INTEGRATED ENERGY POLICY REPORT COMMITTEE WORKSHOP

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

In the Matter of:)
)
Transportation Fuels Production,) Docket No.
Importation and Infrastructure) 02-IEP-01
__________________________________)

CALIFORNIA ENERGY COMMISSION

1516 NINTH STREET

HEARING ROOM A

SACRAMENTO, CALIFORNIA

FRIDAY, JULY 11, 2003

9:34 A.M.

Reported by:
Alan Meade
Contract No. 170-99-001

COMMISSIONERS PRESENT

James Boyd, Presiding Member

William Keese, Chairman, Associate Member

John Geesman, Commissioner

STAFF PRESENT

Charles Y. Mizutani

Brian Covi

David Abelson

Chris Kavalec

ALSO PRESENT

David L. Mathewson, Director
The Port of Los Angeles

Holly P. Kranzmann, Director
Shell Oil Products, US

Robert A. Hermes, Chairman
Purvin & Gertz, Inc.
International Energy Consultants

Joseph J. Leto, President
Energy Analysts International, Inc.

Brian J. Smith, Deputy Director
California Department of Transportation

Jeffrey C. Williams, Professor
University of California Davis

Stefan Unnasch
TIAX

Daniel Sperling, Professor
University of California Davis

Mark A. DeLucchi, Consultant
University of California Davis

ALSO PRESENT

Anthony R. Eggert, Associate Research Director
University of California Davis

Rick Margolin
Environment Now

David A. Smith
BP America, Inc.

Dwight D. Stevenson, Advisor
Tesoro Refining and Marketing Company

Michael T. LaCavera, Facility Manager
Vopak Terminal Los Angeles, Inc.

Steve E. Goldbeck, Assistant Executive Director
San Francisco Bay Conservation and
Development Commission
State of California

H.I. Bud Beebe, Regulatory Affairs Coordinator
Sacramento Municipal Utility District

Jay McKeeman, Executive Vice President
California Independent Oil Marketers Association

Stephen Heckeroth, Director
Uni-Solar
Bekaert ECD Solar Systems, LLC

James S. White, Principal
White Environmental Associates

Douglas M. Grandy, Chief Energy Policy Advisor
Department of General Services
State of California

Kamal B. Ahuja, Air Resources Engineer
California Air Resources Board

I N D E X

INDEX

P R O C E E D I N G S

9:34 a.m.

PRESIDING MEMBER BOYD: Good morning, everybody, and welcome. For some of you this might be a first-time event. For many of us it is number x in a long series of workshops, but I welcome you nonetheless. Thank you for taking your Friday and your day to join us.

This is the IEPR Committee Workshop on Transportation Fuels. And, as many of you know, this is but one of a series of workshops being held under the auspices of the 2003 Integrated Energy Policy Report, which requires an overview of major energy trends facing California, including energy supplies that are available to the state in both the near term and the long term.

This workshop today, like others we've had, will assist in the development of the record for the subordinate report of our Integrated Energy Policy Report. This one on transportation fuels.

As you've seen from the agenda, the workshop has several sessions which address a variety of topics; topics and issues related to future transportation fuel supplies and future transportation in this state, including state transportation fuels demand forecasting plans; the question or the subject of increasing petroleum imports; discussion of the trends in retail marketing of transportation fuels in our state; the hydrogen infrastructure development, since this nation is on a path to hydrogen; and greenhouse gas emissions in the transportation arena.

By way of introduction, I'm Jim Boyd, the Energy Commissioner who happens to be the lead Commissioner on the Integrated Energy Policy Report, and Presiding Officer of the Committee. The other Committee Member is Chairman Keese. And we are joined today by Commissioner Geesman who sits with me on the Transportation Committee, and who has a strong interest in the subject. So any and all Commissioners are welcome to these hearings. And we welcome Commissioner Geesman. And I'll call on the two of them in a few minutes when I finish giving the rest of explanatory and introductory comments.

In addition to the individual presentations you see on the agenda and workshop notice in the topic areas that I indicated, as you see we're going to have a panel discussion right after lunch to explore the implications of the subject of increasing petroleum imports; both the inputs to production, like crude oil, as well as components, blend stocks and finished product like gasoline and diesel fuel.

What we want to get out of today's workshop is, while we don't necessarily expect to come out with definitive conclusions, although that would be nice, we're not pressing that subject.

We do want to better understand how California's energy system will need to evolve in order to supply sufficient transportation energy to meet the continued transportation demand growth.

And this has become quite a subject in this state with all the events that seem to take place on a regular basis in the supply and price of transportation fuels. And somewhat echoed by the fact that this Commission now has had at least three or four different hearings and workshops just in the past year-plus that I've been here on the subject of transportation fuels, world oil supply, strategic fuels reserves, reducing our dependence on petroleum and what-have-you. It's quite obvious that this has become a very key issue in this state.

The workshop notice, which was very thorough and well done by our staff, included topic areas with questions that have been posed to the workshop participants to elicit responses which we hope will be helpful to this Committee in better understanding the driving forces and risks and uncertainties that will affect the ability to provide adequate, reliable and reasonably priced transportation fuel supplies to the citizens of California.

The organization of today's workshop, during many of the sessions speakers will give their presentations and it will be followed by a period of time to ask questions, both from ourselves and from members of the audience, from staff and what-have-you.

But for the session on increased petroleum imports, for which we're going to have a panel discussion, I'm going to ask folks to limit questions to clarifications from the speaker on maybe a little bit of what they said, but to hold the more rigorous questions for the panel discussion, itself

Now, that's going to be a little hard to sort out, but if we interrupt somebody and say, can you hold that for the panel discussion, you'll understand why. We try to take advantage of the breadth of knowledge that's going to be sitting up here and can address some of the questions.

And we have a moderator, as you see from the agenda, who will provide questions and who will moderate, if not referee, the panel discussion this afternoon. And he's going to both open and facilitate the discussions. And during that time we hope that a lot of questions from you are stimulated, and you'll have a lot of questions of the panel members.

And also on the agenda you've seen that at the end of the day we have time for more general public presentations of anybody who wants to say something. So we ask that if you have just a presentation of sorts, which we've openly solicited, kind of hold it for that point in time.

Our Public Adviser has provided speakers cards which are what we like to call around here little blue cards, on the back table, for anyone who wants to speak during the general public session. We ask that you fill out a blue card and let it find its way up here so we can call on members of the public.

But have no fear, this is a workshop. It's reasonably informal, and we'll call on anybody to speak at appropriate times.

So, with that, I would like to ask my fellow Committee Member, Commissioner Keese, if he has any remarks he'd like to make. And Commissioner Geesman. And then we will turn the session over to Charles Mizutani, who's going to moderate, at least the beginning of the day.

Chairman Keese.

CHAIRMAN KEESE: Thank you, Jim. I guess my only comment would be on the integrated nature of the report we're doing, which is to tie together all sources, gas, electricity, petroleum products. Many of the issues we deal with, energy efficiency, air, cross-cut over all these areas.

Today we're dealing with one specific issue. And I guess what I am most interested in is whether we're seeing a paradigm shift from exporting to importing in this area. And the reason I'm interested in that is because it impacts all the other things that you see on our program. It impacts our port situation and needs. It impacts the transportation system for product in the state. It impacts refinery licensing and other incidental pieces of legislation that flow through occasionally like we're seeing this year.

So, it's this -- the question is are we in the midst of a paradigm shift? If we are, when will it occur; and do we see it accelerating in pace?

I welcome you all here. I'm happy to see a good crowd. I will unfortunately have to excuse myself this afternoon; I'm doing global climate change at Stanford University at 2:00. So I will be joining you in the morning, but I'll have to slip out for the afternoon.

Commissioner Geesman.

COMMISSIONER GEESMAN: Play ball.

(Laughter.)

PRESIDING MEMBER BOYD: Thanks, John. All right, Charles, it's yours.

MR. MIZUTANI: Because of the tightness of the workshop schedule I will basically just be introducing the speakers, and probably need to play the role of the timekeeper.

And so with that, the first session is

entitled transportation forecasting and planning, and there will be two speakers. The first speaker is Dr. Chris Kavalec, who's staff here at the Energy Commission. And he will be making a presentation on the results of his 20-year transportation fuel demand forecast for California.

DR. KAVALEC: Good morning. I'm just going to give a brief overview of our recent transportation forecast to serve as sort of an introduction for a lead-in to the discussion on imports.

The forecast was for 20 years, 2003 to 2023. Fuel types and sectors involved, gasoline, diesel, electricity, natural gas and commercial jet fuel. The different sectors, freight, transit, commercial aviation, private light-duty vehicles and commercial fleet light-duty vehicles.

There is a separate model involved for all of these sectors except in the case of transit. We weren't able to get our transit model updated in time for this forecast so we just used historical trends extrapolated out.

Key assumptions. Population grows by an average of 1.4 percent per year; that's from DOF, Department of Finance. Average household size is expected to get bigger, so the number of households grows by 1.2 percent per year.

Income per household grows by 2.5 percent per year. That comes from the latest UCLA forecast. Long-term gasoline and diesel prices, $1.68 and $1.67 respectively. That's based on a world crude oil price of $25 per barrel. The assumption here is that OPEC is going to be able to keep world oil price within its preferred range of $22 to $28.

Additional assumptions. Our forecast for hybrid light duty vehicles is consistent with the Air Resources Board partial zero emission vehicle requirements. For example, in 2010 in order to meet these requirements the Air Resources Board expects sales of 122,000 electric hybrid vehicles. And by 2020 sales would reach almost 200,000.

Diesel light duty vehicles are assumed to be available starting in model year 2007. The assumption here is that with the new clean diesel that light duty vehicles will be able to meet California regulations.

A little change in mileage mpg for

conventional gasoline light duty vehicles by class. For example, compact cars fuel efficiency stays roughly constant over the forecast period.

Airline travel, which has been down since 911, is expected assumed to resume its historical growth; and that's consistent with the most recent FAA forecast for the nation.

I'm not going to go into the modeling details, but I just wanted to mention one thing about the CALCARS model, which is the model we use to project light duty vehicle transportation demand. The CALCARS model estimates light duty vehicle choice, quantity and use for private vehicles.

Vehicle choice is a function of demographic and vehicle characteristics. For example, the choice of vehicle to hold in a particular year is based on its price, its fuel efficiency, acceleration, the income of the household and so on.

Made forecasts at the household level. And most importantly, for this forecast, it was recently re-estimated using the California Vehicle Survey of 2002, to be able to project hybrids and diesel light duty vehicles. We didn't have that capability before.

The way that was done was through what's called a stated preference survey. Households were offered sets of hypothetical vehicles, which included hybrid and diesels, and asked to choose their preferred vehicle.

Key results. Onroad VMT is projected to increase by an average of 1.65 percent per year over the next 20 years. And the next ten years the rate of growth is higher, 2 percent. Later in the forecast period demographic growth is forecast to slow down a little bit. So VMT growth is higher at the beginning of the forecast period than towards the end.

Number of onroad vehicles increases from 24 million to 33 million by 2023, 1.45 percent per year. Gasoline demand is projected to grow by 1.35 percent per year or 15- to almost 20 billion gallons.

In the next ten years the rate of growth of gasoline demand is projected to be 1.8, almost 1.9 percent. So, like VMT, the rate of growth is higher earlier in the forecast period in the next ten years.

For the same reason as VMT demographic

growth slows down. But in addition we have these hybrids and diesel light-duty vehicles improving fuel efficiency for light-duty vehicles. That reduces the rate of growth of gasoline demand.

Percentage growth in diesel demand is 1.9 percent. Jet fuel 3.95 percent. Electricity 5.4; that comes from a growth in transit. And natural gas, 6.95 percent, coming from natural gas buses.

More results. Electric hybrid light-duty vehicles sales reach 144,000 in 2010. So the CALCARS model is telling us that that car requirement of 122,000 would easily be met. Consumers would be willing to buy more than what CARB is expecting in that year; 259,000 by 2023.

Diesel light-duty vehicle sales reach 56,000 in 2010 and 70,000 by the end of the forecast period. The penetration of hybrids and diesels, which tend to be more fuel efficient than conventional or conventional gasoline counterparts, increase mpg by 2.4 percent over the forecast period. And light-duty vehicles by 2023 displace over 400 million gallons of gasoline.

AUDIENCE SPEAKER: Is that per year?

DR. KAVALEC: Oh, no -- Yeah. By 2023

gasoline demand is 400 million gallons lower than it would be.

A graphical look at fuel demand; gasoline at the top, jet fuel and diesel. And finally, as a transition to our conversation about imports, a look at supply and demand at the same time hopefully.

The top line there is projected gasoline plus diesel demand in gasoline-equivalent gallons over the forecast period. The bottom line is our estimate of the supply of gasoline and diesel for onroad use for California coming from instate refineries.

The slope of that line is based on the assumption of refinery expansion or creep of 0.5 percent per year. So the difference between the two, and this is actual demand and actual supply to give us an estimate of imports required. In 2010 2.9 billion. And by the end of the forecast period, 5 billion gallons of imports.

Okay. That's it.

PRESIDING MEMBER BOYD: We'd like to entertain any questions folks might have of Chris. Chris, I'd like to ask a question first.

Your previous chart on gasoline, diesel

fuel and jet fuel, from my recollection, comports very closely for gasoline and diesel fuel with the previous estimates that we've been operating with in this organization. But if I eyeballed it correctly, jet fuel seemed to have fallen off some from the last projections I'd seen.

Is this attributable to 911, do you think? Because it picks up again, as it did in the past, but it just seemed to be more than just a little bit lower than our last analysis in the earlier years.

DR. KAVALEC: Yeah, because it's basically what you said, it's because of 911 there's a sort of shock, and the absolute level drops, and then it begins to pick up again at the same rate.

So, in the earlier years it's going to be lower than our earlier forecast was that didn't take that into account.

PRESIDING MEMBER BOYD: Okay, thank you. Questions from the audience? Please come to the microphone when you have a question or statement, and state your name and affiliation, if need be, for the record, please.

MR. HECKEROTH: My name is Steve

Heckeroth, and I've been attending these, especially the zero emission hearings for 12 years.

I wonder why, in all that you've talked about, you don't mention the fact that people get around on foot and on bicycle as options. Seems like as fuel gets in shorter supply that those options are going to be much more likely to be used.

And my other question relates to the extraction of fuels in California, or the production of raw feedstock, as opposed to refineries. I've read that it's been reducing at a rate of 2 percent per year in California, actual production of oil.

But what does that have to do with saying that refineries are increasing? I mean what we're talking about is the basic feedstock that's available, not refinery capacity, it would seem to me, if we're trying to be independent in California.

DR. KAVALEC: Okay, the second question I would have to leave to any supply expert in the audience that wants to take a --

PRESIDING MEMBER BOYD: Well, I was

going to suggest that since I've read through all the material that's going to be presented today, this topic is going to be covered later on by other presenters in terms of the California production versus other production and world imports and what-have-you. So, I think your question will get answered.

With regard to the first question I'll leave it to you, other than to say that it's a good point. Walking consumes calories, but this is a transportation fuel oriented discussion.

DR. KAVALEC: Yeah, one thing I wanted to mention about the first question is that our light-duty vehicle forecasting includes an adjustment due to congestion, so that as congestion gets worse that has a negative impact, or reduces driving by a small amount.

PRESIDING MEMBER BOYD: Okay, any questions or comments? Okay, Chris, thank you.

MR. MIZUTANI: The second speaker in this session is Brian Smith. He's the Deputy Director for Planning and Modal Programs at the State Caltrans, which his program also includes overseeing the Caltrans transportation planning activities. Brian will be speaking on Caltrans' state transportation plan.

PRESIDING MEMBER BOYD: Maybe Brian will talk about pedestrian traffic a little more than I was able to.

MR. SMITH: Good morning, Commissioners Boyd, Keese, and Geesman, who I have the pleasure of seeing for the first time in 20 years about a month ago.

I'm pleased to provide you with some perspectives from the California Department of Transportation on some of the efforts that we have that are focused on energy efficiency and productivity in the transportation system as a whole. And we like to look at that as a system that is balanced and integrated, promotes sustainability.

We want to commend the Commission obviously for its leadership in this area for some time, in efficiency, but also trying to look at the ramifications outside of just a narrow view. And I think, as Commissioner Geesman was talking about earlier, you need to look at some of the external issues or related kinds of issues whenever developing state policy. And I appreciate that outlook, and I'll touch on that very briefly later on.

In preparing for this I noticed that 20 years ago the Energy Commission, in its fourth biennial report, observed or made a number of observations about California's transportation system as it existed in 1983. It noted the system's oil dependency, its vulnerabilities, its auto dependency and the relationship of how the system is formed and operates to land use decisions that were being made at that point in time.

It posed a series of questions, what are reasonable strategies and methods to pursue in improving efficiency and flexibility of the transportation sector; what barriers and problems stand in the way; and what steps can California take to deal with those problems.

I find that 20 years later both the observations and the issues are still highly relevant. And I'd like to maybe address what I think we are attempting to do to answer some of those questions.

Mobility is absolutely critical to our society. People need to move to work, to play, to shop, to get medical aid, to interact just as human beings with one another.

Equally important, freight movement is absolutely critical to our economy. And especially now that the logistics chain acts as a warehouse in many of our retail and manufacturing sectors. And that that means that the predictable, just-in-time delivery of parts and goods is no longer a nicety, but a necessity. The transportation system has to work for the economy to work.

As a result the transportation system, its infrastructure and its moving parts, the hardware, the wetware, are all woven into the fabric of our society.

At Caltrans we agree with you, I think, that we face some very serious transportation energy challenges over the next several decades. As the state's population grows, as the economy hopefully starts regrowing again, we need to safely maintain an existing transportation system. And also provide for that increasing demand by making the existing system more efficient, and by increasing its capacity.

At the same time we're also got growth pressure and that growth is changing the face of

California; the demographics are changing, both in terms of ethnicity, origin, in terms of age. And that has tremendous impact on the transportation, what it needs to provide.

We will have a large increase in the number of us that have gray hair; we will have an equally large increase in the number of folks under, that are in the youth sector, if you would, under the age of 20.

What that means is that we will have an increasing number of folks that are nontraditional transportation system users. We will have folks that may be more transit dependent, and a larger number. And then you'll have folks like me that will never give up driving when we have to. And you may have to make the signs bigger, the stripes bigger and the lanes a little bit wider to make that, keep that safe.

Personal travel behavior is changing, and certainly transportation demand, the desire to travel is changing all these things, play in the mix. They make the kinds of projections you were just looking at not long ago very difficult when you start getting out to the 2025 range.

In addition we still maintain the status as the fifth or maybe the fifth-and-a-half largest economy in the world. And that status is largely dependent on our transportation system. I pointed out in my notes that over 37 percent of the value of U.S./foreign trade passes through California's ports. We are absolutely a vital link in the United States' position in the world, and that drives our position within the United States. More than 2 million jobs nationally are dependent on the movement of goods through California.

In addition, we also need to maintain personal goods movement mobility, but at the same time we also want to maintain quality of life. Our Director, Jim Morales, has not given us the option of either working on mobility or quality of life or environment. He always likes to use the and word. I mean all those things. And that does guide our actions.

In addition, we really have embraced the idea that we need to work with communities, not through the communities. And you take a look at the transportation system decision-making process, which you probably don't want to do, and I'll just do it a little bit later on. It is incredibly complex with regard to the layers of government, the private sector, responsibilities, the assignments of responsibilities, whether that's funding or regulatory. And it requires intense collaboration up high that I don't think we saw 20 years ago.

We also have the fact of transportation energy as having kind of a peculiar nature. Energy and transportation is a good guy and a bad guy. On the one hand it fuels the transportation system that provides for that mobility that we need; and generally it's most of the revenues that we need for transportation improvements, whether it's improvements in capacity on the highway system, transit rail, other alternatives providing pedestrian and bicycle facilities, handicap facilities.

On the other hand that very dependency on particular petroleum products is a major source of environmental and health problems and susceptibility or vulnerability to disruption of that mobility system.

So, on the one hand it provides the funding, on the other hand it also is very expensive from an environmental and financial and security standpoint.

I think you've already seen some of the numbers on projections. Just indicate in my notes again that if current growth trends were to continue, gasoline use and related CO_2 emissions would probably increase over 40 percent in the next 20 years.

We also have tension between some of our strategic objectives with regard to mobility and sustainability. You increase mobility, that's good. You increase VMT and you may increase energy consumption -- that increase in vehicle miles traveled and the production of greenhouse gas emissions. So mobility and sustainability are two goals that are sometimes tough to reconcile.

