areas, and thousands of our employees live here. But there are a lot of people wanting special help in a lot of areas in the U.S. because of air quality. But we are spending more time in California, and especially Southern California, than in the rest of the U.S.

The technology does reduce emissions on our locomotives. Switch engines of the likes that Mike talked about, are leading the way. But even there, we are using truck derivative engines. The Department of Energy is spending roughly $90 million a year of public funds to reduce the emissions from truck engines. They spend essentially zero on locomotive engines, saying that we are not an important enough part of the problem, so they are spending money on trucks. So we are trying to take as much of the truck engine technology as we can.

But our engines run at different speeds. The pistons are a lot different size. And because we go through tunnels and we have three or four or five locomotives on a single train, some of the technologies you use on trucks are not applicable to locomotives.

We run at steady state because we have a diesel engine that runs a generator and our motors are electric. So we run mostly at steady state. A truck runs with a lot of transients, so some of the technology that works best works best on transients and engines, does not work as well on steady state. So, some of the technology does not work as well, although we use it to the best advantage that we can.

A number of people do like to compare stationary sources to mobile sources and say *look at what stationary sources have done.* And it is a useful comparison. The technologies that they use can be useful for mobile source, as

well. But it is a little disingenuous to say that we should be able to automatically meet what a stationary source does when we have weight restrictions, clearance restrictions, volume restrictions, in order to make it mobile. If we did not have those restrictions we could easily meet it too. But if a power plant had to be moved on wheels and generate power at the same time, it could not meet the emission reductions that it is meeting.

Also, because we are involved in interstate commerce, and there are interstate commerce issues, we do like to do voluntary agreements that really address the key problems in ways that we can meet our fair share, and yet do it in ways that do not unduly impair our needs to participate in interstate commerce.

I will show you where we are now in the reductions from the types of technologies that we are already using on our switch engines and our cargo handling equipment.

The through trains are among the most difficult, because that is line haul equipment, that is large engines, and the breakthroughs have not come as much as they have where we have used more truck like engines. And so there will be a little more than a roughly 50 percent reduction by 2010.

The switcher locomotives, because of the technology that we are bringing along the likes that UP is talking about is a 90 percent reduction by 2010. The cargo handling equipment from the Air Resources Board (ARB) rule, because those are largely truck like engines, they are also a 60 percent reduction.

A big issue for all of us that are in goods movement with drayage trucks, is how do we get more emissions from drayage trucks when they tend to be older and in less economical service? So there is a lot done; a lot will be done by 2010; but we need to do more.

This is a LNG powered switch engine. It is one we have had for 12 years. We have four of them. You lose 20 percent power. You lose 20 percent fuel efficiency. It does reduce NOx, but greenhouse gases go up by 20 percent because they are spark ignited; they are not a diesel engine. But they are running every day in Los Angeles.

This is the green goat, the hybrid that Mike was talking about, which is a 290 horsepower engine and a Gen-set which is 2,000 horsepower with batteries engine. Very easy to overwork it, and if you overwork it, the charge on the batteries goes down. You really lose battery life. We need 10 years of battery life. They need to be kept at 80 percent charge level. They go below that, the battery life goes way down and we will have to replace it and it will not be economical.

Again, this is the same locomotive that Mike showed. We are looking to purchase six of them, and five of them in the San Joaquin Valley with Carl Moyer funds with the San Joaquin Valley District. And we have got six or so on order with the state of Texas with the TERP grants.

This is one thing that we are looking at because the breakthrough technology is a lot harder on the main line locomotives. This is the road locomotive; the hybrid concept; the one that was on our railroad in 2004; the one that we are helping GE bring to light. And you can see it is very much like the Honda Civic. It is the same sort of concept of regenerative braking storing it in a battery and using it for motoring power. We are hopeful that some time this year or the first quarter of next year, that there will be a production type prototype rather than a proof of concept type prototype.

You can see this is the switch engine. The emissions and grams of brake horsepower hour, NOx and PM are the top two bars. As you go to the right, you get to the newer and newer switch locomotives, and these are the ones that are using the truck like engines, the multi-Gen-set. And you can see the reductions go from uncontrolled of 17.5 to a 2005 EPA Tier 2 standard of 8.1, down to somewhere in the 2.7, maybe three years from now it may go to a standard of 1.5. There are big reductions in NOx with these truck like engines on switch engines, and equally large reductions in PM.

The line haul locomotive is, again, the breakthrough technology is a lot harder. There is not as much government funding being spent. General Electric developed a new engine to meet the 2005 standard. They spent $250

million on a new engine from a clean sheet of paper. But still, because of the speed of the engine, the size of the engine, it is in the fives.

Here is a diesel particulate filter that we are working on for our existing switch engines that would have large reductions of particulate. We and Union Pacific are working on this together, along with the California Resources Board.

And then just to look at, you can thumb through this on truck versus locomotive engines. In three decades there have only been 21,000 locomotives sold, where there have been 22 million trucks. We are on the tail end of a lot of the technology as it gets cascaded down, but we are applying it and we are making big reductions. It is just that reductions come first on trucks, then on off road truck type engines, and then the get applied to locomotives.

The railroads are making big investment in California. The colored bars here refer to the benefits from the memorandum of understanding that we did—the blue in 1998, and the green in 2005, and the yellow, a combination of both.

In the SmartWay Program, we are putting on a lot of Automax start, stop equipment. So our locomotives do not idle. They are on all of our new locomotives that we buy. They have been retrofitted onto half of our line haul fleet. And then most of the smaller engines, almost our entire funding on automatic start/stop is going to locomotives in California. It is how much money we can apply to it, and it is all going to the benefit of California.

Then you can see the basic efficiencies of rail. We know we are part of the problem. We do have emissions and we need to solve it, but we are part of the solution. Under the grams per ton mile, we are much better than the competition.

Whatever questions you might have, I would be willing to answer them.

SENATOR LOWENTHAL: Yes, I have a question. Starting from that last slide, that rail is better than, especially in the movement of goods, maybe in the short haul than freight, I mean, rail is better than trucks in terms of….yet, we also hear that rail is really equipped to deal with long haul, but really in terms of short haul it is more expensive. The reason why we are doing a lot of travel

by truck, is that it is a lot cheaper to move that 100 miles by truck, or 80 miles, by using an old dirty truck than it is to put it on one of your trains, or through the Alameda Corridor. So we have that problem, that you are not economically equipped to handle the short haul, which we have….you know, once we can get it onto rail, it is fine. But the question that we are hearing is, where do you put it on rail? So my question to you is, since we are talking about moving to rail, where do you put it onto the rail?

We also heard today a little bit about new emerging technologies, whether it is the Safe Freight Shuttle or the Maglev system, or the Skytech system, whatever model, we are not here to propose one or the other, as systems to eliminate the short haul, highly congested….primarily truck lines now, because that is what we are doing. Because let us be honest, that is who is using that in that in there, much more than you are. We are not putting them on….if we are doing the long distance, then we are going right. We want to get it up to rail. What do you think about these models? And why are not you investing in them?

MR. STEHLY: Well, I am a civil engineer. I have been a civil engineer in the railroad industry for 33 years. We construct new lines every year; expand our sidings; construct triple track; we know what it costs. And they are built because it works for our cost model. We can compete with trucks and provide service to our customers. And I would be very leery of people that come in. Sometimes the deals sound like they are too good to be true, it is because they probably are too good to be true. They may fit in certain niches. There may be some economies of scale in doing things. There may be some manufacturing improvements in the future to bring it down. We would be willing to look at their costs.

SENATOR LOWENTHAL: Yet, what I am hearing is, you are tried, true and traditional. If I go to Japan, I see a high speed rail—modern technology. If I go to China, I see a Maglev system. If I go to Europe, I see both high speed rail and a Maglev. How come I do not see any of these systems in the United States?

MR. STEHLY: Well, because mostly, they are almost entirely passenger, and almost all of them are subsidized through public funds.