Nevertheless, I think we are committed as the Department of Transportation to finding solutions and I'd just like to touch on some of the actions that we are undertaking.

Chuck had asked us to talk a little bit about the state transportation plan. I will talk about that just real briefly. Some of you that were here in the state in the '70s remember there was an attempt to produce a state transportation plan. That actually was never adopted.

Finally, with the passage of the

(inaudible) Service Transportation Efficiency Act in 1991 and a federal requirement for a state plan, we did, in fact, adopt the state transportation plan, the first one, in the mid 1990s.

We're currently in the process of updating that plan. We think it's absolutely necessary to reflect the current realities. We also, the climate that we feel is different. I'll touch on some of those differences.

The plan that we're developing is the California Transportation Plan 2025, proposed submission for transportation, and beyond that sets various goals, policies and strategic objectives to achieve what we think would be a balanced transportation system that promotes sustainability.

Just briefly, that mission statement is that California has a safe, sustainable transportation system that is environmentally sound, socially equitable, economically viable and developed through collaboration; it provides for mobility and accessibility of people, goods, services and information through an integrated multi-model network.

And we've got six goals that we've included in the plan. And this plan, by the way, has been under development for two years. We've held numerous workshops, state symposia with the diverse academic community; did a fairly large, actually survey and series of focus groups to try and get a sense of what the people are interested in seeing, both in terms of what the state is doing to try to provide transportation, what they are willing to do in terms of transportation.

The six goals are enhancing public safety and security; that's always got to be our primary objective. Preserving the current system, keeping that investment that we have in place working and making it work better.

Improving mobility and accessibility. Supporting the economy. Enhancing the environment. Reflecting community values.

So three of those goals really get to issues that we feel are very important to our customers, the citizens of California.

We also propose 13 policies for implementing those. And we've also offered a number of implementing strategies. And I should mention that we've had the opportunity of working with your staff in the development of this plan. And we currently are in -- we have a draft final of that plan.

The plan, interestingly enough, does recognize that California's transportation sector consumes about 50 percent of all energy used in California; it accounts for about 60 percent of greenhouse has emissions produced by fossil fuels.

I had a sense of deja vu when I was looking at that because it reflected an awful lot of what was in the 1983 plan again. The numbers have changed a little but not a lot.

So, what are we doing? I think it's important that when the state talks about changes in policy that it also is going to walk that talk. At a recent meeting that was convened by the Transportation Research Board, National Academy of Sciences, many of the attendees thought that the transition to alternative fuels, topics you're addressing today, over the next 20 years would probably not be consumer-driven.

That rather the transition would be undertaken for a variety of societal reasons, for security, et cetera. And that would require some public sector action. And obviously that's the issues that you're confronting, to accelerate that in technology, that adoption.

I think that public sector will be both in terms of policies and actions. I think that California, certainly on the transportation side, is taking a lead role under the guidance of Governor Davis and the leadership of Caltrans Director, Jim Morales. And I'll just touch very briefly on some of those activities that I think demonstrate that.

In July of 2000, all though my notes say 200, I don't think it was that long ago, Governor Davis signed what was really a historic bill, and which created the traffic congestion relief program, which allocated over $5 billion in additional money to transportation, which was then available.

Significantly, almost 60 percent of that money was targeted to transit projects. And that included a number of projects to start pushing technology and cleaner technologies into the transit fleet. For example, I pointed out, there was a $40 million project to purchase buses in the San Francisco Bay Area to not only create express bus service, but they were also to -- that money was to be used for low-emission buses, to try and bridge those two concepts of sustainability and mobility.

In addition, we've adopted a number of policies over the last several years. We have an energy policy, an energy efficiency and conservation policy that emphasizes energy efficiency and design, construction and operation and maintenance of our facilities. And also addressing clean fuel sources and fleet efficiency in our operations.

We also have two other policies. One on accommodating non-motorized travels. In fact, Caltrans adopted a year or two ago a policy that says we have to consider pedestrian, bicycle, handicapped access in all of our projects.

That's done for a couple reasons. One is it's the right thing to do, because those are legitimate modes of travel, as the speaker a moment ago was mentioning.

And secondly, if you provide walk-ability and bike-ability, you also start providing a community that is more friendly to transit. And so you naturally start promoting those other modes in addition to just the primary walking and biking.

We also have a policy on context sensitive solutions. Since the transit system exists within a community, it's got to serve multiple community needs. We can't just narrowly define mobility.

On the planning analysis, my area, we have a transportation energy program that's led by Dr. Reza Navai. It's responsible for developing sort of the policy and guidance that helps guide our own planning activities, and also the activities of the regional planning agencies.

Reza is also responsible for coordination of external agencies such as the Commission and the Joint Agency Climate Team.

We've funded and are actively working on several projects that I've listed here to actually improve the way that land use decisions are made. Remember back in 1983 there was that connection being made, as well as is present still today, between what the shape of our communities is and how that impacts the transportation system. And how the transportation system impacts the shape of our communities.

We're trying to improve the way that

those decisions are made at the local level both by use of technologies and just different decision-making processes. And really, all that stuff is aimed at trying to reduce unnecessary travel, unnecessary expenditure of energy and transportation.

In terms of our own internal operations, whether it's putting in light emitting diodes for signals, using solar panels, doing other kinds of things, greening our fleet, going over more efficient engines in our very large fleet of equipment, actually trying to take a look at cleaner fuels, hybrids. All our district directors now drive around in Priuses; they do not have Excursions like some folks do.

We're doing a number of things, ourselves, because, again, if you're going to talk the talk, you got to walk the talk, as well. And we're trying to model the way, and also, to the extent we can, try and stimulate the market for some of those cleaner fuels and technologies.

I'd just like to briefly mention that we have five strategic goals that support our mission. Our mission, very simply, is five words, we like fives. One on each finger, it's easy to remember. Caltrans improves mobility across California.

I think for this discussion it's important to recognize that three of those goals directly affect energy efficiency. Reliability is one of those. And then talks about reducing traveler delay. And a moment ago there was mention made that congestion in the model tends to drive up fuel consumption.

We'd like to, particularly in our own operations, eliminate any unnecessary congestion, whether that means how you time your improvements when you're out there actually doing construction kinds of projects. Do other sorts of things to reduce congestion, you'll also get some increased efficiencies and you'll get increased mobility.

Flexibility, making transit a more practical travel option. Our unwritten goal there is tripling transit trips by 2025. That's a pretty ambitious goal since we don't own any buses, and we don't operate any commuter rail services. We just operate inner-city rail services.

What that means is that we, all of our districts, all of our staff, have to think about every day, what is it that I'm doing that either help or impede transit. Because we'll never get to triple those transit trips if we don't help the transit.

Productivity. That's just the general area of improving efficiency of the transportation system. We're looking at a number of things there, whether it's traffic management systems; whether it's using intelligent technologies, intelligent traveler technologies, et cetera. Car sharing. Anything to make the system more efficient, more productive.

That's not to say that there aren't a few bumps in the road that we, and I think you, face and we need to consider. Times are changing. We mentioned the hybrids. There are -- and other alternative fuel vehicles are entering the market. Our demand on the system is increasing, while our ability to just physically increase capacity is not the same as it was.

In reality, for the foreseeable future, transportation demand, mobility demand is going to be met pretty much by the system you see that's out there. The system being the visible infrastructure and a lot of moving parts. We're still going to be relying on trains; we're still going to rely on planes. If Jet Blue and Southwest have their way, we'll be seeing 737s until, you know, at least the middle of the century.

You're going to be seeing trucks and cars, because that's the way our built environment is laid out. And so that's still going to be the predominance of reliance on those systems. So anything that we do in terms of looking at new technologies, new fuel sources et cetera, has got to reflect that reality.

There's also institutional inertia. We experienced that when we were attempting to green our fleet. I think some of you may remember some issues involved with even trying to get the light emitting diodes out when we had the very real crisis a few years ago in terms of energy supply, electricity supply.

Sometimes it's tough to fit in the traditional benefit/cost models for government agencies when your benefits are somewhat intangible. They may be an avoided cost in the future, they may be an avoided regulatory issue, and they may be the ability for you, as a government agency, to take a leadership role; to use the bully pulpit to try and provide change in other government sectors and the private sector. That just doesn't fit into the standard Department of Finance model, so it's very tough sometimes to be innovative.

Again, I mentioned there were very diffused responsibilities in the transportation sector. All of us is a primary transportation decision-maker because we all make that first choice to make a trip in the first place; and then how we're going to make it.

We've also got a whole cast of both conventional city and county governments, special regional agencies that have been created for transportation purposes, state transportation departments, the federal -- a variety of federal departments, none of whom really are one of the USDOT. And they all play a part. And so there's really truly shared decision-making.

And the funding is split up in California such that you really have to leverage somebody else's money for major projects. And so there's a lot of folks that have to be involved in decisions; you don't have unilateral decisions.

I think lastly we have to be careful of unintended consequences. When I was sitting out the audience somebody behind me made some comment about MTBE. And I wasn't going to bring it up, but I think that we have to be very careful to make kind of stove-pipe decisions. We have to do this internally.

For example, maybe if a maintenance crew goes out; does some shoulder work and gets a little asphalt concrete dike along the road to keep, you know, channel water. Occasionally those little dikes have been known to be put up in front of bus stops, which if you're in a wheelchair or otherwise mobily impaired, makes it difficult to use that.

Unintended consequence. Did a very good job in terms of keeping the roadway safe in terms of the water being off of it and doing shoulder work that keeps cars and trucks okay. But you just made transit not usable for some sector of the people that want to use it.

Ditto, I think, in terms of any energy policies or other environmental policies. You need to look out for those unintended consequences. We need to look at the transportation system as a system. Look at its interconnections; look at the primary purposes that it's solving. Remember that the energy aspects of it fuel it, but they aren't the end-all and be-all, just like transportation, itself, isn't the end-all and be-all. It's a means to an end.

So, we really have to do the end. We've got to reduce the vulnerabilities; we've got to reduce greenhouse gas emissions and we have to insure continued productive mobility if we want California to have the quality of life that it does today.

Just in closing. What's different? I think that 20 years ago, I think we have a clearer vision of California's total transportation needs, as the Department of Transportation, as we move forward into this century.

I think we have a better sense of how transportation fits into the social, environmental and economic well being of California. I think we've got some clearer policy direction than we had then. And closer working relationships amongst key state agencies. And I really think that's been a hallmark of the past few years.

You probably agree, having been in some other agencies. I haven't seen the level of cooperation in the 30 years that I've been with the state, as we have in the last few years. And I think we need to capitalize on that.

I think we also received some real changes in the public's attitudes towards things like transit and smart growth. Our surveys really reflected that. And what the state's role could be in activities that are traditionally locally provided.

I think we know that we've also got a long way to go to develop that sustainable transportation system, part of which is the energy that drives it.

So, in conclusion, thank you. We look forward to working with your staff. It's always a pleasure to see folks I used to work with lo those many years ago. And I'll take any questions.

PRESIDING MEMBER BOYD: Thank you, Brian. Any questions from members of the audience. And while anybody's coming up, come forward to the desk, and just let me comment as you're coming forward.

Brian said something that I was going to comment on when he talked about the level of cooperation. And his references to systems, in looking at whole systems.

I, like he, agree that in the past five years there's a level of understanding and cooperation and the need to look at total systems, and the need to work more closely together between state agencies than I've ever seen in my 30-plus years, I won't tell you the real truth, in state government.

And people like Brian are part of what has made that possible. In my previous incarnation as the Deputy Secretary of Resources, the cooperation between Resources and Transportation reached an all-time high.

Caltrans' participation in and pledged support for the climate change activities of the Joint Agency Climate Team were very instrumental in moving that subject forward.

So I just hope, as he says, that those who follow us white hairs in the not too distant future can maintain what it took a lot of people decades to accomplish. And for the sake of the quality of life of the Golden State, hopefully not the late, great Golden State, things like that need to take place.

And I just wanted to publicly thank Brian for all that I know he has done in that arena. So, now, questions?

MR. SMITH: Thank you, Mr. Boyd. I'm Dave Smith from BP. So, Mr. Smith, I'm pleased to be here to ask you a question. Actually I want to first compliment Caltrans on their attempts to clean up their fleet in the use of both alternative and conventional fuels to do that. So, thank you for that.

You made a comment about how difficult it is to make projections like we saw in the first presentation. And I assume that in your transportation plan you're making projections.

So, as you do that, do you look at sensitivity analysis or something, so that instead of just having one straight line or one value, you say, okay, given these kind of pluses or minuses do you come up with a range of projections?

And I hope that's a clarity question. Thanks.

MR. SMITH: I think the simple answer is no. In my earlier comment about the difficulty of making projections, for example if you're going to project airplane fuel use, do you assume that a mere change in Los Angeles caps the passengers going through LAX as something significantly lower than what had been projected the year before. Do you assume that the voters in Orange County decide to take the El Toro Great Air Station and turn it into a green park. And then a week later, or a month or two later, decide to turn the green park into the great housing and commercial park, which is going to add 500,000 daily trips to the Orange County highway system to build out.

That wasn't planned. You remember. A lot of things happen. The Port strike, for example. It's very easy to make some major constructions that have kind of long-term ripple effects in the transportation arena. And it's just an awful lot of personal choice that goes on.

So I think that in the shorter term it's easier to make those kinds of predictions. It's a personal bias. There's an awful lot of things in transportation because it is driven so much by so many different factors within society, that it makes it that kind of a projection over the long term kind of difficult.

Bottom line, I think our projections on

a statewide basis are cruder. We have to remember that we have regional transportation planning agencies under state law, and for all the metropolitan areas under federal law; metropolitan planning organizations that in that smaller area they're responsible for, do a much more precise job of taking a look at in their regional area what the growth development patterns are like, what some of the demographics are like, and more precisely what travel demand might be.

But, yes, there's vagueness in terms of, we'll pick on Orange County, they're fun to pick on. You assume there's going to be a light rail system, so that may tell you that there's going to be a certain reduction in fuel vehicle -- vehicle fuel consumption, until the voters decide that the center line will not be built because they don't want it through their city.

And, you know, there's a lot of that; it's not pretty. It's kind of like the budget.

(Laughter.)

MR. SMITH: So we look at trends, but I don't think we -- to my knowledge we really don't do that kind of really refined kind of sensitivity analysis. And besides, some of our responses to things are a little bit more crude. We build a highway, build a rail line. You either build it or you don't.

MR. ABELSON: Good morning, Mr. Smith. My name is David Abelson; I'm Senior Staff Counsel here at the Energy Commission serving as attorney for the IPER.

My question --

MR. SMITH: Do I need counsel to answer this?

(Laughter.)

MR. ABELSON: I'm sorry?

MR. SMITH: Do I need counsel --

MR. ABELSON: I hope not. My question is this. A few years back I had the privilege and pleasure of working with Chuck Mizutani and others on something that was at that time called the SB-1214 report, which was a transportation forecasting effort that the Commission undertook about ten years ago.

One of the items that staff discovered at that time was that the transportation system in this state really does a very poor job of reflecting through price signals what we actually want to have go on.

There's no congestion pricing, by and large. Gasoline is incredibly cheap. Insurance is paid for once a year, not at the pump. So the net result is that the consumer actually receives almost no meaningful economic data when, as an individual, they decide to get into their car or not.

You talked about Caltrans and government in general perhaps having take some initiative over the next few years in policy directions to try to accommodate some of the competing demands we're struggling with.

Is Caltrans looking at congestion pricing as an issue? If not, when is that subject going to hit the radar screen, in your opinion?

MR. SMITH: Are we looking at it as an issue? Sure. As part of the development of the state plan, for example, we had, as I mentioned, several symposia that we held in conjunction with the diverse academic community in California. That's, so a), it's always been an area of intense debate amongst the academic community.

I mean in reality we have some toll roads; and we have proposals for hot lanes, certainly in the Bay Area. And I-15 in San Diego, the ability to vary price with time of day and (inaudible). I kind of look at those as a little bit of experiments to see both how the public reacts, are they getting the signals, et cetera.

Beyond that, and why it's such a mine field, why I wanted to take the Fifth, is I think that talking about those ideas is good and it's interesting academic debate. Politically I don't know that there's the will to really move in that direction.

IST, the Intermodal Service Transportation Efficiency Act of '91, which was signed by the other President Bush, actually had a provision in it for a pilot project to use pricing strategies on the Bay Bridge to reduce the horrible congestion. You just basically jack the price up and everybody wants to be there, they'll meter it out, you lose the congestion, et cetera.

The Metropolitan Transportation Commission, in my recollection, kind of pussy-footed around that one for awhile. I don't blame them for being very careful. It's a hot issue. And eventually walked away. We do not have time-of-day pricing, or whatever, on our congestion treatment pricing on the Bay Bridge.

One of the issues that was kind of a touchstone, or actually a hot-button form was the whole issue of environmental justice, or more appropriately, probably Title 6, equal access benefit, et cetera. And so did you have folks that would be discriminated against. And the answer, of course, initially was well, we'll jack the price up if you use the facility, but we'll use the money to provide buses.

Some people aren't happy about the idea that they can't take their car because they're too poor, and they need to be stuck on a bus.

So the politics and the social issues involved in it are pretty tremendous. And we haven't done a closure on it; we're open relative to discussing it. We've got a couple in experience that are out there. Perhaps the Commission would like to get into that a little bit more.

And I think we're going to have to see how the politics goes. I mean there is pressure particularly to take some of the diamond lanes, carpool lanes and turn them into hot lanes that you could, in fact, and not Lexus lanes or Beamer lanes hopefully, so you could do some of that with parts of our facility.

Just have to see how it plays out. Does the public want it; is the public going to accept it.

CHAIRMAN KEESE: You can send it to the Commission but we'll hand it to the Transportation Committee over here.

(Laughter.)

MR. SMITH: And we'll be glad to work with you.

(Laughter.)

PRESIDING MEMBER BOYD: Brian, I'd refer you to a report that went on our website just yesterday, subject reducing dependence on petroleum, which Commissioner Geesman and I have been struggling with for months. And this issue of price signals, pricing economic tools, hotly debated during that whole process.

And you'll find that we cowered away from the topic like everyone else before us has. And you're right, maybe some of us on the way out the door some day can take a wild public shot, but public and politics don't allow much of a discussion.

MR. SMITH: You know, I think there is a

corollary, though, and that's providing more information to folks. And I think that the more information we can provide, in terms of intelligent transportation systems, maybe even some day give them an idea of what it's costing them on a real-time basis to do something now versus some other time, is another way of approaching that issue. It's not a mandatory approach, but there may be something that can be done in those arenas with new technology.

PRESIDING MEMBER BOYD: Chuck, you're going to have to move this along.

MR. MIZUTANI: Yeah, thank you, --

PRESIDING MEMBER BOYD: Was there one other question in the audience? Real quick.

MR. HECKEROTH: Steve Heckeroth again. Thirty years ago I worked for the Division of Highways; there's a group called the Community and Environmental Factors Unit.

MR. SMITH: CEFU.

MR. HECKEROTH: CEFU, yeah. I wondered if there was still such an organization? When I worked there our job was to go around into communities and mostly we eliminated freeways, which was kind of subversive within a Division of

Highways, but now that I hear that you're opening it up a lot more, is there still something like that going on?

MR. SMITH: Actually, I think we've well beyond it. Are you related to Heinz (phonetic)?

MR. HECKEROTH: I'm his son, yeah.

MR. SMITH: Ah. Heinz was our Chief Deputy. I had the opportunity of working with him on a couple of projects very closely, and still see him about every year or so; say hi.

MR. HECKEROTH: He just bought a hybrid, by the way.

MR. SMITH: Good. I'm not surprised. We've moved beyond that. that unit really kind of worked on projects after a project was already decided. I think there's a couple things that I know (inaudible), but one, that unit that was in right-of-way has morphed into an entire division of environmental analysis, and we probably have 400 to 600 environmental staff statewide. Probably the largest environmental staff in state government, to be quite honest.

Those folks were working in the project while looking more importantly we're forcing the consideration of environmental issues back in the planning and programming process a lot more so earlier identification of issues.

We've also started several grant programs that were threatened with suspension during the current budget crisis. And we've had more letters on those than we've had on almost anything else. So, obviously very popular to actually work with communities.

We had an Office of Community Planning in our Division of Transportation Planning; we had complimentary offices doing that in all of our districts.

So I think we've moved beyond that kind of reactive situation into really trying to move environmental and social issues more into the decision-making process.

MR. MIZUTANI: Thank you, Brian.