SENATOR LOWENTHAL: But I do not even see the passenger in the United States. And now we are talking about taking what we have learned, but unfortunately we have not learned it from here in the United States, the models are outside of this country.

MR. STEHLY: But watch Congress deal with Amtrak budget. They want them to be profitable, to pay for all of their costs out of the fair box, and that does not happen in any of these other systems. They are not paid for….their total cost of their operation, their construction, is not paid for out of the fair box.

SENATOR LOWENTHAL: But do you think a freight system might?

MR. STEHLY: Freight systems involve greater mass, higher forces it is more difficult to construct to contain those forces, although we would operate at that speed. So you know, the best I can say is, we are willing to look at these people's proposals and give you our best look at it as to what they are on a realistic, constructed system would look like.

SENATOR LOWENTHAL: We would love to hear that. That would be great to have that input. Because at some point, and it is not necessarily the railroad's fault that you are not getting any support, that we do not have a national rail policy like the rest of the world does. But now we are talking about, if we want to move to new technologies, we do not even have effective old technologies in this country, especially in terms of passenger, because we have not invested in that. And now we are saying, we are going to be investing $107 billion in transportation infrastructure and $220 billion overall—where are we going to be in 30 or 40 years? What kinds of systems do we want? And why are we not seeing those models here in the United States? Why do we have to go to Germany, China, Japan, to look at those models?

MR. STEHLY: I would like to say one thing about the truck drayage we do not particularly have a big interest in how the containers get to our intermodal yards. If they could come by a monorail, I mean, and it did not

interfere with our things, we do not care. If the port wants to build a big thing for everybody in the port to go to our intermodal yards with something other than drayage, I mean, that would be all right with us. If we had to pay for it and it was not economical, of course, that would be a real problem, because our whole transportation would not be economical. But there are some new technologies and they do not interfere with the rail operations, I mean, what is it to us? We would like it if it were cheaper, better faster, if we could be better neighbors. That would be a good thing for us.

SENATOR LOWENTHAL: Thank you. I would like to close with the public comments. And I think our first one who had asked us is Henry Hogo from South Coast Air Quality Management District. And then we will have anyone else who wishes to address us.

HENRY HOGO: Good morning, Mr. Chairman, members of the committee. I am Henry Hogo of South Coast Air Quality Management District. I am going to be very brief this afternoon. We are supportive of all of the technologies that are coming online that would help move goods movement, but we are also look for technologies that are the cleanest technologies that can be implemented as early as possible. We believe that what you heard today about having cleaner engines, are a good move, but today's clean engines are tomorrow's dirty engines. We look at accelerating the cleanest technology earlier than mandates. So for instance, on the on road side, we believe that a lot of alternative fuel engines is going be much cleaner beginning in 2007 compared to diesel engines in 2007, because they are going to come out with engines meeting future standards.

Similarly, we believe that the rail operations should be the same way. They are looking at Tier 2 engines today, but EPA is going to have Tier 3 engines coming out with regulations for those engines, and we believe that if we look towards technologies that could move in that direction, we can get these newer engines on faster.

You heard a lot about switcher locomotives and new engines, but there was not that much discussion about retrofitting assisting locomotives. As you

look to the future of a zero emission network, there is going to be a transition needed. And we need to cleanup the emissions from the current engines.

We believe that retrofit is the viable way to go. Alternative fuels, low sulfur fuels, cleaner fuels, hybrids, this is the diverse portfolio that you need to put in to the program in order to have a transition to zero emission goods movement.

So, in the meantime, retrofitting in terms of on road trucks is a good way to go. Alternative fuels where they fit into the operation, is a good way to go. Hybrids are a good way to go. But we believe that retrofitting line haul locomotives is a very viable technology. We believe that the technology in Europe can be adapted to the U.S. for these locomotives, as well as for the switcher locomotives that are still going to be running for a long time.

With that, I just want to conclude that we would like to work closely with you and your committee on looking at technologies in the future. Thank you.

SENATOR LOWENTHAL: Thank you. Others that wish to address the committee? Good afternoon.