MR. SMITH: Thank you.

MR. MIZUTANI: We're going into our second session, challenges to increasing petroleum imports to California. And we'll start off with an overview from one of our staff people here at the transportation energy division, Dr. Brian Covi. Brian.

DR. COVI: Good morning. Okay, I'll be

very brief because we're running a little behind schedule.

We decided to call this next session, presentation, challenges to increasing petroleum imports to California. A couple of trends are pretty self evident. As we saw earlier this morning, the demand for transportation fuels is going to continue to increase for the foreseeable future, gasoline, jet fuel and diesel.

At the same time because of declining sources of domestic crude oil, Alaska, North Slope and California crude, we're going to see an even higher rate of increase of crude oil. So irrespective of where the future source of demand comes, or whether we import more crude or blend stock or finished gasoline, it seems clear that we are going to be increasing imports in the foreseeable future.

A few questions. These are very general questions, by no means comprehensive, guiding our thinking about the rest of the afternoon, or not the rest of the afternoon but the next session, is there a problem here. The east coast already imports, I think, close to 10 percent of their gasoline consumption. Are there any unique issues that we need to be concerned about California to facilitate a transition to increasing imports.

Will California refining capacity expand beyond just capacity; or is there any potential for any significant expansion? What are the likely sources of impacts of increased imports? Does it matter where we get crude oil from? What are the issues surrounding refinery economics? And what might be the impacts on prices for finished petroleum products, especially gasoline?

There's a lot of issues with the marine terminal infrastructure. How are increased imports of petroleum products going to compete with container ships? Is that an issue? Is permitting a problem in the marine terminals, especially Long Beach and the Port of L.A.?

And I think I skipped a slide here -- yes. So just to tie things up here, the purpose of today's discussion is primarily a learning experience for us at the Energy Commission. We want to hear what the issues are facing the industry; and we want to, in particular, focus on what the industry's, you know, what the issues are from the industry's point of view. And to identify any potential areas of concern that we need to start looking at more closely, not only in the near term, but in the long term, concerning this issue of challenges to increasing imports to California.

That's it.

MR. MIZUTANI: Thank you, Brian. The next two speakers will be talking, providing presentations on the topic of west coast petroleum imports and supply.

The first speaker is Holly Kranzmann; she's with the Shell Oil Products, US. And she'll be the next speaker.

MS. KRANZMANN: Good morning. I'm the West Coast Director of Supply for Shell. And I first wanted to thank the Commission for asking me, and specifically Shell, to participate in this workshop because it gives us an opportunity to provide a little bit of insight on what Shell is facing regarding this whole topic of imports.

And so the first thing I wanted to point out is about the decline in California crude production. And this is basically the view of two different consultants. And for those of you who were at the last meeting you'll understand this, Shell did pay to have the rights to look at these and present this data. That was an issue of the last session.

(Laughter.)

MS. KRANZMANN: Anyway, it's just two different views and they show the same thing, which is that the crude production is declining. And this is particularly significant because many of the California refineries are specifically built to run this unique type of crude. So that's why it becomes so important to us.

As far as the issue of imports in general, this is not anything new. California has been an importer of crude and finished products for quite awhile. This slide jus shows that the foreign crude imports into California are going to increase as our California production decreases. And it shows you, you know, the dramatic increase of crude imports that we're going to rely on here in the state.

But I just want to caution everybody, this is imports are not new to us; the volume of this significant amount is, but the imports, themselves, are not.

Let's see. We've got similar issues, frankly, on products. I don't have a slide on this, but I've got the most recent data of imports from January through April. And we were importing, on average, about 63,000 barrels a day of products into the market. So, you know, this is going on in both crude and products.

And frankly, the marketplace is responding to our needs and looking for ways to help us have other sources for importing of gasoline.

And what this slide shows is that, you know, because California provides a significant portion of Arizona and Nevada's gasoline, you know, that puts another constraint on our supply system here in California.

So, you know, not only are we restricted on how much we can bring from the gulf coast and from the east, because of a full pipeline, you know, but also Arizona and Nevada are experiencing demand growth the same way that the State of California is. So, that is an issue for all of us, as well.

And then, I know somebody said they didn't want to mention MTBE, but the MTBE phase-out is also impacting California's demand for gasoline imports. And this shows it pretty dramatically of how much we're going to continue to rely on imports.

Now, that being said, we were all interested to see what was going to happen when we begin introduction of MTBE-free gasoline this year. And we were quite concerned about the ability to find alternate sources when we went to the summer grade and the lower RVP pressure.

And, you know, Shell felt that we were going to have about two additional sources for that gasoline. And as it turns out, when, you know, when the going gets tough and we really need to find product, we've found at least four sources where we've been able to acquire the summer formulation.

So what I'm trying to say is even a picture that looks bleak sometimes it straightens out as we get into some of these issues.

And then this is just to round out the picture, because not only are we importing crude and gasoline and gasoline components, but we also are an importer of distillates. I mean this shows that that's going to continue to rise, as well.

I was also asked to comment on what the Energy Commission could do to help de-bottleneck supply issues, and where did I think that specifically you could help Shell.

And I think through all the processes we've gone through the last few months, of the things that you've been looking at, the one thing that would help us the most is streamlining the permitting process so that when we want or need to do something at our refineries, or our distribution terminals, to be able to expand to meet this changing situation in the marketplace, that we can actually get it done in a reasonable amount of time. Because that is, quite frankly, a very large issue for us.

So, that's what I wanted to talk about.

PRESIDING MEMBER BOYD: Thank you. Does anybody have any clarifying questions, because I believe you're going to participate in our panel later --

MS. KRANZMANN: Yes.

PRESIDING MEMBER BOYD: -- and I'm saving questions for you for that time.

CHAIRMAN KEESE: Do you think that the projection that staff has that our current California refinery capacity will stay stable with about one-half of 1 percent creep, I think was the suggestion that I heard? Is that a reasonable assumption going forward?

MS. KRANZMANN: I think that's reasonable. However, I will tell you from my experience that the refineries find ways to be able to increase capacity, because it behooves them to do so.

So usually those kind of projections are the worst case scenario.

PRESIDING MEMBER BOYD: Thank you.

MR. MIZUTANI: The second speaker on this topic is Joe Leto. And he's the Co-founder and President of Energy Analysts International, Inc., headquartered in Westminster, Colorado.

MR. LETO: Good morning; it's a pleasure to be with you this morning. I think from the broad range of topics we have in this daily session, from gasoline sales and supermarkets to hydrogen we see how much this energy business has changed over the last 20 years. I don't think we're quite ready to mix the two, but I think some interesting topics for this forum.

The objective I had, I guess, on behalf of this CEC presentation probably have too many slides, but just point out some issues and some trends and some outlooks that we see on the west coast, both on the petroleum side, a little bit on the crude side. And, again, maybe just provide some issues for further thought here.

So what I'd like to do is cover a little overview of the whole west coast product business; look at some of our outlooks for supply and demand. I think some of our demand trends are pretty much in concert with the Caltrans presentation that was presented earlier.

A little bit on west coast crude oil supply, which is, I think as Holly mentioned, is a growing import market. A substantial volume of crude comes into the west coast market to keep refineries replenished.

And I think this is indicative of refineries' ability, continuing to expand capacity to meet growing demand. We've seen that as a result of I'll say a narrow band of increases in product imports and a continuing increase in fuel. So I think those two curves kind of reflect refiners' capability to de-bottleneck plants.

And then lastly we'll get a little bit into pricing relationships, you know, within the west coast and a little more on the global scene.

Just by way of illustration I'd like to point out a few key points that whenever we do a -- we just finished a west coast product study and working on a crude oil study right now, so some of these are extracts from those studies.

Whenever we look at an area, whether its west coast or east coast or any trade area, generally the geographies for purposes of these studies continues to expand because the global energy picture is becoming much more interactive.

Certainly in the case of the west coast we not only had interaction with foreign countries with respect to sourcing supply, there's a lot of interactions between trade areas within the U.S. that have let's say pushed to satisfy increases in demand.

I'll just point out a few of those. First of all, there's a lot of interaction between what we call the Pacific Northwest, Washington, Oregon, and the southwest, California, Nevada and Arizona. And these are waterborne movements from the Pacific Northwest to satisfy both some conventional demand in the south as well as CARB. And, in fact, the Pacific Northwest is actually increasing its capability to make CARB to satisfy some growing L.A. market demands.

So that has been one of the mechanisms that's gone on to help let's say quench some of the increase in demand in the south.

Also, we have west Texas/New Mexico product supply that comes into Arizona to satisfy increasing demands in the Tucson/Phoenix area. And we now have some pipeline constraints in getting from El Paso to Phoenix, but nevertheless both conventional and CARB move into the Tucson/ Phoenix markets to satisfy growing demand. There's potential changes going on to increase capacity along that corridor.

And then lastly there's interaction between the Rockies and the Pacific Northwest. There's Rockies' product that moves into the Pacific Northwest to satisfy eastern Oregon and Washington demand.

So there's quite a bit of interaction. And actually these interactions have been very key to what's gone on to satisfy the growing California demand. And we'll get into a few of those in a moment here.

I probably hit on most of these issues. This is just trying to roadmap some of the key supply/demand issues. This is in your handout; a little too busy to go through all, but I guess some of the key variables are the west is continuing to increase in consumption, you know, at a 1 to 2 percent range for the overall trade area.

So, as we mentioned earlier, the big blow-off has been in jet. But gasoline, even with the down economy, has continued to grow in most of the western markets.

So, we're looking at satisfying, you know, growing demand. And as we'll show, refineries have probably captured or supplied most of the incremental demand increases in the west, refinery increases.

I mentioned in west Texas/New Mexico, all of the product that comes into the Tucson/ Phoenix markets is either from the Texas panhandle or west Texas/New Mexico refiners. There is capability to go from Houston to El Paso, but it's very limited right now. And that is the Longhorn pipeline, which is a project that has gone through a number of I'll say planning iterations for start up. That's not quite happened. But that would be another connection between Gulf Coast supply and

Tucson/Phoenix market.

And I guess a key point there is if you were to displace Phoenix/Tucson barrels from L.A. with Gulf Coast products, you would increase the product availability for the California market.

Just kind of a, just to orient where we are on gasoline supply and demand on the Pacific Northwest -- or excuse me, southwest, again which is Arizona, Nevada and California, this is just an overall gasoline balance, all grades, both environmental and market grades.

Total consumption across the trading area is about 1.2 million barrels a day. And if you look at where we get our supply we've broken it down into San Francisco Bay refining area, Los Angeles. Total output from those plants is a little over a million barrels a day.

And then total imports to supply this demand is on the order of 130,000 barrels a day. And when I say imports that means both domestic and foreign imports.

And as you can see, we've got about 22,000 barrels a day of finished gasoline imports; about 22,000 barrels a day of waterborne imports from domestic sources; and almost 80,000 barrels a day from the west Texas/New Mexico area.

And again, that's about, if we continue to move some jet and diesel on the El Paso-to-Phoenix pipeline we probably have limited capability to move any additional gas on that pipeline without expansion. So we're kind of capped out at about 78 a day.

And this is kind of a subset just looking at CARB, you know. Again, this is one of the most unique markets in the world in that CARB has very specific stringent specs and there are not, you know, a lot of refineries globally that could meet CARB specs in, you know, high volume amounts.

But CARB is pretty much satisfied by local supply, but there are also imports from multiple sources. West Texas/New Mexico refiners, for example, do, in part. There's at least two of those refineries that make CARB that's moved into the Phoenix market.

We had CARB gasoline from the Gulf, St. Croix, as well as some of the eastern Canadian refiners comes into the west coast. So there's been a lot of different mechanisms in place to replenish or to satisfy incremental CARB growth.

I think one of the issues we talked about, I think, on the phone is you know, on crude oil the area is substantially short, so there's a lot of supply chain mechanisms in place to keep crude moving into California. On finished product, at least on gas, we've always been transitory, our level of import. So we've not needed a lot of imports into California.

Therefore, we've not built, I'll call it very sizeable supply chain for the California market. So in some ways the fact that we've been self sufficient has caused a lot of dynamics we've seen on supply in the west coast.

I won't go through all the details on this. This is our projection, region by region, on gasoline supply/demand from the Pacific Northwest all the way through the Rockies. And the reason we kind of lumped all these areas is that in part a lot of these regions draw on the same supply source for incremental supply.

So, bottom line that we have with our demand projections, including some refinery creep, we have no refinery closures in this scenario. We're showing that the total trade area to go from about 175,000 barrels a day of gasoline net shortfall in 2002 to about 250,000 barrels a day by 2007.

So, you know, that's on the order of 150,000 barrel a day refinery equivalent. Again, that's Rockies, Pacific Northwest, Pacific South West. So really all the western trade area.

Now what this illustrates is our consumption growth outlook and average annual percent per year across all these western states. And, again, we're probably fairly close to some of the CEC numbers we've seen. They may be a little more conservative.

I guess our longer term projections is a tapering in gasoline consumption growth for a couple reasons. One is the aging population, lower level of miles traveled per household. The other significant factor is just a peaking of SUV influx into the fleet. As that tapers off there will be a little more pressure on fleet conservation to improve. And that's been pretty flat. And the average fleet mpg across the western trade area has actually tended to move up or flat the last few years.

You know, I remember looking at these same curves ten years ago and we expected this dramatically increasing mpg fleet number, and that's just not materiaLized. So the SUV influx, I guess the baby boomers, which I guess I'm part of, and the resulting increase in vmt, all of that, relatively inexpensive gas cost to drive per mile has stayed flat to declining.

So all those factors have kept demand very strong.

MR. MIZUTANI: Joe.

MR. LETO: Yes.

MR. MIZUTANI: I don't know if other people in the back can hear you, but if you can try to speak into the microphone.

MR. LETO: I'm sorry, I'm kind of wandering. Thanks.

So if we look at the supply and demand for this whole western trade area these are actually movements of gasoline that would have to come into the western trade area to satisfy that incremental demand that we mentioned.

So we're showing, you know, increasing gasoline into the Rockies, pretty flat demand without pipeline expanding into the Tucson/Phoenix area. And then the little purple wedge we're showing there is increasing gasoline that has to come either on the water or this Longhorn Kinder Morgan corridor that we mentioned to you earlier from Pasadena, Texas to Tucson/Phoenix.

So, most of the incremental supply, as I mentioned, have been refinery creep with some increases in waterborne imports. And a lot of that has been from other U.S. (inaudible).

So, again, I think a moral in that story somewhat is it's been pretty amazing how the west coast refining logistics infrastructure has kept up with tremendous increases in demand. It has been very, very efficient in doing that.

Again, with a just-in-time supply chain, you know, in the way petroleum moves, you know, we're kind of in a delicate balance now where, you know, we're somewhat self sufficient on gasoline, but slowly we're tweaking up for external imports. And, again, that supply chain on external imports tends to be somewhat varied. You know, it's not always the same source of supply coming into west coast markets.

So, I think as increasing demand continues and we bring in more product import, that's probably going to tend to stabilize supply and pricing on the west coast.

Just a glimpse on the crude and I think Holly presented some slides on the crude side, so won't have to spend much time on this, but just in summary, west coast is already a net importer of about 720,000 barrels a day of crude from foreign sources.

So, again, unlike product, I showed you the numbers a little earlier, crude oil, you know, imports is already a big part of the supply chain for west coast refiners. And as was stated earlier, will continue to grow as refiners continue to add capacity.

With respect to where do we get that supply, the answer is from a variety of sources. There's Middle East, Canadian sources, South American sources. So quite a diversity of supply mix for the west coast. And the diversity of those supply support sources will probably continue to increase.

Most of this has been addressed so I won't belabor that, I guess. The, you know, there probably are some of the same issues on crude as there is on product. If we go to more land-based crudes, which we could. If we increase Canadian imports into let's say Puget Sound and potentially

California via pipeline, you know, that would tend to reduce the need for waterborne imports of crude.

But for the most part, most of the incremental crude supply to the west coast has been waterborne, coming into L.A., San Francisco and Puget Sound.

PRESIDING MEMBER BOYD: Joe, could I ask yo a question on this chart?

MR. LETO: Yes.

PRESIDING MEMBER BOYD: Your from-Alberta line there, and I know from looking at your presentation later you mentioned the bitumens, but what kind of a figure are you using for the oil sands production of Canada?

There's been a controversy of late over the magnitude of that, and I was just curious.

MR. LETO: I think again we're probably a little on the conservative side. We went through all the Canadian projects and assigned a risk factor and probability. And I believe, over the next five years, -- excuse me, by the end of the decade we hit about a million barrels a day of synthetic crude output. So that is upgraded bitumen.

And the number I remember on raw bitumen is an overhang of bituminous supply, meaning after you satisfied Canadian demand and maybe a little bit in the Rockies, there's probably about 300,000 to 400,000 barrels a day of bitumen overhang that has to move to some other market.

And California would be, you know, a good market for that overhang of Canadian crude. Because some of the eastern markets are saturated on running very heavy crudes.

So those are the numbers that -- now, the announced projects or planned projects, if you added all those up, are bigger than those numbers I just mentioned to you.

PRESIDING MEMBER BOYD: Thank you.

MR. LETO: Sure.

PRESIDING MEMBER BOYD: Having just been there, I came away with exactly the number you just quoted in my mind, so.

MR. LETO: I know, as we go further south in our travels there's less belief of all that's happening in Canada. But if you go up and look at the Fort McMurray plants, the tar sand plants, I mean there's a lot of spending, a lot of activity going on in Canada, expanding production and --

PRESIDING MEMBER BOYD: It's awesome, frankly.

MR. LETO: Yeah, it is awesome. In fact, I had the opportunity to visit the Sa-Saw plant in South Africa when I first came out of school, and I was actually involved in the alternative energy then. You know, other than those plants which have a coal mine on one end and, you know, a refinery on the other end, the plants up in Canada, other than those plants, are the largest scale projects I've seen.

This is our look at west coast crude requirements. Again, you know, ANS crude is very stable in production, so that's actually a bright spot in west coast crude supply. They're bringing on lines from satellite fields. They've actually arrested the decline rate. And at least for the next few years we expect nearly flat supply on Alaskan crude. So that bodes very well for the west coast.

The area that's probably increased somewhat on the decline rate is he San Joaquin crude, the very heavy crudes. And that's the area with probably the -- you know, not a huge deficit over the next five years, but a growing deficit, to bring in some replacement for, the very heavy crudes in southern California.

And, again, you know, there's a lot of things going on when you open up to the foreign markets. I mean, you know, we had the Gulf of Mexico crude ramping up and that's tending to put some pressure on heavy crude coming from South America or Mexico. That tends to free up some crude for the L.A. market like the Mexican line, which comes into the L.A. market.

And also with this growing supply of Canadian crude, I think, as you well know, you know, there's a couple different projects being considered to increase pipeline capacity to move western Canadian crude to the water, to British Columbia. And then out on the water to different markets.

So, a lot of dynamics. Probably more dynamics on the crude side than there is on the product side with respect to supply sourcing and logistics.

COMMISSIONER GEESMAN: Would you see that trend pretty consistently being toward lighter crudes for California refineries?

MR. LETO: Well, most of the replacement crudes are heavy crudes. You know, I would say there's a number of refiners looking at maybe some of the stability of some of the lighter or medium sour crudes from the Middle East, and looking at replacing those with western hemisphere crudes.

So there is some look at the lighter crudes for replacing vulnerable supply. But a lot of the import needs are heavy.

I'm trying here. There we go. Again, talking a little bit about refining, there's about 22 significant refiners on the west coast, I think at least 40,000 barrels a day. Nine different companies. So, you know, the companies have changed over the last few years with all the mergers and acquisitions, but, you know, still fairly, very healthy competition in the west coast.

We've included the west Texas and New Mexico refineries because they do play such an important part on incremental supply for west coast markets. Again, they tend to be a little bit smaller. They have surplus in crude with west Texas/New Mexico crude. They sit right in the Permian Basin. So they're long on crude and the market is short, so even for a smaller refiner that's the most opportune market for a refiner to be in. There's not too many areas like that around the world.

And I mentioned the total capacity is about 3.2 million barrels a day. Now, sometimes crude tower capacity is somewhat misleading because refiners can have downstream unit constraints that make the refiner's capability a lot less than their crude tower capability. So the number I gave you was crude tower.

Then again, I think, as I mentioned, the biggest concentration refinery is L.A., followed by Pacific Northwest. Probably some of the biggest growth that's going on, you know, there's some projects in the Pacific Northwest that are increasing production capability. And, again, that does interact with California.

This slide might be a little confusing; this is using a 1989 base year as our reference point and looking at cumulative incremental production for gasoline across all the western trade areas that we've been talking about.

And the purpose of this slide is just to show the role of creep along the whole western trade area. So, we've gone, in 2002 we've added about 200,000 barrels a day of gasoline production capability relative to that 1989 base year. We're showing a little bit slowing down on that output, but still reaching about 255,000 barrels a day in 2007.

Again, incremental gasoline relative to 1989 base. So, again, this is what's gone on with creep. And some of this has displaced refinery closure.

You know, there are some bumps here, you know, with carb gasoline, the removal of some light ends, there's kind of a bump on output capability. So that kind of moderated some of our near-term creep rates on gasoline output.

PRESIDING MEMBER BOYD: Joe, you mention there Rocky Mountain refiners likely closing down. That surprises me a little bit as kind of why. Are they running out of supply to run? Is the demand not there? I mean you do show a net deficit going out of the state to other areas. That puzzled me when I saw that.

MR. LETO: Well, you know, I'd have to -- you know, I will say this, refiners have been much more resilient than I think most people predicted as far as staying in operation. The reason is there's some very, very small plants in the Rockies. Twenty-five thousand barrels a day, there's several refiners of that size.

And diesel investment, low sulfur diesel is probably a prohibitive investment for some of the very, very small plants.

So, you know, the Rockies is part of that geographical phase-in area, so there is some reprieve on time. But in 2008, you know, we're looking at maybe some flow out of a couple refiners. You know, again, it may be on the order of a couple 25,000 barrel a day plants. So a 50,000 barrel a day type level on crude.

But, again, I think the thing that has been in place that's hard to predict is when refineries change hands on the mergers and acquisitions that have gone on, you know, somebody buys a refinery for 50 cents on the dollar, or 20 cents on the dollar, and has more headroom to make investment, you know, that's kept the refining, some of these plants running.

Just looking at margins, west coast refineries, this is a 3-2-1 crack spread, so it's three barrels of crude, two barrels of gas and one barrels of diesel, just a simplistic way of looking at -- gasoline margins.

But what it's showing is this is looking at ANS as our base group. You know, a lot of volatility in margins, anywhere from -- this is crack spread, from $9 to $14. And a lot of this is induced from the product side.

The crude side, price stability have been fairly constant, I mean fairly steady. The product side there tends to be a lot more volatility on pricing. Again, this is more due to this critical balance we've got on the west coast.

We had some upsets in refineries during that 2001 timeframe, and you can see the, you know, crack spread was very high. Last year things more stabilized on supply. Margins actually were terrible. And I think first quarter and second quarter this year, you know, margins have improved.

Certainly I guess if you were to ask me would I put my money in refining, I'd have to really think about it. It's a really tough business. Because sometimes what margins don't reflect is all the capital that's deployed to keep the plant running; you know, all the investments that have to be made.

And when you're looking at this kind of gross margin boundaries for allowable profit, and being this volatile, very difficult to plan for.

And this is just an illustration, again from January '99 to first quarter, gives you an idea where the margin parameters, the contribution to margin parameters. So the little green space at the top is actually net profit. And feedstock is the gray area. Natural gas, you can see the blip we had on gas prices; you know, not a huge factor, but a significant factor on profit margin.

But, again, that tends to be product price. I think you can see that due to the top line, it's been the largest contributor to overall refinery margin, and certainly volatility.

This is kind of looking at the same margin trend for Gulf coast, but then -- excuse me, for west coast, comparing it to Gulf coast. And you can see there's been a disconnect to some extent between stability in the Gulf on margin and increases in the west coast. And, again, some of this is just due to try and replenish itself with replacement product supply when there's a hiccup in the supply chain.

And, again, I think as the area continues to go more supply short and we have more ratable supply chain, some of these hiccups that we're seeing probably will go away. Some of these pretty much illustrated that.

I'm going to go through -- for the sake of time I'm going to go through some of these. This is looking at reference market pricing such as New York Harbor or L.A. relative to the Gulf. Kind of use our Gulf as a measurement of a true liquid gasoline market. In this case we're comparing carb with rfg, yet they're not exactly the same products. Certainly not exactly the same products, but the closest we can get to looking at some regional markets.

So this is New York or an L.A. market minus Gulf, minus transportation to connect the two marketplaces. And what's been happening, and again, I refer back to an earlier statement. New York Harbor has tended to be net long on gasoline supply with increasing European product. And that's tended to push down price and actually back down product to the Gulf Coast. And that's really been, I'll say the mechanism for incremental supply out of the Gulf.

The west coast, you can see, is actually somewhat stabilized relative to the Gulf. You know, it was very oscillatory in 2000, 2001. And then over the last year and a half has been a little bit more stable. And, again, we tend to use the Gulf as your baseline on pricing.

As far as, you know, how we've satisfied demand increase with respect to foreign sources, most of the product, you know, a large product fraction of California imports originated in Singapore, Korea and Dubai in 2002. Approximately 11,000 barrels a day, or 54 percent of all imports.

Jet, by far, is the largest imported stream into L.A. Or at least was until demand fell off with 9/11. You know, again, as was mentioned earlier, jet A and even the diesel markets plummeted after 9/11 and the demise of the economy.

Now the companies bringing in these barrels tend to be large trading organizations that literally buy and sell product worldwide. And, you know, they play the arbitrate between, you know, a European or Asian barrel. And in this case, you know, west coast market.

And this is probably a little too sensationalized, because the total magnitude of the curve is not very large. This is northern California ports, '95 through 2002. But it's all product; it's intermediate petroleum-like streams all the way to gas blends. So if you look at just the gas there's been very little blend stock or gasoline material requirements in northern California.

And I should mention, even though a region might be short on gasoline, you know, some refiners might be long, some might be short, some still might be importing even though the area might be in that balance. Or even export. So, you know, each company is trying to satisfy its own balance depending on its markets and where its supply is.

But overall, you know, northern California, pretty much net long. And a key source of product for L.A., also the Columbia River market.

Southern California, and again the southern California probably, I guess when we look at port planning on the petroleum product side, in general southern California is going to be the growing market for waterborne. San Francisco is probably going to absorb a declining level of waterborne exports. The Columbia River, as they retract that to keep RNG replenished, and possibly as they satisfy local demand, maybe retracting some of the carb that's shipped to L.A.

So most of the focus on waterborne facilities, I guess the other area might be Portland. You know, we can see a retraction of conventional moving up the Columbia River. Maybe more foreign coming into Portland. And then certainly more foreign coming into -- or domestic waterborne coming into L.A. So, L.A. is really the key focus on marine facilities for product. Probably also on crude.

And this is just focusing on the southern California area. Again, since that appears to be the area where we're probably going to have the most (inaudible) logistical changes. This is looking at southern California supply trends and outlooks. So, we're looking at the material coming across from El Paso, Gulf Coast waterborne. The material that comes across from San Francisco, which we show shrinking, as San Francisco refiners satisfy local demand.

There is product that comes down to Fresno from San Francisco, so we've allotted for that. And that red wedge, which, you know, obviously looks like the curve we showed earlier, is the product that needs to get into the L.A./ Phoenix corridor from outside. Now that can be Pacific Northwest, which to some extent it will be. It can be El Paso/Gulf barrels, or foreign.

And, again, this is probably with a little more moderate demand forecast, consumption forecast, than what was presented earlier. I think for California we're on the .8 to 1.2 percent a year. Arizona/Nevada, we have a healthier growth rate. But now significantly less demand. California we're working off a million barrels a day demand. Las Vegas, I think, is 30,000 barrels a day demand. You know, just to put these in -- and I think all of Arizona or Phoenix/Tucson is probably on the order of 130,000 barrels demand.

So when we look at these percentages, we need to keep remembering what kind of base demand we're talking about.

As far as I guess some comments on incremental west coast gasoline supply, just some -- there's probably a lot of things that can be done within the west coast/Gulf coast area to replenish supply, or let's say satisfy incremental demands.

Some of those are, you know, increasing supply from Puget Sound. Refiners committing to produce additional carb. That's already starting. I mentioned retraction of conventional gasoline from Portland/Columbia River market. And replacement with foreign imports.

Now, obviously if you retract Columbia River barrel, you got to replace it with something else. So, the most likely replacement source would be a foreign barrel. And that can be a conventional barrel, because of the Columbia River market. Now, Portland to Pasco, Spokane, tends to be a conventional market.

When you add up all these barrels that I'm talking about domestic it probably could add another 100,000 to 125,000 barrels a day of supply to the southern California market.

Displacement of Phoenix/Tucson supply with Gulf Coast barrels via Longhorn and Kinder Morgan with start up. And again, if Longhorn proceeds, which is the Pasadena to El Paso line, you still have to expand the Kinder Morgan line from El Paso to Phoenix.

So we're probably looking at minimum at a three-year time horizon, you know, for all of that to occur.

Can increase waterborne supply from other domestic sources and foreign offshore. Product blending and increasing demand has tended to tighten tankage availability in California. You know there are some -- tightness in L.A. on product tankage. And handling, again, with more blending requirements this is only going to increase.

So I think the issue of land area and assignment of land to cargo shipments versus petroleum is, indeed, a real important issue to be looked at.

And we mentioned consumption outlook, level of product retraction and displacement supply, plus refinery creep capabilities in combination will determine the need for foreign import barrels of finished product.

But again, I mentioned the domestic source is probably on the order of 100,000 to 120,000 barrels a day added product for southern

California.

So, again, in the short term, we're speaking of three to four years, we see this kind of equilibrium in balance probably still being in play. I think as we get out towards the latter part of the decade, 2010, 2015, we'll start ramping up significantly on need for imports.

With that, any questions? I understand there's a panel, so -- yes?

MR. WHITE: Jim White with White Environmental Associates, La Brea, California. By the way, your graphics are excellent. My high compliments.

MR. LETO: Luckily I had help.

MR. WHITE: I noticed in your presentation when you were talking about gasoline supply, especially in the future, while you showed the presence of MTBE in part of that gasoline volume, there really wasn't any mention of the pinching out of that MTBE and its market impact on gasoline supplies here in California.

As you know the Department of Energy and our host here, the California Energy Commission, have both predicted a 10 percent reduction in supply during the summer; and as much as 5 percent during the winter.

MR. LETO: Right.

MR. WHITE: How was that considered in this? I hope that was a clarification question.

MR. LETO: Yes, good question. I mentioned, a lot of these slides were extracts from our west coast product. We did model each refinery and what impact the phase-out of MTBE would have on let's say the capability to produce gas.

I think we had on the order of, that's the shortage I was mentioning, about 50,000 to 80,000 barrels a day shortfall due to MTBE replacement with ethanol, and removal of some (inaudible) from the gasoline pool.

We actually did it plant-by-plant, and then looked at L.A. versus San Francisco. So, you know, 10 percent, you know, 100,000 barrels, I think we were a little less than 100,000 barrels a day, but similar ballpark depending on the season.

PRESIDING MEMBER BOYD: Joe, I'm going to ask a question that I'm going to classify, using my prerogatives, as clarification.

You skipped a slide, slide 7. I don't know if you did it purposely or whether it's that --

MR. LETO: I was having trouble with --

PRESIDING MEMBER BOYD: Yeah.

MR. LETO: -- I don't know, my --

PRESIDING MEMBER BOYD: Well, we didn't train people to use the computer, not the flat screen, to move the slides. And because it's that sensitive, but your slide 7, which I guess you've lost now, --

MR. LETO: I can probably --

PRESIDING MEMBER BOYD: -- was a gasoline demand versus refinery output slide, 1989 through 2007.

MR. LETO: That was a percent change per year --

PRESIDING MEMBER BOYD: Percent change per year. And I just didn't know if I misreading it or not when I looked at it last night, because the variance -- it appears that either I'm misreading it and the percentage changes don't amount to a hill of beans, or the industry has misread signals for a long, long time. Because it seems that every time the demand goes up the refining has gone down.

And I'm just wondering, am I reading

this correctly?

MR. LETO: Yeah, this is --

PRESIDING MEMBER BOYD: Looks like somebody's had a terrible time figuring out where we're going, because every time the demand goes up they just made a decision to reduce refining. And we're chasing each other around here. Until, perhaps, the last -- well, actually you're forecasting the future to get better is what you're doing.

MR. LETO: Yes. We're optimists.

(Laughter.)

MR. LETO: Well, I'd have to say one factor is, you know, when you have a growth market it's somewhat hard to predict the magnitude. And you're in an area that's very tight on refining capability.

Probably the chances for supply, when you're running full-out in a strong demand market is probably higher.

So, you know, if you had a season where you're going in a strong demand, there's probably some probability that there's going to be more outages because everybody's running flat out, you're keeping all these facilities running. And if something does go down, you know, it can have a traumatic impact on supply.

So there's probably some relationship between running operations at the max in response to, you know, high demand, and then actually having outage on product output.

PRESIDING MEMBER BOYD: I accept that explanation for the last few years because, I, too, am of the opinion that a) we're a just in time system; and b) the rubber band is stretched really tight, and if there's a hiccup anywhere.

But when you go back '89, '91, '93 I didn't think it was that tight then. And yet, it looked people were just guessing wrong continuously as to which way the market's going.

MR. LETO: Yeah, and this it was different --

PRESIDING MEMBER BOYD: Anyway, it's just an observation. I hope I'm not wrong completely.

MR. LETO: Yeah, no, you're -- I mean those are just the numbers as we estimate them. The reasons for early part of the 1990s I'm not quite sure.

PRESIDING MEMBER BOYD: Well, maybe the

panel could comment later.

MR. LETO: Okay.

MR. SMITH: Dave Smith from BP again. During a couple of your slides where you're showing I guess it was fluctuations in price when you compared New York to west coast, various things like that, you kind of threw in a couple comments about expecting that volatility to decrease in the future, I thought.

And was that somehow or other -- it wasn't clear exactly why you thought that, but was it somehow or other associated with increasing imports?

MR. LETO: Yeah.

MR. SMITH: And so like you had mentioned that New York is something like 10 percent of their, can't remember, gasoline demand or something like that, was coming from imports --

MR. LETO: -- right.

MR. SMITH: -- and that we're significantly lower than that, it was single digits. So, as you see, if we got up to maybe a more consistent import level that that would help with the overall volatility?

MR. LETO: Yes, right.

MR. SMITH: Could you expand a little bit on that?

MR. LETO: Yeah, the reason for that, again, that was more longer term rather than shorter term. I guess in short term we expected there to be equilibrium between supply and demand.

The longer term, as we have to draw foreign imports or external imports to satisfy like L.A. demand, Phoenix demand.

As that supply chain increases in magnitude and we increase the number of supply options that we have, I think that supply chain gets much more efficient in supplying California. And it would then look more like a New York Harbor type market, rather than what we've seen.

And that's where we see some of the volatility maybe being suppressed.

COMMISSIONER GEESMAN: Does that assume that we do a better job on keeping up with marine infrastructure needs than we have done in the past?

MR. LETO: Yes, very much so.

COMMISSIONER GEESMAN: That's a pretty big assumption.

MR. LETO: Yes.

MR. MIZUTANI: Thank you, Joe.

MR. LETO: Sure.

PRESIDING MEMBER BOYD: Thank you, Joe, I thought your presentation was really fascinating, at least to me.

MR. MIZUTANI: That might be a nice segue into the next two speakers. They'll be talking about marine infrastructure.

The first speaker is Steve Goldbeck from the Bay Conservation and Development Commission. And he'll be talking about northern California Bay Area development plans.

MR. GOLDBECK: Let's see if I can work this thing here.

(Pause.)

MR. GOLDBECK: All right, we're running a little behind schedule, so I'll try to roar right through my presentation. So feel free to ask questions.

I am Steve Goldbeck with the San Francisco Bay Conservation and Development Commission. We'll be talking to you today from the regulatory side of the house.

And I just thought I'd throw up a slide that shows my expertise and background in energy stocks and the like, so I won't be able to answer any questions about what the refineries have in mind or what they're doing.

But what I do know is San Francisco Bay, and I do know the regulatory program that is affecting marine transportation in and out of San Francisco Bay. And that's what I'm going to talk about today, starting with my agency, and then focusing on my particular expertise, which is dredging, and dredge retrieval disposal, a fascinating topic that --

(Laughter.)

MR. GOLDBECK: -- I'm sure you're all wanting to hear about, but is a real impediment for bringing in and out stock through San Francisco Bay.

What I'd like to do with this slide is show, obviously San Francisco Bay. This is our jurisdiction; it stops at the Gate, and goes all the way into the Bay up to the Delta, through the Suisun Marsh. And also I'd like to point out this is sediment flux down the system. And that's why we need to dredge so much in San Francisco Bay.

The San Francisco Bay Commission I am staff to regulates all activities in San Francisco

Bay under the State McAteer-Petris Act, which was adopted back in the 1960s to halt the rampant filling in San Francisco Bay. And at that time it was feared that if all the projects then in the hopper were actually constructed that San Francisco Bay would be a San Francisco River.

And a popular people's movement came and prevailed upon the Legislature to pass legislation to set up regulation on a region wide basis for the Bay. And that led to the formation of the Commission.

And then later in 1972 under the federal Coastal Zone Management Act, we have authority to review federal activities in San Francisco Bay.

The Commission has 27 members. And as you can see, there are five by the Governor, two by the Legislature, five represent other state agencies including Finance and Resource Agencies, two other federal agencies, U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency. And the rest are local government.

And the thought behind this was to try to set up a truly regional agency that would reflect the region as a whole. And how it's worked out actually, the early thoughts that it would be unmanageable turned out not to be true. And, in fact, one of the benefits is that it's very hard for any one interest group or locality to kind of run through the system, because it's buffered by all the other members of the region having to weigh in.

And we find actually that when the Commission votes, it usually acts in fair unanimity on any given project. And so it actually works fairly well.

And what does it regulate? Pretty much anything. The main thing is placement of fill in San Francisco Bay to halt the filling that was then going on. And it's very difficult to place fill now in San Francisco Bay. It can only be done for certainly water-oriented uses that don't have an upland location, and as the minimum amount necessary. And even if you get past those tests you are going to have to mitigate any impacts to San Francisco Bay.

And that's on the fill side. We also regulate dredging and disposal and any changes in use on the shoreline. And in part that is to get at the other main impetus for creating the Commission, which was the overwhelming lack of any access to the Bay shoreline. I think around four miles of the Bay shoreline, when the Commission was established, had public access to the general public. And the Bay covers over 200 miles. So, there was a strong push for that. So any project also has to provide maximum feasible public access consistent with the project.

And the state law, the McAteer-Petris Act, directed the Commission to prepare a comprehensive plan to manage the Bay as a great natural resource. And that is the basis of the policies that it now uses to decide whether it should grant the permits for the various projects, including those for marine terminals.

And as you can see from the picture here, that we are supposed to be looking at San Francisco Bay as a whole, not in its parts. And we are supposed to balance both the benefits of a given project against the benefits of preserving the Bay for the region. So we look at the Bay as a special resource.

But our Commission is the Bay Conservation and Development Commission. And we can allow fill for water-oriented uses. And one of those is water-related industries. And, in fact, this is the definition in our Bay plan of what is a water-related industry. And that includes the refineries that are bringing in or shipping stocks through San Francisco Bay.

So fill can be allowed for these projects. And in the years that the Commission has been established we have been approving many major projects for refineries and for the ports in their infrastructure.

And, in fact, this is one of our Bay plan maps that in addition to the written policies lays out planning for the shoreline. And what I wanted to show here was these areas in blue are designated for water-related industry. And here's more of a closeup, and these include the refineries.

And what we've done here is twofold. One is that it helps the water-related industries from being crowded out by competing uses, because we will only allow permits in the shoreline in these areas for uses that are consistent with the water-related industry designation or wouldn't interfere with it or are easily displaceable.

And for us what that means is that it preserves upland along the shoreline for projects to be constructed so they don't have to be constructed on fill in the Bay. But, we think it's helped the region to, particularly in the gentrification that was occurring in recent years, from pushing out a lot of the basic industries that need to be along the shoreline.

The Commission is also involved in oil spill prevention that also impinges on marine transportation. We've adopted marine oil spill prevention policies that mainly look at decreasing obstacles that could result in a release of oil from where the ships running into something. We are still allowing the bridges, which are probably the greatest major impediments in the Bay, but people have to get to and from.

We're also working closely with the State Office of Oil Spill Prevention, OSPR, that's run through the Department of Fish and Game, to coordinate our efforts with those.