MARY MCCORMACK: Good afternoon. I'm Mary McCormack. I am the president of the MBI Group, but I also wear two hats today, as the president of the Harbor Association of Industry and Commerce. I wanted to share with you this morning that as a business association, we participated in a white paper a couple of years ago which actually Assemblymember Oropeza and then, Senator Karnette were involved, which was the Symposium on Integrated Transportation Strategies. It was an ITS white paper that we designed and wrote. I wanted to talk to you about what is in this paper. It talks about the issue of whose problem is it and it really came to the blending that everybody really needed to come to the table. But there was an issue of flow of goods, flow of data, and the flow of money. All three of those different pieces of information basically occur exclusively in the private sector. The private sector is basically driven by having to make a profit, and also to just talk about their operating costs. However, it is our goal this year to try and bring people to the table, and because we are a business association, to talk about out of the box

thinking, and we want to make sure that we are there to start bringing people to the table. So I am here today to talk about what information you might need from the business community so that we can start bringing people to the table to come up with some solutions as well.

A lot of our members are at the Port of Los Angeles, Port of Long Beach, the Pacific Harbor lines, the terminal operators, shippers, all those people, as I know you know very well. But you know, if we can look at some roundtable opportunities, roundtable discussions, I would personally make sure that that happens and I wanted to make sure you knew that.

SENATOR LOWENTHAL: Well, we welcome that. Let's figure that out. You know, there are just a lot of discussions going on. This hearing was for us here in Sacramento, to hear some of the discussions and some of the different technologies and what is going on, because we are seeing that in the local communities that these discussions have already begun. So we need to be able to integrate this, not necessarily to micromanage, but just for us to understand, and as we engage in this major investment that we are consistent with the thinking that the local communities have.

The other part is, especially in the goods movement part, we are talking about, not the state running these programs, but this is really where the public/private partnerships will be. We know that, and we understand that. It is very important that we do engage with the private sector and understand, that we are going to be helping, but they are the ones that are going to be running this operation and doing this. These are not going to be state run facilities in any way, and we want to promote that. We want to promote public/private partnerships. We want to, whether it is the governor's toll roads for goods movement in terms of on highways or what we can look at new emerging infrastructure, we want to promote the fact of bringing the private sector, so the more we can have those discussions, the better place we are in California, really, to do that.

SENATOR LOWENTHAL: Anyone else that wishes to address the committee?

MOSS BITTNER: It is encouraging to see the Joint Committee considering all the options for making the freight system more effective, more cost-effective, more efficient, and most of all, to cause fewer impacts on the health and residents and the environment. You heard a number of proposals today, and I am sure it is clear that no single proposal is going to fulfill the expectations of the state for improving its transportation infrastructure over the next 20, 30, or 40 years. And in some cases, the right thing to do might be to make massive daring investments, like Maglev or other things which really do break with the historical expectations of private enterprise, of the people who build things. Because who is in the better position than the state to start pushing towards that future? But since it is my generation who will be working for the next 40 years and paying off these projects, which I'm led to believe can only be paid for bond obligations, it would be very encouraging to see the low cost options be considered fully. And even if the bulk of the money goes to big projects, a significant part of the discussion should go towards those low cost options. One that you heard earlier today was more of a safety consideration, which is putting in speed markers on dangerous turns. Those have been very effective on Highway 101 at various sections where because 101 is a U.S. highway and not an interstate highway, it does not have flyovers in many cases. It goes through cities and the speed is reduced in those areas. In doing so, there are speed markers that tell vehicles to slow down and they do. It is sort of a peer pressure element.

And of course because I work with a small port and its connecting railroad, it would be encouraging to see those facilities used. Because these are under utilized assets that could fulfill some of the expectations rather than focusing on the bottlenecks, which are inevitably going to be very expensive problems, to focus some of the energy on the under utilized assets, takes the pressure off those bottlenecks.

Thank you.

SENATOR LOWENTHAL: That is an excellent suggestion. With that, I am going to call this hearing to a conclusion.

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