A couple of the other activities that the Commission's involved in that would talk to the subject are involvement in the regional ferry system where we have been a strong proponent. The Commission has recently adopted policies that push for greater ferry establishment on the Bay to reduce the pressure on the roadways and get folks out of their cars.

And the Commission also is working with other agencies cooperatively on regional smart growth policies to further center development in areas where we can decrease pressure on transit.

The main thing I want to talk about today is dredging in San Francisco Bay, and particularly the long-term management strategy for dredging.

San Francisco Bay is large but it is very shallow. And you saw the sediments coming down. So therefore, if you're going to have a marine terminal most anywhere along the shoreline except some of the deeper portions of the City of San Francisco's waterfront, you are going to need to dredge to get adequate depths to bring in ships and to berth them safely.

And historically what happened is everyone dredged where they needed to dredge, and then they dumped wherever was convenient. And they dredged and dumped everywhere. And that caused a lot of problems, both environmentally and just in causing sedimentation in your neighbor's berth from dredging your own.

And so in the '60s to '70s we cranked down on the disposal sites to these red dots, and said that all dredging projects had to dispose at these, that they couldn't go to an upland or an ocean site, to reduce those problems.

And that worked very, very well until the mid-80s, and this year is a -- this is Alcatraz Island, and this is a scour feature next to it, which is the disposal site that was picked with the thought that everything would get swept right out the Gate.

Unfortunately it turned out that that wasn't a good assumption. And we ran into a capacity problem. And we'd already said that folks had to use these disposal sites for disposal of dredge material, so all of a sudden we had a big problem just maintaining our facilities.

And at the same time the ports were undertaking major deepening efforts to accommodate the new larger container ships, particularly the Post-PanaMax container ships that are too large to go through the Panama Canal that operate on the Pacific Rim.

So, we had a real problem with capacity for disposal of dredged materials in San Francisco

Bay at the end of the '80s. And that was coupled with increased environmental problems.

The environmentalists and fishermen in San Francisco Bay were convinced that the disposal of dredged materials in San Francisco Bay was killing the Bay. And this actually is a blockade that they did around '89 of the Alcatraz disposal site. And so dredging became very, very controversial. And the combination of lack of capacity and the controversy resulted in what was affectionately called mudlock, where it became almost impossible to get a permit to maintain your facility, much less deepen it.

So, out of that the agencies got together that regulate dredging, including my agency and the two federal agencies and the Regional Water Quality Control Board. And said, we need to come up with a plan that will resolve this.

And that led to the LTMS, the long-term management strategy. The Army Corps thought up the name, so you can complain to them. But what we tried to do in the program, at that time everybody was at each others' throats frankly. And what we tried to say was let's try to come together on solutions on areas where we agree.

And what we could agree on is that we needed an environmentally acceptable solution but it had to be something that worked to keep the economic vitality of the region going. And we also brought in the idea of can we use dredged material as a resource instead of disposing of it as a waste in the Bay.

And also can we establish some kind of a cooperative permitting framework, because the dredgers were saying basically by the time they went through getting their last permit from the last agency to dredge, they claimed the first permit was already expired. They were just back in an endless movement.

So what we did is went through a series of studies through the '90s. A program was initiated in 1991. And one of the main things that we did early on is the EPA focused on designating a new ocean disposal site to, if nothing else, be a relief valve for the Bay. And they have designated that site in the mid-90s with more capacity than we dredge from San Francisco Bay. So you could call this the solution.

Unfortunately it's 50 miles out the

Gate. It's in waters over a mile deep. So there was very little environmental issues associated with using the site, but it is costly to use. And we've already lost one tug trying to transit in heavy weather. Luckily no one was injured.

We've also looked at alternatives to inBay disposal, given the controversy of it. I actually managed this study where we looked at over 100 sites around San Francisco Bay for beneficial re-use, and looked at every idea that made sense, and even ones that didn't, just so we could document what we did.

And really what we found, the only real viable, large-scale solution for the millions of cubic yards of material that's dredged every year from San Francisco Bay is this kind of thing, which is wetland restoration. Taking subsided diked farmland around San Francisco Bay, placing dredged material on it. And this is a pump-out from a barge that's placing material in this diked site. And then restoring it to tidal action to create wetlands.

I'm sure some of you know that over 80 percent of the Bay's historic tidal wetlands were lost to diking and filling in the good old days.

And so this is to try to restore the diversity and health of the Bay while getting a solution to disposal of dredged material.

And so after these various technical studies and other work on the pollution testing program and the like, we went through the environmental process to come up with a new plan.

And basically what we did is we took our whole inBay disposal levels and cranked them down. This is actually the amount that was dredged over the period 1991 through '99. And you can see it averages around 2.5 million cubic yards per year. That's enough to fill PacBell Park around two or three times. So it's a lot of material.

And what we did is we went from overwhelming reliance on inBay disposal and not much alternatives to going to low inBay disposal of dredged material and splitting it between the ocean and beneficial re-use.

But we realized to be economically feasible to make this kind of a large-scale transition would take time and work. So we were implementing this over time. We're right about here where we're cranking down from our introductory level; and over time we're going to crank down to a lower level of inBay disposal, with material being re-used or taken to the ocean site.

So re-used where? There's two main sites we're working on right now. One is a private site, the Montezuma Wetlands, which is up near the Suisun Marsh, which actually is run by a private entity on a tipping fee. And they're going to be both restoring marsh on the surface and burying material with some level of contaminants at the bottom of the site, which is deeply subsided. This has, I think, around a 14-million cubic yard capacity.

And they are ready to take dredge material now. And they're going to be taking material from the Port of Oakland's 50-foot deepening project later this year.

Well, if you could see this, it's a picture of the Hamilton Wetland Restoration Project, which is a major project being undertaken by the California Coastal Conservancy and the U.S. Army Corps of Engineers to restore 2700 acres of wetlands along the Marin shoreline. And it will use around 24- to 27-million cubic yards of dredged material.

So, between just these two sites we have a long-term solution to dispose of material from San Francisco Bay.

The other interesting thing about the Hamilton site, were you able to see it, is that as a part of the congressional authorization for the site, it helps pay the differential in cost between inBay disposal and taking it to the beneficiary's site. So we've addressed a lot of the economics of the equation, as well.

So that's the plan. And we've implemented it through amendments to our San Francisco Bay plan and our regulations. And also the Regional Water Quality Control Board, in its basin plan. And the federal agencies have taken similar actions to implement it. So we now have an implemented plan.

We also prepared a management plan, which we have here, if any of you are interested we can get you copies, that lays out the whole program.

And the last thing I'll talk about is the Dredged Material Management Office. And you remember that the last goal was to set up a cooperative permitting process. And I think this might be of interest here.

What we did was set up a virtual one-stop permit shop. We took the five application forms that folks had to fill out from the regulatory agencies and the State Lands Commission; made one application form that you can fill out and submit.

You submit it to one agency which for the DMMO; that was just the Army Corps of Engineers. And we, the agencies, process it cooperatively. So what we tried to do was make it look to the applicant like they got one permit from one agency. They filled out one form; they went through one process.

And then at the end of it the various agencies use our existing authorities to issue our permits. We've been doing this for four or five years. It's a voluntary effort, no dredger has to go through it. No one, to my knowledge, yet has declined to go through the process.

And we have won several awards including the former Vice President Al Gore's Hammer award for reducing waste and increasing efficiency of government.

But all is not resolved. We are working

on a couple of issues right now that came up as a part of the LTMS program and are also bedeviling folks across the country. And that's seasonal work windows which really talks about closures of various parts of the Bay to protect habitat, mainly threatened and endangered species. For example, salmon, or there's other threatened and endangered fish. So when they are migrating the Fish and Wildlife Service or National Marine Fisheries will say no one should be dredging or disposing during this time period.

And so we've worked this out and implemented it as a part of the program. But it's very confusing and we're working with both the regulated community and with the resource agencies to try to see if we can open the window some more and make sure that more of the time folks can go out and work without having to worry about these windows and consult with the agencies.

And the other thing is dredgers still have to go through and look at whether there's an alternative to inBay disposal. And that's been something that has been difficult in the past year for the dredgers. And a couple of refineries have told us that they found it very difficult to go through this process.

So, we are working through the DMMO to come up with guidance and a template for applicants to use in going through this process. And, again, this is a part of our goal to make sure that we're protecting San Francisco Bay, but also fostering economic development and use of the Bay that is consistent with San Francisco Bay and its protection.

So, in closing, the implications for the fuel supply is to work in San Francisco Bay, if you're going to expand your facility, amend it, you're going to need a permit from us, as well as the other regulatory agencies. And for your dredging and disposal we will be looking for the consistency with our LTMS program. But on the other side of the coin we have set up the DMMO and are working closely with the regulated public and with the environmental groups to try to come up with a program that everyone can live with.

And that's really been the hallmark of this approach, is trying to build a consensus-based approach to resolving these issues in a way that works for all. And I think the proof of this is that we are dredging in San Francisco Bay.

Folks are getting permits. We no longer have mudlock in San Francisco Bay.

And if you go along and visit some of the other major harbors around the country, I think you'll find that not the case.

So, with that, that concludes my presentation and I'd be happy to answer any questions.

PRESIDING MEMBER BOYD: Any questions, folks? I guess it was crystal clear, thank you.

MR. GOLDBECK: Thank you.

MR. MIZUTANI: Thank you, Steve. The second and last speaker before lunch is Dave Mathewson. He's the Director of Planning and Research for the Port of Los Angeles. Mr. Mathewson will be talking about the Ports of Los Angeles and Long Beach plans for liquid bulk terminals; issues facing ports with respect to terminal siting and crude product forecasts.

MR. MATHEWSON: Thank you. It's really tough being the last speaker before lunch. I'll try to keep it brief --

PRESIDING MEMBER BOYD: Just take your time. We want to hear what you have to say.

MR. MATHEWSON: I appreciate the

opportunity to be here. What I intend to do is to focus my talk on the San Pedro Bay ports of Los Angeles and Long Beach. Those are two major commercial ports that really are involved with crude oil product movements, excluding Chevron's operations in El Segundo.

And what I wanted to do is just to quickly give you a flavor of the ports and our structure, and then get into some of the terminals that we have, our plans, and then the challenges and issues that we're faced with right now.

Clearly both ports are driven by containers. Los Angeles is the busiest container port in the U.S., seventh in the world. If you combine L.A. and Long Beach together, we're the third largest container port in the world.

However, both ports have committed to make strategic policy decisions to be a diversified port. So while clearly the emphasis is on containers, we do also, both ports provide facilities for liquid and dry bulk uses, as well as break bulk cargos. But clearly, any which way you look at it and cut it, containers are the bread-and-butter of both ports.

And we're looking at growth rates, last

year for L.A. of 12 percent. And so far this year we're pushing 20 percent. And both ports we're looking at 10 million TEUs this year.

Both ports operate as landlord ports as opposed to operating ports. We just provide the land and water areas, and then the customers then develop the facilities.

Both ports operate on state lands granted to both cities through a tidelands trust. And those trusts identify the appropriate uses of each. Our trust was amended last year to allow for greener uses with respect to recreational, commercial and public access type uses.

We're both self supporting; we don't receive $1 in tax revenues. On our side we have over $2 billion in assets and we generate about $300 million a year in operating revenue for Los Angeles.

And on our side we have nine liquid bulk terminals currently. And those would include 12 berths and water depths ranging from about 32 to 40 feet. And in Los Angeles there's about 7 million barrels of storage not on waterfront.

And I'll just quickly go through these. The first one is Westways; it's on the west side of our main channel. And I'll go quickly where these are. It accommodated chemicals and products and has about 600,000 barrels of waterside storage.

Then we move into the west basin area of the port. We've got Kinder Morgan, Amerigas, which Kinder Morgan handles products; propane is Amerigas. And the waterside storage capacity is about 500,000 barrels for the products. And again, water depths there of up to 35 feet.

Moving along the east side of the west basin area of the port, ConocoPhillips has a facility there with two berths and about 850,000 barrels worth of waterside storage.

And in this area right here is moving into the Wilmington district of the port. This is the oldest area of the port. And this area right there is more an island. This is historically the focus of all the liquid and bulk activities in Los Angeles. There's about 2 million barrels of active storage there right now, and we have three operators in that area.

That 2 million barrels does not include these tanks right here. Those tanks are Kinder Morgan's tanks, and they've ceased operations about two years now. And, again, those tanks plan to be taken down to accommodate adjacent freight bulk cargo expansion.

Moving further east of the Wilmington district, we have the Vopak terminal. There's about 700,000 barrels of storage on the water. And a pipeline linking to the inland site, as well. And about 35 feet of water.

Finally, the last terminal in Los Angeles is the ExxonMobil terminal. They have actually two sites. This is on the main channel. They have product storage here of about a million barrels of storage capacity. And it says two, but actually there's two berths on the main channel. And they have limited berthing in this slip right here, as well, principally further.

And this is also connected to a remote tank farm site on Terminal Island, which has been used for crude oil. And it's about 1.3 million barrels of storage capacity.

That's a quick view of what the existing facilities are. As I mentioned before, clearly containers are a major impact in Los Angeles and a major cargo that we're accommodating. And over the last several years we've seen several facilities, marine liquid bulk terminals cease operations in Los Angeles for a variety of reasons.

And this provides a list of some of those that have been impacted and ceased operations for, you know, a variety of reasons. We've got storage facilities being closed with Kinder Morgan, UNICAL about eight years ago closed their crude oil tank farm in the San Pedro area. That was the conflict.

They had residential units across the street from this. ConocoPhillips in the west basin, we are currently looking to expand an adjacent cargo activity. So some of their tank is just going to have to be eliminated. And same as with Kinder-Morgan in the west basin.

There's an adjacent container terminal. And we're looking at impacting their storage area. The port is sensitive in trying to maintain berthing facilities for these operators. And we've been in discussion with Kinder-Morgan and ConocoPhillips to ensure that berthing remains available to these operators.

While some are negatives, the port has for several years been engaged in long range planning to accommodate projected growth in crude oil and product receipts through Los Angeles. And our biggest product has been the pier 400 facility. That was recently completed about three years ago.

It's about a 600 acre landfill. And in the initial planning stages, although 600 acres -- over 200 acres were committed to the colony of liquid bulk uses. That was a combination of relocating some of the existing facilities in the port, as well as accommodate projected growth in crude oil and product receipts through Los Angeles.

We accommodated this facility, provided with 81 feet of water so we can handle VL tankers up to 375,000 foot tons. We provided dedicated pipeline corridor from this landfill to term line, which would tie into the existing pipeline network and be able to service the refineries in the basin.

And you'll notice one point here, right now we have about 15 acres on 400 that's available to accommodate locate bulk use. It's a far cry from the 200 plus acres that we originally planned for. And I'll talk about that later on. We'll talk about the challenges and issues that we're faced with right now.

And this is just a visual of it. This is the deep water channel right here. We've got space to accommodate two berths for VL tankers. The 15 acres is right about here. It will be pipeline here, and off the island onto pier 300. At one point we also had plans -- this is a 75 foot channel depth right here.

This area right here was initially proposed to accommodate local bulk uses. The crude oil would be over here. The product terminal would be over here. When we started this effort in the early '80s, again, we recognized the projections of the growth, and we planned our facilities accordingly.

But through an extensive marketing effort, we reached out to the end users of crude, third party terminal operators and producers of crude. We had meetings to try to get somebody to step up and commit to develop facilities out here.

And those efforts were ongoing for probably since the mid-1980s. And port management and port bore finally decided that it was not wise to keep 200 acres vacant after we just spent several hundred millions of dollars to create this landfill, and with the competing demands for container activities.

The decision was made to enter into an agreement with MAERSK to develop basically the entire pier 400 landfill, which is here, which is about 500 acres that they have now to accommodate containers. While the port was very active in trying to accommodate what we saw as a real need for future facilities, we were not successful.

And from our perspective, we really think that the window of opportunity there was lost for pier 400. Although we still do have berthing capabilities and some background for storage. Long Beach, just quickly, they have about seven facilities currently that handle crude and product.

They have deeper water depths. 76 feet is at their main crude oil facility, berth 121. And they've got about 4.6 million barrels of storage on the waterfront. Long Beach also had been engaged in long range forecasting. And they also recognized the need to accommodate crude oil.

And they also have a project that they're currently soliciting to develop a second crude oil berth in Long Beach, right around the corner from their existing one. And that would include three million barrels of storage right behind the dock. That also would be served by a deep water berth and channel.

And that facility is up here, being a threat here. This is the existing deep water berth for Long Beach. And then the balance of their facilities are located up here with petrodyne and shells up here. So they're principally located, their tankage on the inter harbor area.

Again, for a number of years both ports have engaged in cargo forecasting, which includes liquid bulk, receipts of crude and product, and consistent with what we've seen so far. Clearly, we saw a need to accommodate this growth and product in crude. And these are just numbers, actual numbers, from the Los Angeles side with respect to product.

For the last three years we've seen a fairly health growth in product. Currently we don't handle any crude at all for the last few years. So on our side it's all been product. Long Beach, this is in metrographic tons. It's been relatively stable over the last three years.

And of that 30 million metric revenue tons probably two-thirds of that represents crude oil. And finally, the issues and challenges that we're faced with right now, clearly we had a tremendous pressure to accommodate additional container growth. We're looking at, again, you know, 12 percent growth here annual over the last few years.

Container activities are very intensive, and there's been a tremendous pressure to accommodate that. There's also been -- we've been under some pressure to minimize tankage on the waterfront from a variety of sources, from the local community in San Pedro and Wilmington and Los Angeles.

We had a lot of pressure to remove tankage that they believe is inappropriately located with respect to the residential areas. Also, the state level historically there has been the view that tankage on the waterfront is not an appropriate use of tidelands properties.

The coastal commission has jurisdiction on both ports. We had to maintain a promaster plan. And they have approval and oversight of any (inaudible) of that. And they're sensitive to minimizing tankage on the waterfront. Also, this management planning is also a requirement of the coastal commission.

And LA and Long Beach Ports are unique in that we are the only two ports we think in the country that are required to do this site planning requirement. And the purpose of this management planning is to segregate potentially hazardous facilities from high density populations, what we call voluble resources, residential areas, any type of visitor serving areas.

So that limits both ports' abilities to locate new facilities. And we're in a more difficult situation in Long Beach because our port truly backs up to residential neighborhoods in San Pedro and Wilmington. So we've got a lot on the waterfront that is basically off limits to accommodating any liquid --

And then finally, there really hasn't been a whole lot of interest expressed in pursuing new facilities in Los Angeles or Long Beach. As I said, we've been actively planning for pier 400 for 15, 20 years. And we've been actively marketing that facility for development.

It's only been the last month when we finally received an application to develop (inaudible) on pier 400. And that's with the Pacific Energy move. So we're engaging in preliminary set up design work and starting to gear up the environmental work for that facility right now.

But, again, I think over these years the ports' management and board clearly recognize the need to accommodate future through petroleum and crude oil. But they can only hold off in keeping that land in reserve for so long. And the pressures are there. After we thought we had done our due diligence, there really wasn't any interest out there to develop something, the decision was made to commit to containers.

So those are some of the issues and challenges that are faced here at the port right now. So I'd be happy to entertain any questions.

PRESIDING MEMBER BOYD: Dave, can you infer from what you've heard this morning that maybe in the future there is going to be more interest in developing the kind of facilities that unfortunately you thought about in the past and they weren't realized? Maybe the curve is coming now and there's a greater interest?

MR. MATHEWSON: Yeah. There clearly is. Unfortunately, that window I think of opportunity is closed. Right now we're not going to build anymore landfill in the foreseeable future. We have to go outside of the break water. And costs of doing that are just absolutely tremendous.

Right now we can't get it permitted anyway. We don't have the mitigation credits in place to allow anymore substantial growth. So years ago when we were approaching all the parties, you know, the same response was, well, you know, it's a good idea, but I think you're a few years ahead of yourself.

And clearly that's the case, but, again, it came down to how long can we keep this land and reserve.

PRESIDING MEMBER BOYD: The one thing that does concern me a little bit from what I heard this morning in your presentation is the fact that the ports actively engage in taking out the existing facilities. It looks like there's a potential conflict with need versus need there that perhaps a lot of people have to engage in some discussion.

Of course the oil industry has to step forward and express more interest in the subject it sounds like.

MR. MATHEWSON: You're right. That is a huge conflict right now. And the port has been in discussion with our existing customers to try to keep their operations whole as much as we can. As I said, with ConocoPhillips for example and Kinder-Morgan we had been in discussions to make sure they can operate efficiently. And we try to meet our continued use as well.

COMMISSIONER GEESMAN: Where would the proposed Mitsubishi L&G Facility be located?

MR. MATHEWSON: That is now -- they've now shifted their focus over to Long Beach, and that would be just north of the that proposed crude oil facility.

COMMISSIONER GEESMAN: Do you know what the acreage requirement would be?

MR. MATHEWSON: No, they have the zone exclusion that they need to deal with. And I'm not sure what ultimately their acreage requirements is going to be. When they were talking to us they did range from 25 to potentially 60 acres.

PRESIDING MEMBER BOYD: Any questions?

MR. AHUJA: My name is Kamal Ahuja. I work with the Air Resources Board. You mentioned the lack of long range interest to develop new terminals. However, there seems to be a lot of congestion at both the Long Beach and the Los Angeles Terminals. Can you address that issue right now?

MR. MATHEWSON: Well, that congestion issue is really being driven by container activities. And the focus was on accommodating both facilities.

MR. AHUJA: Okay. Thank you.

MR. MATHEWSON: Okay. Thank you.

PRESIDING MEMBER BOYD: Thank you very much.

MR. MIZUTANI: Commissioner, that concludes the morning session. I don't know how long you'd like to take a lunch break and reconvene. But when we reconvene the first speaker will be Jeffrey Williams. And then from there he will moderate the panel discussion.

PRESIDING MEMBER BOYD: Okay. Well, Chuck, I think we'll declare an hour for lunch, because that's about what it takes. But we'll start promptly at 1:15, and maybe you can have your panelist already seated when Jeffrey gives his introduction and move right into it.

And if Jeffrey is going to use slides, wiring with the wireless mike, no offense to Dave, but it was hard hearing.

(Thereupon, at 12:15 p.m., the workshop was adjourned, to reconvene at 1:15 p.m., this same day.)

--oOo--

AFTERNOON SESSION

1:21 p.m.

MR. MIZUTANI: Our next speaker is Dr. Jeffrey Williams, Department of Agriculture and Resource Economics at the University of California in Davis. Dr. Williams will be speaking on commodities, markets, storage and imports. And then after Dr. Williams' presentation he will basically do double duty and begin to moderate and facilitate panel discussion on the session on challenges to increasing petroleum imports.

Dr. Williams.

MR. WILLIAMS: Actually, I'd like to emphasize among those all possible topics, one, which is the interaction between gasoline imports and price volatility. We've talked a lot this spring and other venues about price volatility. But these subjects are interwoven, and I think it's worth emphasizing that point.

To put it a slightly different way, a lot of what we've been talking about today is systems interactions, transportation system, the distribution systems and so forth, trends and demands in those systems. I'd like to propose that these are all in very complex interaction, including the issue of price volatility.

And I don't think we've been really thinking about price volatility in terms of this system level analysis. To just give an example, while we're talking about trends in refining imports and so forth, we haven't ever talked about what's likely to be the shocks to the system.

Is there a trend in the shock that we might expect? Are we finding outages more likely in the year 2010 or less likely? That is an equally important prediction as is the prediction of what is the mean production in 2010. Along the way I'm also wanting us to think about whether the sensible aggregations for the analysis.

We've been looking at annual data. Is that the best way to look at the problem, or should it be monthly? Also, we've tended to talk about California, though we've seen other maps about the west coast or parts of California. I'd like us to think about that more systematically, and because those are often simplifications about a problem.

And I'd also like us to think a little more systematically about what are useful simplifications in studying something as complex as the interaction of price volatility, terms and demand, and inventories and so on. Now, this is an academic invented mind, I'm sure, but I am no academic and you have to indulge me a little bit in talking about some broader methodological issues.

I have here a plot of monthly foreign imports into California. We've been looking at some of the data on an annual basis. This covers 1996 through April of this year. This is gasoline, finished gasoline, finished gasoline plus blinding components for all of California.

I see a number of things about this monthly data that the annual datas tend to mask. In fact, I'm now going to argue that we get a very broad impression of what's going on if we look at the annual data. The dominate feature of this particular diagram is the incredible variability. That seems to me that's the fact we ought to focus on other than a slight upper trends.

I'm not as confident as everybody else here that given this incredible variability that there's an upward trend, maybe, but it's not obvious to me. And there's another feature that's worth emphasizing, we have periods here, here's another one, even here, where there are very few imports.

And then there are periods of many months in a row. This clustering I think is a very important feature of this type of analysis of this type of series. And I want to suggest that in fact it's typical pattern of something that's a buffering mechanism. And what we're seeing here is import use as a buffer stop type of operation.

And that's how we should think about imports. I'll even segregate this monthly data further into Northern and Southern California. And here is what we've seen about imports into San Francisco Bay. And, again, it's hard to tell of the trend, but there is huge variability.

Of course there's this major spike here that coincides with a major refinery outage, which, again, suggests that the imports are being driven on shocks to the system, take care of volatility. And that's also true if we look at just some of California. I put these on the same scale so we can see the components.

This, at a minimum, suggest to me that we have to characterize any import series in a more complex way than just saying it's a possible trend. It's a highly variable trend or not, I don't know cluster amounts. And we're really looking at two different systems in Northern and Southern California.

Another way to think about the aggregation that we tend to do just so we can analyze something is what is the spacial unit of the analysis. We've been talking about that already this morning. What I want to suggest to even a finer breakdown is that at least possible, we don't have to declare the data on it.

The interest fuel is in some sense an independent area, and it tends to be an exporter, right, to what we know in the San Francisco Bay Area, Northern California, which is to say that they shipped some gasoline away to Fresno typically. How much is that? No one seems to be recording it on a systemic basis.

I've seen some Kinder-Morgan numbers that suggest what that number is, but I fear I'll be electrocuted here if I even so much suggest that I would know such a number. But clearly, this matters, right? And none of it seems to ever care about Eureka up here.

And presumably it needs gasoline, and it's coming in by water I would imagine. It's from San Francisco probably. Some of it is no doubt coming in from the Pacific Northwest. We've already simplified our problem a lot by looking at the San Francisco Bay or Los Angeles.

It may be appropriate to think about this as a more complex system, even than California. And that makes us think a little differently about how we characterize imports. For example, Reno, Las Vegas and Phoenix are really, really major import centers by that definition compared to local production.

The San Francisco Bay is a large island, if you will, but customarily a small net exporter. Bakersfield is a smaller net exporter. So they should be worrying about export petroleum products and imports, right? California as a whole maybe is a net importer. Los Angeles, I think it would be better described as a trend shipment center than as an import center, if we had to use one word.

And Eureka, I don't know much about what's happening in Eurkea. That's my point there. I think I can persuade you that you have to look at perhaps subunits of analysis. But another thing we're emphasizing there is that the subunits of analysis are themselves a function of the infrastructure.

So a major pipeline is connecting San Francisco Bay and Los Angeles instead of marine shipments. We call them on system. Their prices would be differently too. And the price volatility that results would be different also. So that this is, from a systems level analysis, even more complex because in units of observations we get of themselves a reflection of the existing infrastructure.

And that's tough to analyze. It looks about the same passing, but it's almost a gratuitous comment that really this workshop should probably have been held by the Nevada Energy Commission, if there is any such organization, because clearly they're much more dependent on imports than California.

And worst, they've got California, a very flunky statement, budget crisis, and energy crisis and all that between that and their supplies of gasoline. I would be really worried if I were in Nevada, which is just a reflection if you can choose where you would like to be, near the beginning of the distribution system than near the end.

Just like if you are wanting water it's much better to be at the top of the canal than at the bottom, because if nothing else you could steal it as it goes by you. If it's dried up by the time it gets there, you don't have a choice, right? This upstream/downstream I think explains a lot about price volatility too.

So to conclude this point, I think that the spacial aggregation at the minimum would need to be Northern and Southern California, and we ought to be looking at monthly data. If we're trying to understand trans and imports, because they are primarily a part of the stochastic system.

Well, speaking of stochastic systems, I'd now like to talk about one, and a simplified one. So I'm opening myself up to the very criticism I've just made. What's the appropriate unit of analysis? How do a I aggregate things and so forth? I'm happy to let you criticize me about that because I think that makes a useful way of thinking about how we analyze things.

But I'd also like to argue that these are very difficult systems to understand. And that it's important to do some simplification so that we can think about things systematically. That is a complicated way of saying the price volatility and the degree of the imports are surely interrelated. One isn't causing the other.

Both are being caused by something else. I only hope of trying to understand those relationships is to be systematic about some very simple ideas first of all. So I've set up a very simple world in which, first of all, there's no stocks, no possibility of imports, no trends or anything.

Well, I guess there could be imports coming in, but, you know, in this world you would never do so if there were no shocks. So the price of gasoline at 100 period after period, and 100 units are produced, or minimal barrels, however you like to think about it. But now I introduce some randomness.

Not randomness in long-term projections, but period by period randomness. I'll let there be each period ten percent shock of a refinery outage, which knocks out 4.5 units of the gasoline that would otherwise be available. And I also make a demand shock. I don't mean the trends and demand here, but there's an unusual vibrant economic activity.

Like in San Francisco a few years back, and every truck is on the road, and then suddenly it goes the other way and there's nobody driving except to look for a new job in hitech sector or something like that. We'll consider those shocks, but they're temporary shocks. And the next period there's a chance of drawing the very opposite shock.

And that will make the demand elasticity of gasoline fairly low. So you can imagine then this system of shocks playing out, and we would get a sequence of prices over time. I'll further simplify it and say we'll only think about a few periods, and the fifth period of the world becomes certain.

I'm playing a game of a hypothetical world that has shocks, and I want to ask questions such as what happens to this system where we have storage? What happens if we have storage and imports? We also end up with asking what if we have some trend in demand? I want to suggest that our intuition about how those things interact isn't very well developed.

So I ask right now, in that little world, if we put a trend in demand, what happens to the price volatility say for the third period? Who would say it goes up compared to the other worlds that I imagine? And who would say it goes down? You probably have an opinion. I'm not going to ask for a show of hands.

But I would guess most people would say that the price volatility increases in the presence of trends, right? I want to make us think systematically through this. So play this game with me a moment. So I have in mind just to reiterate here that we start with someplace, I'll say there's mean demand and no outage.

And then the dice roll. And there's a small chance for the worst price spike, a high demand and an outage. It's going to lead to a very high price. And there's six permutations, and the period after that, this period one, period two and period three, that there will be another set of shocks.

The shocks are unrelated. There's no carryover from the shocks. And we'd like to be able to think about what's the sensible thing to do in the first period? Imagine you were a logistics official of some refinery, you might be thinking about this. Do you hold inventory? Do you place an order for more imports if that were feasible, and so forth?

I think you systematically try to think about where you might be in the future. And that's going to affect what you do today. But it's also clear that if you decide to store today, you effect where you'll be tomorrow. So there's this complex going forward and going backward in these types of systems.

I also want to emphasize that in these systems, or in this kind of problem, we can calculate from the prospective of the current situation the mean price, any number that appear as a head. Where will we be, and can figure out all the permutation, and take the average of that.

That's the mean price. You also compute the variance through the periods out or something. I'm going to go further and interpret those mean prices as if they had been forward prices, or future prices. So I'm going to get what I would like to call constellation of prices. And some of you who have heard me talk before on this, realize I want to emphasize the behavior of the forward price relative to the spot price and so forth.

This little hypothetical model will help us think about that, I like to believe. I'm not talking about risk aversion, though there's uncertainly in this world, if I can speak to the economist in the audience. Let me show you examples of those computations in my first hypothetical world of no storage and no imports.

The price in the first period is a little below this standard of 100 because I've adjusted production a little bit to deal with the average production the same in my servy world and unservy world. But beyond that, the mean price is going to be a little bit above 100 because I have a curved demand curve.

But it's the same every period from this prospective because nothing connects the periods. There's no storage. There's no imports. So what happened in period three is likely to be what period two is, and that mean is the same. And the variance is the same in period two, and period three and period four. Okay.

I'm going to show this diagram again and again, well, three or four times. I don't want to make you too worried here. And I want you to compare it to the world of storage or something. So remember the patterns here, especially remember the variance, which is something like 13.

The numbers mean nothing. It's the relative changes that I'm trying to get at here. This is clearly not any real market, but it's got some features about the inherent volatility. So let's try to think about, well, how would this little world, this hypothetical situation, work if you can store, and it cost you two cents per period?

A period might be six weeks or two months. And that leads to a set of questions, how does the prospect of the current and future stores affect the constellation of that forward price from the same starting point? And how does that affect the variance?

Let me try to explain a little bit about the calculations that I think were going -- But I'd also like to say this is for the market equilibrium that happens. Let's fast forward to period two from period one. What happens in period two is going to influence how much we might store in period one.

I want to see if it makes sense. I'm going to jump in and say, yes, it does store a little bit. And if we store a little bit what will happen in period two? There was six permutations. I'll show two, the two extremes, the high demand and an outage. And the other one a low demand and no outage.

That's just some simple ideas here. I think you'll agree with both instances, circumstances go, ratings set price of gasoline a lot. Because here, this is an extreme example, from period two's prospective though what would we expect to happen in period three?

If you couldn't store anything it would go back to that average of 100, right? But here it's a little higher because there's a chance in period three, and then we've got the circumstances that cause the price to be very low. In which case we store. And so that raises this average a little bit.

It's sort of the same story here. In period two we've got the news of low demand and no outage. We have way too much gasoline. The price, if we couldn't store, would be way down here. But we choose to store. We support the price. And if you notice that this price difference is by two, because you have to cover your cost to store.

And you see that these systems cause a convergence to the long average. But when you introduce storage it attenuates it. I'm not saying anything is that special. It's just that when there's a lot of -- when the circumstances where there's a large quantity of gasoline available it makes sense to spread that over a couple of periods.

And that's just going to depress the price for, on an average, a few period again. And likewise, there's circumstances where, like here, the gasoline is worth so much now you might as well use up all the stocks you have and trust to (indiscernible) in the future. That's all I'm saying here.

From the perspective of period one, you take account of all these permutations and you think about what's the optimal amount to store. You think about the average price you'll get. So what's the relevant single to you when you decide to store in period one, or in period two? It's the one period ahead forward price, or in period one what price you expect in period two.

And if a lot of people are making that computation, the total on the storage is going to lower the average price in period two, even as it raises the current price in period one. So this arbitrage like perspective is contemplating the future circumstances, right? And so that's saying that the future affects the present, but there's this complex system says that the present is affecting the future, because if we store it's going to affect where we are in the next period.

Implicit of what I'm saying, I hope you don't see this as a losing proposition, is that viable storage arbitrage is most likely when there's a relatively low price in the spot market. There's a lot of gasoline around. You store it then, not when there's not much gasoline around. Not a high principle item thing.

The consequences of that though may not be so obvious. Let me now, in my little world, target optimal storage, but that's less important and it's sort of sensible. What would be this constellation of prices? Here you're going to store something in period one where there was no storage possible, of course you didn't. And that raises the price.

So the prospect of this future uncertainty means we'll store now, raise the price. We get this strange expected price patterns. Those are observed in real world futures market, so it's possible. But look here what's happening to the variances of prices. Most important, they're lower. Storage tends to stabilize the system compared to the 13 level.

I think everybody shouldn't be too surprised by that composition, but it's worth emphasizing. Now let's play the serious game. One of the effects of imports being available one period ahead at 103 cents CIF, my little world that is. Transportation and cost are covered.

If this were certainty, I said if the prices all were 100 you'd never import. I built in here something that is important about the real world, which is imports don't come instantaneously. They take some time. And I tried to make the period equal a reasonable amount of time for imports.

And so I'm saying that it's the one period ahead for a price that is the relevant signal. Let's also think about simultaneously what happens if you could get imports two periods ahead at 102. It takes longer to get it there, maybe it's cheaper. Let's see if that would do.

To get us thinking about this I want to go from a hypothetical world to a real world, gasoline prices in California on September 2nd, 2000 when there was a big price spike. I've shown this diagram before when we were talking here in late April. And these are the observed prices for crude on NYMEX, which is to say Cushing, Oklahoma by months ahead, and the New York Harbor prices for NYMEX gasoline, and this is backwardation.

And we observe at that time in California these three forward prices. And if you recall, well, the reason we don't have forward prices far out here was, well, it's pretty obvious what they would have been. I'm going to take that one step further and say let's imagine what they would have been and call them real things.

I'm going to make these circles the prices for gasoline in California, these periods ahead. So on September 7th, two months ahead, that is to say early November, it would have cost $1.12 or 13 to get gasoline. It cost much more, like $1.45, to get it the next cycle, or something like that.

Does everybody agree I can fill in the little dots like that? Let's think about being an arbitrageur who is interested in importing gasoline. He looks at this set of prices for delivery of gasoline in California. What can he do? He calls around on the telephone and gets a bunch of quotations.

Here's one that it takes to the normal sources. It's going to take a month to get there. He gets these quotations. Of course he's only interested in the lowest one, if he's going to be interested in any at all. He gets some of these quotations up here for -- you get it in a week or so if he pays a huge premium.

This might be something out of the Pacific Northwest from refiner oil change. It's production ones. You want to tell him, no, this is never feasible. No one would ever even ask about that. And I'll concede that point. That's because no one is ever going to want that trade, as I'll show you in a minute.

But imagine that there were these quotations. What about this quotation here? Here is one that says it cost about $1.40 and I'll get it to you in two months. Well, clearly that's better -- that could never be better than $1.20 in four weeks, right? Surely you'd take the lower price sooner.

But it's not automatically obvious that you would pick a lower price later. So among the prices here, if you take the lowest one, is there, with these quotations, and arbitrage possibility into California? Let's go back to the prices here that were available. Let's put in the various quotations. Well, yes, we did get quotations for getting it here in a week from the Pacific Northwest, but that never pays because, granted, we can only sell it for $1.55.

Forget that red dot. We're looking for a red dot that's below the price that's going on in California. Here's one, one month ahead. Well, the red dot eight weeks ahead is lower than four weeks ahead. It's above what is being offered in California. This isn't a deal anyone would take is an arbitrage. This one is.

That means there's going to be imports into California, landed here in about a month, right? And of course you're going to say, well, that affects this price. Yes. And it affects probably all of these prices. This is going to be equilibrium where these things touch, or they overlap.

But that probably makes it very unlikely that we are seeing any imports that take two months to get here, or one week to get here. That's sort of the typical pattern of these curves intercepting is going to have one place where they touch, and that's the arbitrage.

And it looks like that the typical arbitrage brought into California is going to take a month. And I'll go further and say, well, that's why we have that forward market and not the other ones. And that's why I have to make the other ones hypothetical. Does everybody understand the principle I'm looking at here?

Because now I want to go into the hypothetical world where this will happen under every possible circumstance of my little decision tree. I'm going to let that one be a constant price of imports. So let me make sure you understand the experiment. One period ahead you can it for 103.

It doesn't matter -- that price isn't

changing. You get two periods out of 102. What will you do? I've blown up part of my previous diagrams. And this is the price on that high demand outage, one of the two possibilities I showed before. And here are the two prices.

This was the one period ahead forward price in period two in my little example. And the two periods ahead. And the way I got it here, 102 is higher than this forward price, don't import even at that lower price. But this red dot is below that black dot, import one period ahead. That's an arbitrage.

It's going to change those prices. I want to get to the results of what that does to the system, but I want to emphasize along the way that these arbitrage calculations involve comparison of the current acquisition cost and the type of transportation to the implied forward price that time ahead.

We see again and again a comparison of gulf coast spot prices with California spot prices. And that's implicitly saying the transportation is immediate and free. Now, once the relevant is the gulf spot with the rollover California forward, how long it takes to get there.

And that's the general principle. And I keep seeing us talking the other way. And that's going to lead to confusion. It's also important to conclude simpler examples that viable imports, if any are likely for a particular period ahead, seems to be about four or five weeks into California. That can shift over time.

So one of the things that could happen is California becomes more import dependent if the national period of head may change. That's something we ought to monitor too. It's more perplexing to see than this complex system, an arbitrage for a particular period ahead may make arbitrages for other periods ahead less likely.

So we have to look at this whole set to be monitoring all the time. So it's not just enough to look at gulf versus California and pay attention to that, but some of the other ones too, because the gulf may become less important if one of those other arbitrages matters.

It's also implicit we're finding here that the imports are most likely, when they're relevant forward prices high, which means that spot prices are even higher. It seems from this analysis that we will tend to get imports into a system like this when markets are in backwardation.

And that means we won't very often see storage of inventories in California when they're imports of inventories coming into California, because a certain census will be very different. We may later store those imports, but that's a different issue. That's sort of the next period ahead.

It does not say though that there's no -- that the imports don't drive up the storage or vise versa, because they're interacting in a way. If we bring a lot of imports in next period we'll have less reason to be storing the next period and so forth because we have in the future we can bring in imports.

It's very complex interactions are likely here. I hope everybody sees this point about the current prices that can be high and attract imports, but it's the forward price that appeared ahead that is doing this. And the likely circumstances we see that would be in a backwardation.

And if you go back to the diagrams that

I showed at the beginning, when were the big imports, they follow refinery outages and so forth, which coincide with backwardation. It looks like California. So now I've done my hypothetical world with imports and storage.

We have to remember what the numbers were without storage, or the numbers were without anything at all. And anything at all is here. It turns out that the imports cause prices to be less volatile. I don't think anyone would be surprised at that, but it's worth, again, concluding it with a more systematic analysis, right?

And they would be more volatile with storage. And so you say, all right, I can see that imports with storages makes prices less volatile than with just storage alone. But what would in this world be the volatile of the frequency of the imports and the volatility of prices if there were imports allowed but no storage?

Remember what the forward prices were if there was no storage sale, all of these 100. You would never have imports. It's the prospect of future storage that causes the prices to be sufficiently high in the backwardation that brings in imports. Follow that? I'm not sure I understand all those interactions.

And that's my main point that there are very complex interactions in these systems, and so talking about do imports drive out storage? I think framing the question fully to start with. But all of this really lead to the question that I think we've all been wanting, what do trends do?

So I'm now imagining in this little world a constant trend in demand. So if this was a (inaudible) world the price is going to go up a little bit each period. What should happen to the variance when we have storage and imports? And it will be my guess it goes down. That the mean prices go up.

Now, what's happening here? Well, if you accept my result, first of all let's say when everybody talks about import dependance they're thinking about means, the mean prices. And, yes, I bet mean prices are going to go up. But the interaction with volatility is much, much more complex. But you can almost get the intuition.

Suppose we get to a point where under almost under all circumstances of case import, that's at the 103. Well, that's a nice stable price, isn't it? It's going to dampen everything else. Once California is part of the system where it's lots of imports, and assuming that you can get a lot of imports, I want to emphasize that I'm implicitly assuming that, that will stabilize the price.

And so as the trend gets us to import more and more that import is going to be the dominant influence on our pricing system. And that's fairly stable because California is small. As big as it is, it's small relative to all of the other gasoline markets in the world.

That's my main result is that in fact in these complex systems we could get a volatility going down even as we have trends. But you should criticize me for making some implicit assumptions along the way. One of them is that you can get as much influence as you want. And our discussion is about, well, can you really do that?

And I'm going to say, well, that's the crucial issue then, isn't it? And it's not how much you can get as a long-term trend, is what's the maximum capacity you can get? Let me conclude then by arguing that in these complex stochastic systems, and I think I'm the first that's tried to emphasize that the world has this random component to it, the first of our speakers I mean.

I highly claim that I alone have these insights. That these interactions are far from obvious. Among them is that the inventories are both substitutes and compliments. One will effect the other in a very complex way. Likewise, the economic geography itself reflects these interactions. And my little simple hypothetical didn't have five locations, but can you imagine how complex that one is?

It's possible that the trends towards imports could reduce the price volatility. And last of all is the one that I want to emphasize, if the trend is obvious why isn't it already in the price? If you can store the commodity, which we've been positing, as so it has inventories, then people thinking about those inventories should be thinking about the future.

You let me show the possible decision trees without saying, oh, no, people don't think about the future. Well, if they think about the future they can think about trends too. And I will argue that some of that trend at least is possibly reflected already in the price, not in the year 2008, but today.

And if there's storage today, it's quite likely that it's happening. And if you say it's not in the price of gasoline, well, tell me it's not in the price of crude, because crude is stored. When we did these hypotheticals of what if you store, what if you can import and so forth, a set of those, actually it was getting us to think about was some flexibilities in the system.

Being able to import adds flexibility. You may not use it all the time, but it is a flexibility. And a basic message of those examples is that the more flexible the system is the more effective it is in price volatility. Now, we can then talk about a lot of other examples where there's flexibility.

If refineries can adjust their capacity up and down very quickly, then of course the system is going to have less price volatility, right? So that flexibility is important. I don't mean long run trends in the refinery output, but surterm surges are going to do that, right?

And you may say, well, we don't see refineries doing that very much. Well, that's because they're in a complex system that has other buffering mechanisms such as imports and stocks. And it may be that the buffering mechanisms said we want to use the most are imports in stocks, and changes in refining utilization rates and so forth.

As you add more flexibility then you end up having the system dampen itself much more. And so what I want to know as much as anything about the state of San Francisco Bay for imports of petroleum products, or Long Beach or Los Angeles Ports, is their surge capacity. Because there's going to be times when we need a lot to come in, and other times when it looks like we need zero.

And it seems to me to be able to handle a surge is almost more important than be able to handle some slightly increasing average, because it's the surges that you have the price volatility. And I make that argument, I'm coming back to a conclusion I draw by looking at the monthly import series that they appear to be buffering mechanisms first and foremost.

If they are mainly buffering mechanisms, let's recognize them as such and think about adding flexibility in the system that will help them buffer more. And what we need then is to think about surge capacities and flexibilities and how those interact. And I'm sure you all can think of many more examples in the controlling industry than I.

But how much is a bigger pipe worth on the same route as the surge capacity issue? What would happen if we are able to get product from San Francisco to Los Angeles more quickly by that pipeline. What's that worth has to be viewed in this stochastic world I would argue. And the projections of future volatility, inherent volatility, I think are equally important.

So I want us very much to consider what is the trend and the probability of refinery outages over the next five years, or ten years or 20? That seems to me as important as knowing the average capacity. I'm not saying that's not important. But let's ask that other question too, because that also is drawn in the price volatility.

And if that's the main concern we have then let's find out the facts about what drives price volatility. I think that imports need to be understood in this price volatility context first and foremost.

Thank you. I saved us a little time. Any questions? No questions or clarification?

MS. KRANZMANN: I actually have a question.

MR. WILLIAMS: Okay, Holly.

MS. KRANZMANN: Your import numbers are foreign imports, right?

MR. WILLIAMS: Foreign imports, yes. That's what I could gather.

MS. KRANZMANN: Okay. Because I wouldn't want the room to be misled that California supplied demand balance is short gasoline, and we move it from other places domestically like the Pacific Northwest.

MR. WILLIAMS: Yes.

MS. KRANZMANN: I just wouldn't want people to think that.

MR. WILLIAMS: No, but clearly the mean imports are positive. It's a question of whether there's a trend. But it could be trend. I'm not arguing that there's not a trend. I think that it's as important to recognize that the series is very volatile. And why is that? I would argue because it's a buffering mechanism. All right.

And I don't know if we saw the domestic

movements, if they were the same amount every month, and they're now buffering mechanisms. They're going up and down a lot, and they need to be examined as a buffering mechanism.

MS. KRANZMANN: Great. And I think what happens is when you see the spikes that you showed on your graph, what happens is we tend to over club, if you will, bringing in the imports, and then it backs off because our inventories get as high as the system will even bear with the tankage that we've got.

And that's why you see the drastic decrease, because we're working off that inventory because there's nowhere to go with anymore.

MR. WILLIAMS: I agree.

MS. KRANZMANN: Okay. I just wasn't sure that would be clear to the room.

MR. WILLIAMS: All right. I'm agreeing with you, so I hope --

MR. HERMES: Bob Hermes with Purvin and Gertz. One other point on that too I think to keep in mind is that refinery production is more or less rateable. It's the same every day if nothing happens. On the other hand, imports come in as cargos, and I don't know what those numbers are, but it's a small number of cargos per month.

And so you can stack cargos in monthly data, and the period will be volatile just because you had five cargos come in this month and three next month because they came at the beginning and end of months. I know we run into this and the company I'm involved with crude production because you have to -- you can't book it as earnings until you sell it.

And that means lifting it. And it doesn't take but one or two liftings to really distort your monthly earning picture. So I think you see some of that also.

MR. WILLIAMS: Sure. Yes. Surely some of that volatility is of that source, right?

MR. HERMES: One cargo would be 10,000 barrels a day.

MR. WILLIAMS: And if it were mostly that, then we get a much better picture of what's going on if we average to a year, because those issues are smoothed delay. All right. And I think that's what everybody instinctively is doing to get a better picture of it. Clearly daily data is too fine to let us see.

I think it's going to be dominated by

the accident of, is it 11:59 or 12:02 a.m. or something like that. But there are some features in those series, the clustering of zero for three or four months that looks to me to be more like a buffering mechanism type of thing.

And there's another fact that the big spikes of imports coincide with the periods of the backwardation and the refinery outages. And so that's --

MR. HERMES: I'm not disputing your claim. I'm just saying that contributes to it.

MR. WILLIAMS: Yes. And that's why I agree completely. And my point was we need to think carefully about the aggregation we do. And here's a temporal aggregation to better look at weekly data, monthly data or annual data. And I'm just cautioning that the annual data here I think is hiding a big part of the story in the imports.

And that's all I'm going to say. And I don't think that comment is in any way taken away by saying the monthly data themselves aren't telling us the complete story.

COMMISSIONER GEESMAN: Would you attach a different value in terms of surge capacity to let's say an X percent bigger pipe compared to an

X percent bigger tank?

MR. WILLIAMS: What, are you sort of asking me to do these models in my head now? That's hard. All right. I'm cautioning. I bet they're not too different, but they could be. Maybe another way to say this is that if in a system like this, where we are having the shocks occur, we should expect to see a number of assets like tanks or pipes, or berths, sometimes not used. It shouldn't always be at full capacity.

COMMISSIONER GEESMAN: Right.

MR. WILLIAMS: And that's not a bad thing. That's just the world needs to have search capacity. Pricing that is harder. Now, what's the best place to put your surge capacity, that's a hard one for me to say. My instinct would be that something that can do it quickly, but not necessarily a lot of it, is more something that can do a lot of it, but slowly.

Did that makes sense? I think so. And you don't need a large amount of search capacity. You just need some. I don't know whether that means about tanks or pipelines. But I think that's the general principle.

MR. COVI: I think in talking about

search capacity, and not knowing anything other than the graph you had earlier with the EIA data, we see that huge price spike -- not price spike, but import spike during that unique combination of outages in 1999. Maybe some of the industry people here can fill us in on the details.

But that would define to me that we have at least that much surge capacity in the system for imports, not withstanding the discussion this morning that talked about some closures.

MR. WILLIAMS: Yes.

MR. COVI: I mean how close are we on a routine basis?

MR. WILLIAMS: The max observed, minus the possibility that next month should have been carried over, but it seems to me that's the search capacity, right?

MR. COVI: Bob Hermes, when we were in 1999, during that episode in spring, were ships stacks up? Were we near like a sort of a limit of the import capabilities?

MR. HERMES: I think we probably had more surge capacity then because the Tosco Refinery was shut down. Some people in the audience know more about this than me. And it was actually being used. They were bringing product in through that facility that might not have been available on an ongoing basis, just a normal outage type of situation.

So maybe that's overstating, I don't know, but it may be overstating the surge capacity.

MR. COVI: Thank you.

MR. WILLIAMS: I've noticed that lots of us who don't know a particular industry are always inclined to imagine that it's much less flexible than it really proved to be. So do we do the worst case scenarios in our head? And usually people can figure out how to do things.

How quickly they figure it out is another matter, right? And that, too, is a bit of a surge capacity issue. If you're used to rerouting gasoline as pipelines go out, well, then you're better at things like that. And I think it makes a difference how much experience an industry has with dealing with production shocks, man surges by geography.

A happy piece of news from these last years is that I would imagine people -- that the petroleum business in California have had a lot more practice at dealing with refinery outages, and rerouting cargos and all that than other parts of the country perhaps. And maybe that will be a useful skill later.

You don't want to use those skills necessarily, but they're probably there. And maybe one reason that the circumstances in 1999 were so extreme in terms of prices was that the system hadn't learned all the possible buffering mechanisms it actually had. There are skills in finding these arbitrages and so forth.

And that learning may have taken place. The little models I'm showing you, everybody's marked. But that's not true in the real world. It takes a little while to figure these things out, and I can believe that's happened. But that, too, I think we could usefully classify as a surge capacity.

MS. KRANZMANN: The other thing on the surge capacity issue is I think that there would be more surge capacity if there were more customers or players in the market who were willing to not just want storage when the prices spike, but they want it all the time. That's a big issue.

MR. WILLIAMS: They take it sometimes when it doesn't look like such a good deal.

MS. KRANZMANN: You know, when someone who owns an asset wants is a customer who's going to be there all the time. And people who take advantage of arbitrage want is to be able to bring product in when they feel like it and not all the time.

MR. WILLIAMS: There is an inherent intention that, yes, that's certainly the case. But it should be that arbitrage shouldn't be happening all the time, in this stochastic response sense. All right. And so it may be that the expectation of that particular facility is always full is unreasonable.

But the arbitrageur should also view it as unreasonable that he always has that capacity available when he wants it, right? There's a tension there. There's a tension always in these decisions when the world is uncertain coming up. I try to show you the decision tree. I announce there's a sensible amount of store.

I didn't show you the number. That's not too relevant here. But we know ex-post it was wrong, right? If the dice roll then there was an outage, a high demand, whoa, we should have stored a lot more. And if it turned out to be that there was no outage, and low demand, what were we doing storing any, right?

Ex-post, it always looks foolish. That makes it very hard to judge whether this system is behaving sensibly or not. I guess that's the final point here. And we tend to worry about whether the systems are behaving sensibly. It's very hard to judge whether so much randomness inherent like refinery outages and so forth.

That's an unpleasant fact of life I think. And maybe in academic I find that that's interesting then how hard it is to study. But I don't know that everyone shares that taste that I have. All right.

PRESIDING MEMBER BOYD: Well, put yourselves in our shoes as, not academics, but an alleged policy recommenders or decision makers. And I came into the panel discussion ready to ask questions about should we do something, we here in California, to enceinte the longhorn pipeline and the rest of that, or thinking do we need to encourage people to build refining capacity in Nevada, Arizona or the Pacific Northwest since we're a net exporter?

Or does the port of LA have enough facilities or not to meet our needs? Now, with what you've thrown out on the table, I'd almost have to ask everybody sitting here at the table what would the Energy Commission do in this particular situation, besides cross its fingers, with regard to the action that might be available to it to help address this problem?

Because as you said a few minutes ago, we seem to be getting a lot of experience of late with refinery collapses, failures, breakdowns. We've gone through two price spikes now in the last -- I mean we seem to go every two years now, and then have a situation. And we saw all the forecasts this morning of where we're going, which is going to just put more pressure -- we're going to grow.

And the question is, with all this talent, what are you going to recommend we do?

MR. WILLIAMS: Do we emphasize changes in average capacity or in search capacities? Maybe that's not a trade off, but that might be a useful thing to talk about. I don't claim an expert.

PRESIDING MEMBER BOYD: Yeah. And an assumption is you can get the surge capacity and that might be tanks in the Ports of LA I'll call it, where it might be that extra size pipeline somewhere in the system that I don't know the details of. Or is it surplus refining capacity somewhere in the system?

MR. WILLIAMS: Well, shall we move to the session now? I have the odd role of monitor of Nevada. Usually the monitor's job is to repair the audience interests after the previous speaker.

(Laughter.)

MR. WILLIAMS: I think we should just continue that and maybe this issue of surge capacity versus changes in average production and so forth. Commissioner Boyd put it better than I did. But I think that's an essential question.

MR. COVI: I have a question that I think follows closely to the point Holly just made that it's nice when demand is perfectly rateable, and predictable. And that certainly gives refiners and suppliers outside of California a comfortable feeling as opposed to this occasional demand.

But as we transition into more routine

importing from refinery centers outside of California, and more people step up to the plate to provide California's gasoline, does that also improve surge capacity at the same time, do you think? Do you understand what I'm saying?

Say there were six refineries, or three refineries, outside of California routinely making carb gasoline, which may not be the case today, does it also add to surge capacity of imports at the same time. I mean are those two complimentary things?

MS. KRANZMANN: Yes. What it is is those six refiners outside of California don't want to make California gasoline unless it behooves them to do so. And so they tend to make it when the price spikes.

MR. COVI: Right.

MR. LETO: I was going to mention too though, physically to unload more ships, more volume, you increase land storage.

MR. COVI: Go ahead.

MR. LETO: Yeah. If we had more imports, more water borne barrels coming into let's say LA, you're going to increase storage capability. Because to off load a ship you've got to have ready tankage to accept volume. So that infrastructure is going to change with increasing volume.

There's really two types of surge capacity we're talking about, there's physical, and then there's barrels on hand, you know. The physical will increase and the barrels on hand would undoubtedly increase.

MR. HERMES: I guess I have a hard time making a real clean distinction as far as tanks are concerned. I can't tell by looking at a tank whether it's a surge tank or a storage tank. And if it's a surge tank that clearly gets used, it's not going to be very attractive for anybody to build or to lease out.

And so if it's storage that's regularly used then investors will come forward and build tanks, assuming the permitting process and everything allows that. Build the tanks, refiners will see that this is an opportunity, and if they don't produce carb gasoline all the time they have the capability of doing it.

I suspect before 1999 there was maybe one or two that had even thought about it. Now, this has happened often enough, and imports have come in that that list has increased. I don't know exactly what it is now, but it's definitely a half a dozen or so. So as California gets more imports, the structure for handling them kind of naturally occurs.

The difficulty is that California is on the cuff right now. We went for almost all of 2002 with arbitrage not being on hardly at all to bring in gasoline and, therefore, not very much came in. So it's difficult to justify foreign refiners making investments to make carb gasoline, or storage operators or traders leasing tanks to make commitments if you think your facility might not be used for a whole year.

Now, as more imports come in that problem starts going away. And I don't have the intellectual background to what Jeffrey just went through. I'm not even sure I understood it.

MR. WILLIAMS: Uh-oh.

MR. HERMES: But I think what happens is that if you go to import parity all the time you kind of think of two loads of operation in California. One is refiner versus refiner competition here, which I would say drives the price down well below the arbitrage for spot supplies to come in.

Then not much happens. Your average price is lower, the price is lower. But if you go to import parity all the time, the price is higher than that because it has to support imports coming in. I guess one thing I would see that contributes to the volatility is you jump from one to the other.

Well, if you had imports coming in all the time you'd have less volatility but a higher price. That's probably not all the reasons Jeff said.

MR. WILLIAMS: No, that's the exactly the reason what I was saying. You said it better than I did. But that's one reason we have price volatility in California is we're jumping up to that import to parity point and back down. And if you take that amount of volatility out then it's less volatile, but it's higher on average.

Whether we're better off as California for that, I don't know.

MR. COVI: I have a question about import parity. We touched on this in our last meeting, and maybe for the panel, does that number change as we import more and more routinely? We talk about it now. I've heard 15 cents, maybe 15 to 20 cents is import parity with respect difference in the transportation costs.

But if we're importing say from longer distances, because we know we're going to be needing it three months from now, and we're getting a lower price as a result of importing, not from the gulf coast, but from say Singapore, wouldn't that tend to reduce import parity in the long run?

MR. HERMES: Well, I think you have a couple of factors. You have some facts that are always going to be there, like what the marine transportation is to move it from somewhere. That's not going to change very much, depending on what California's requirements are because you're not going to be big enough I think to influence the tanker market.

But I think the point that Jeffrey made is a good one, that as experience is built up, and more regular supply comes in, then I think the cost does come down, because people find better ways of making more suppliers enter the market. But there's certainly a limit of how low that's going to come because you still have to overcome a pretty substantial transportation barrier.

It comes from the gulf coast. That's, what, ten cents. Maybe it's less than that in the foreign flag ships. But the price of crude in California is about the same as it is on the gulf coast. And so whatever the transportation you add to it, it's just an added cost to the price.

MR. COVI: Well, how does it work for jet fuel? I mean we import a lot of jet fuel, mostly I think from Korea. And you can't be adding that much to the price because we're still competitive with other refinery centers in the United States that make jet fuel. Is that cost being absorbed by the rest of the crude slate?

MR. HERMES: I think in a nutshell, yes. I guess one thing I could -- I think gasoline is kind of a different product than other products around the world. One obvious difference is jet fuel is jet fuel more or less. There's some minor differences between IP specs and out of specs and so on. But for the most part, I say I want jet A, at the same product everywhere in the world.

Gasoline is different everywhere. The other thing is most refiners or most countries in the world, I'd say the trade in gasoline is pretty small worldwide. I think our numbers are there's three million barrels a day of international trade in gasoline.

And a lot of that is pretty structural in nature, about 800 of it is in the US, 600 on the east coast, and 200 elsewhere. And of course the east coast includes the US Virgin Islands, Venezuela, and Canadian Maritime imports that are pretty structurally part of the east coast market.

And then you have cross barter trade in Europe. It's quite a bit of the additional makeup of it. And then you have small countries that don't have refineries, Guatemala, Panama, countries like that. So you add all those up and the three million barrels pretty much disappears.

And the volume of gasoline that's out there in spot trade is much smaller. I think our numbers would say that gasoline is the order of magnitude, ten percent of international trade of all sorts, while diesel is more like 20 percent. I think jet fuel is 25 percent. So there's a lot more trade flux already going on in those products than there is in gasoline.

And then you put onto that the quality requirements of the California gasoline, and that trade is virtually zero. The only trade in that commodity is what comes in here.

MR. WILLIAMS: Could I ask a question? Everybody is talking about capacity creep, and I will admit that I don't quite understand what that really means. And can someone elaborate what's really going on there? And maybe also say what does that say about surge capacities, the way I was talking about it? Maybe it has nothing to do with it.

MS. KRANZMANN: Well, capacity creep is, you know, the fact that we have really good engineers who figure out how to take our current hardware and want it in the most optimal way they can, and obviously trying to make the products that are worth the most. So what you tend to see is we get better at using the asset that we have in making more gasoline. I mean that's the most simple way to say what capacity is.

MR. WILLIAMS: But is also the ability to switch quickly if you need to, or let's say the need for gasoline versus jet fuel, and you can -- I mean you can learn to --

MS. KRANZMANN: That, and the definition of capacity creep. I'd call that more flexibility of your asset. But I don't know if I have the --

MR. LETO: It just so happens though in California, which has a lot of hydro cracker capability. Certain types of hydro crackers do give you flexibility to switch from more gasoline product to more diesel and jet. So California is unique in that capacity.

MR. WILLIAMS: So it's possible to get some elements of capacity creep that make you more flexible, and others without necessarily planning it that way, and other that could make you less flexible, right? Just to squeeze the last little bit.

MR. HERMES: I think the term is pretty loosely used. And in the broader sense, people use it to mean any growth in refining capacity that involved building a brand new refinery, which would mean all growth and capacity in the US since '78, or whenever the last refinery was built.

Some of that is I think the process is like probably described, and that's the half percent a year number. But some of it comes from major projects that anytime a refiner builds a major project you can almost be guaranteed that crude capacity will go up. But that usually happens like to meet new specifications or installing a major new process, or something that's part of a major capital investment.

PRESIDING MEMBER BOYD: Could I interject a different question into the discussion? We've been talking about California and the US, and our growth potential, and it leads to more imports. And a lot assumptions are they're out there to come in our direction when we need them. And people are getting more sophisticated and more interested in making California gasoline, etcetera, etcetera, i.e, it's a perfect world.

But we didn't talk about it, and we didn't inject what's going on in the whole world with regard to the demand for transportation fuel. And as the developing countries develop, and as somebody talked about mobility being one of the virtues of life, and ultimately in my experience that leads to somebody that wants a car somewhere.

And, you know, when everybody talks about when India and China really get with it and start buying automobiles, you know, we can suck the planet dry of petroleum and what have you. Does that really enter into -- I mean that's going to mean more competition in the world market.

On the one hand we're trying to expand ourselves away from the self-sufficiency we enjoyed for years to playing in the world market and getting assured that the world market is a market, and it can take care of us if we provide facilities and surge capacity or what have you.

But what's happening in the world market, and what might be its effect on what we're trying to do here in California, and ultimately the price that people have to pay, either based on scarcity or just based on demand, is that an issue we, the Energy Commission, should worry about in producing a report this fall that talks about, you know, our energy future in this arena?

MR. HERMES: Well, obviously it fits into the overall context of the world's supplies. But the level of imports we're talking about is still pretty small compared to everything that's moving around. Gasoline is probably a little bit more of an issue for the reasons I've mentioned earlier. But most countries, typically the ones you're talking about, have put in facilities to take care of their own gasoline demand.

And usually the problems those

developing countries have is more of getting a balance of products. And that typically makes them either long or short on diesel jet and fuel oil. And part of it is gasoline is the money of refining. So most refineries in countries like that are going to supply their own domestic gasoline demand if they possibly can.

So I don't see a lot of competition coming in from that you're having to compete because India and China won't import gasoline, if that's the sense of your question. I don't really see that happening.

MR. WILLIAMS: You're saying more that if anything, there's going to be a disruption in say the jet fuel market?

MR. HERMES: Well, those tend to be the products that float. The refiners run to make gasoline, and then they import and export to balance the other products would be my general perception of how those countries work.

MR. LETO: Another thing maybe to add, you know, the reason we have a lot of gasoline coming into New York, one of the reasons, because Europe is using more and more diesel for their automotive. So they have surplus gasoline short of diesel. And that's allowed the driver for New York. So that's something that's happening on a continual level.

The other thing is some of the world specs on gasoline are starting to converge. Other countries are getting more stringent on gasoline quality, which although maybe not identical, we may be moving from these special products like carb, and kind of having a product dial in, to have a more of a fungible global gasoline stream.

Although there's this lag while everybody's got their different schedules for implementation.

MR. COVI: I have a question for Dave. There was a very interesting discussion this morning about the terminals. I know nothing about that. I know a little about economics though, so I'm curious, as oak fluid ships compete with the container ships it seems to be like that the berth would go basically to the highest bidder.

Why is it such sort of a (indiscernible) that these container ships are just in large part the future of the ports, not the bulk fluids?

MR. MATHEWSON: Well, we look at it not only on the berth utilization, but on back lang utilization. But both ports do, with respect to pricing of the property, is over the years we've developed revenue rates for activities that relate to container use versus a bulk use.

And clearly over the last several years we've gotten to a point where today container use on a per acre basis is probably two and a half times to three times what we could get if that acreage is put into a liquid bulk use. So clearly, financial model is much more attractive a port if that land was put into container use rather than any other use, including a liquid bulk use.

MR. COVI: So I don't know what the relative cost of a barrel of crude is, you know, importing at the terminal. I don't know how those fees average out on a per barrel basis. But is this a really big hurdle, three times the cost?

MR. MATHEWSON: Just to follow up on that, what we also do is part of our pricing model for containers is we have volume incentives. So we have a minimal annual guarantee. And then after that there's an incentive for additional cargo on containers whereby we share revenue with a customer, 75/25, 50/50, 25/75.

We haven't done that in the past for liquid bulk. We are now looking to do that with the proposed customer for 400 whereby the agreement could be structured to allow the customer to grow the business. So the first three to five years we don't realize our established rate of return.

So we're getting revenues return that is significantly less than what we'd usually get. It allows them to grow the business. Then afterwards, in years five and out, we recapture that. And we're also offering the liquid bulk, as we do containers, the opportunity to revenue share.

So we're hoping that combined with a longer term lease to allow amortization of the improvements would make it more attractive for an end user, major oil company, or a third party terminal operator come in and make the necessary investments.

MR. WILLIAMS: May I ask a question along those lines? What about the operation of unloading a tanker requires that the tanks be right next to the berth? It seems to me the pipeline take the tanks a mile away or something like that.

MR. MATHEWSON: Right. And clearly that's something we would like to see. The farther you go though from the berth the greater energy requirements to the pumps, the short side versus vessel based pump, work pumps, there's some issues there as well. So I think there's a fine distance that you can locate tankage to receive a product.

MR. WILLIAMS: Is there any very difficult problem of -- suppose there were a way of unloading a tanker, could it unload at a container berth? If you had that pipe there is it --

MR. MATHEWSON: You know, we actually tried that on one of our container terminals. We installed bunker fuel lines underneath the dock. Rather than having the bunker barges go throughout the port and tie along a vessel we thought, well, we'll see if this makes sense and put the bunker lines underneath the wharf, and they can just connect that way.

That really didn't work out. And with respect to actually handling a tanker out of container berth, you're going to have some issues with berth utilization and conflicts, and who has preferential berthing assignments there. And in that situation that would be a container terminal.

So the tanker is at berth. That vessel operator is going to have additional cost incurred to depart the berth, go to tanker and then come back in a day or two. It's something we've looked at. It hasn't been warmly received. And that's why with 400 we've offered the opportunity to have two dedicated deep water liquid bulk berths there so you wouldn't have those conflicts.

MR. WILLIAMS: But pursuing my idea, as moderator I get to pursue this idea, and so the surge capacity sense then, if there was some way of unloading a tanker of gasoline on very short notice that a container berth -- assuming lines were there it could be done, right?

MR. MATHEWSON: Sure. But, again, I think with respect to surge tankage, I'm clearly not an expert, I'm not in the industry, but I think you would be very hard pressed to find an economic model that would make sense for a third party terminal operator to make the necessary improvements, and commit the capital required to build the tanks, and have basically limited tank turns on those assets.

COMMISSIONER GEESMAN: Did I understand you to say that the ratio in revenue per acre between container shipments and bulk liquid cargo had gone up over the past?

MR. MATHEWSON: Yeah. With respect to our return on a container, yeah. As we renegotiate compensation for all of our facilities, which is every five years, we're in the position where we can enhance our revenue streams on the container agreements. And we've tried to limit that on all of the bulk activities.

COMMISSIONER GEESMAN: They're based on the economic value added in those containers compared to I guess the relatively flat real price of crude oil. Do you see that ratio expanding even further in the future?

MR. MATHEWSON: Yes, we do.

COMMISSIONER GEESMAN: This is a problem then that is likely to worsen?

MR. MATHEWSON: Very much so.

MR. COVI: I had one more question in this topic area. You talked about different facilities for crude, different facilities for finished product like gasoline. Is it that important? I mean do you pretty much -- crude has to be dedicated to crude imports? I know there's problems with the tanks being cleaned, but how quickly can you convert crude storage tanks to gasoline if you had to, you know, under the area of flexibility?

MR. MATHEWSON: You know, I think that ought to be directed toward somebody who really deals on the operational aspects of that.

MR. COVI: Yeah.

MR. MATHEWSON: I think there could be some issues. Berthing prospective though, what we can offer with respective to the facilities that the port can develop, which is really limited to the berthing, from our perspective it doesn't make sense to create a deep water berth and channel to accommodate a product carrier, which is not going to draw anywhere near 81 feet of water.

All you're going to do is, you know, diminish the utilization of that deep water berth. And so we'd rather have the product carriers go to existing berths that are drawing, you know, 40, 45 feet of water as opposed to the deep water.

MR. COVI: I'll ask another question. Recently I've read about it, and we've read about it before, this potential for a new refinery in Arizona. And it's kind of a two part question for the industry folks. I know it's a competitive market, and you're not really interested in having new competitors in the market, but do you think about this at all?

Do you handicap the probability of this refinery actually getting its permits and being built? And the second part of the question is how does this enter into your long range planning? I mean if there were a new refinery coming on line say in like 2008/2009? Do you think about that at all when you're talking about your own infrastructure expansion potential down the road?

MS. KRANZMANN: To be honest, we have not as of yet. We would if it became a reality, but, no, we haven't spent any time on it. Our refineries are all built in California, are all built to make California gasoline. So, you know, that's what we --

MR. COVI: But we also export quite a bit to Phoenix. I mean basically building a new refinery in Phoenix is almost the same as building a new refinery in California.

MS. KRANZMANN: But we're capable of

making 100 percent car gasoline. It's not for Shell, but that's one of the reasons we haven't looked at it as much.

MR. LETO: Okay. Just maybe a couple of comments, we were talking about this before lunch is, you know, one, we've kind of converted the lines they were going to use to move crude to Phoenix to product, or to natural gas. There were two lines that you could conceivably get close to the plant or right next to the plant.

Second of all, the last refinery I worked on when I came out of school was 1978. And if you look at the cost of building a brand new grass roots facility, this was 100,000 barrel facility in Canada. That cost 1.1 billion. You're probably talking three to four billion, which is probably on the order of three to four times the acquisition cost of today's refinery, you know, trading hands.

MR. COVI: Right.

MR. LETO: So a new capital on plans. And literally, when they add capacity to existing refineries in the gulf that's probably a lot more cost effective, and that's what we've doing to, you know, to create more capacity, rather than a grass roots plan.

MR. COVI: That makes sense to me. And I just don't understand why they're talking about it then. I mean there's some people who are seriously spending a lot of time talking about building a refinery in Arizona.

MR. LETO: Well, there's a product need there. It's an isolated market. But, you know, economically whether -- I think you can scratching the numbers on the paper, but the economics don't work.

PRESIDING MEMBER BOYD: Well, I was very influenced by the comment earlier in the presentation that the Nevada Energy Commission ought to really be worrying about this.

(Laughter.)

PRESIDING MEMBER BOYD: It's kind of, you know, a little quid pro quo though, you know. We can't shut off the flow of gas. I mean we could take care of ourselves if we were the nation State of California, but we don't. Besides that, we need their electricity.

(Laughter.)

PRESIDING MEMBER BOYD: So it is a world market so to speak. But it does make one wonder, from an academic perspective you can do certain things, but then when the constraints of the real world enter the picture, I'm having a tough time finding the land space for the surge capacity so to speak.

And I did put forth that you want to build refiners in those places, but we all know oil refineries have been built in this country for a long, long time. And although there's been some mutterings lately about expanding California refining capacity, nothing serious has come forth as of yet.

So it really leaves me worrying about the chart that went up earlier today that shows demand up there, and supply down there. And we're still pondering how to close that gap. And I'm not feeling any better at five to 3:00 in the afternoon than I felt when I walked in the door at 9:30.

So before we close this down I would, again, ask any advice for us here, who aren't planning for corporations and are not worrying about the competitive nature of things, as to what you might do, if you were in our shoes, to try to address what appears to be, you know, a problem for us in the future in California?

Anyways, I'll trade places with any of you for a few minutes.

MR. HERMES: I'm afraid I can't take over your job for you, Commissioner Boyd. But, yeah, what's needed obviously is more facilities, be they storage facilities, surge facilities, refinery expansion and so on. And, you know, the process of encouraging and maybe making that easier to do seems to me, short of the state getting into the business, is about all you can do, because you really can't make people invest.

They're going to invest when they perceive that it's a good investment, and it suits with their allocation of capital versus other needs. So I don't really know how far you can go on that because companies are looking at a lot of other investment options.

And until they feel that it's pretty much a certainty that something is going to happen, I just don't think companies make very many investments on speculation of market trends five and ten years out. You obviously look at them. But until it's there the investments don't tend to happen.

Now, imagine if imports came in regularly, and the prices were always up at that level, my guess is you would see some investments starting to happen. That's not very much help I realize.

COMMISSIONER GEESMAN: Well, I think we heard at the last hearing we had a month or so ago when we were discussing the strategic fuel reserve that there's a lot that the state can do about creating a more rational permit environment in removing some of the uncertainty in that. And you're right we can't make people invest.

But we can certainly clean up our own house in such a way that decisions are made on a rational basis. They're made one, and they're made on some type of time certain basis.

MR. WILLIAMS: Holly, you said that the biggest thing from Shell's perspective is permitting, right, a big thing, right?

MS. KRANZMANN: That's the most obvious thing that we see that the Energy Commission could help with.

PRESIDING MEMBER BOYD: There's a gentleman at the table here. Do you have a question for our panel?

MR. STEVENSON: Well, you just covered a point I was going to make about, you know, you're asking about what can you do, if you an do anything about permitting? If you expect to see that product demand well above the capacity there will be the incentive on an ongoing basis for the investments, and then it's a matter of opening the gate on the permit process to allow that investment to occur.

And also about what would -- I'm sorry, I'm Dwight Stevenson, Tesoro. What kind of facilities if you were to be able to direct, and I'm not sure how you could do, but if you could direct what kind of facilities are needed, I've got a point there that the crude oil facilities are probably something that has been more taxed in the refineries than in the products.

There's a number of refineries who have the ability to export product. And as that turns around they're going to be able to use those facilities to import that product, especially in the Bay Area. But as the refiners are grown the crude import facilities have become taxed.

So if you were to look for somewhere for tankage, logistics, pipes or whatever, I'd put that into the crude oil. Does that answer your question?

PRESIDING MEMBER BOYD: Yeah. I would just want to ask the question of let's say it's a perfect world and permitting per se is not that big an issue other than the land use aspects and the fact that there's 35 million people in the state, and nobody wants anything in their backyard.

And local folks have allow the subdivision to build right up to fence lines of existing facilities and what have you. Is there really the opportunity there to expand refining capacity in the state. And that's kind of just a broad general question. I don't think anybody has the answer because it's kind of plant by plant specific.

But just from the experience that Commissioner Geesman and I tell Commissioners that have with siting power plants, we know nothing is popular in the state. And I just wonder how big a hurdle that is, even if, you know, the traditional, let's say, air quality permitting was no big deal and what have you.

The land use issue, it's almost -- and

it's the economic use of the land as it occurs in the ports, is that a significant hurdle? Every passing day and every growth in the population it seems to me it does become more of a pressure anyway to do it.

MR. STEVENSON: I'm not sure the answer for that. For the industry, we have land. As far as the capacity creep, you can look at that and getting the most out of the same equipment. There's the catalyst that are seemingly every few years you're increasing that capacity.

You can increase the capacity of unit just with a new and better catalyst. And utilizing the same space and, like a skyscraper, essentially building up. But I really can't answer that. You know, primarily I think you're thinking about the LA area, which I believe is more of a problem.

PRESIDING MEMBER BOYD: Well, we've gotten somewhat into the public comments. That's not until later in the agenda. And I'm leading into the agenda. So I'll stop asking questions. Any other comments the panelist want to make, or any other last advice you want to give us before we excuse you and we move on to the next agenda?

MR. ABELSON: Can I ask a question?

PRESIDING MEMBER BOYD: No, you can't.

(Laughter.

PRESIDING MEMBER BOYD: I can do that, he works for us.

(Laughter.)

PRESIDING MEMBER BOYD: All right. I want to thank the panelist. And thank you, Jeffrey. Thank you, everybody, for your time and effort. We should move on.

Chuck, you're in charge. Get back up here.

MR. MIZUTANI: Yes, sir. So that concludes the second session. The third session is entitled retail marketing issues. And there will be one speaker, Joe Leto. That he will talk about the impacts of high volume retail marketing in California. Joe, you're up again.

MR. LETO: Hello, again. This is probably going to be a little anticlimactic on the retail side. But nevertheless, we're here to discuss some changes in retail that has some ripple effect, repercussions on the whole supply chain side.

The topic is US hypermart, and basically discount stores, supermarkets, mass merchandisers getting into gasoline. How is that likely to impact marketing? How does that impact supply and pricing? So with that, we get into some of the issues. I guess for sake of definition, when we talk about hypermarts we're talking about any nonconventional gasoline retailer.

So, again, there are discount stores like Walmart, mass merchandisers like Costco, supermarkets like Safeway. Say over the last eight years the hypermarts have made a great roll into the gasoline marketing business. We started looking at this back in about I think it 1999.

We took our first look at the hypermart business, and it was kind of creeping up on us. So the first question is what's the incentive for other retailers to get into the gasoline marketing? And they've done it as creating other profit centers with having a whole concept of the one stop shop business.

They saw how big the convenience store business was getting and they were trying to recapture that fill in business, you know, the convenience store side of the business. And they look at gasoline as a traffic draw, you know.

There's probably no product on earth that creates as much change and havoc in the market place with pricing as gasoline.

I was thinking about it yesterday when I paid a $34 parking bill. And I'm thinking, you know, people drive around and shop, five cent, two cent discount on gasoline, and yet we pay these other things without even blinking an eye.

And I guess lastly, you know, the big push for the retail business, which like a lot of other industries has seen a lot of downward pressure on margins is, you know, how do we increase same store revenues, you know? What can we add to our business to increase store revenues?

That's been another big incentive. Just to put things in context, you know, part of what's happening out there is we've got a lot of overlap and different types of retail going after the same type of business, and the same customer. Probably the biggest change effecting gasoline marketing is some of these stores, like the mass merchandisers are increasing traffic and trips per month, and a lot of customers are planning their gasoline purchases at Costco rather than at a local, you know, conventional retailer.

And this is in some markets dramatically shifting who markets gasoline, and diesel. This is just to show sort of the retail chain continual for mass merchandisers to convenience stores. The numbers to the right put this in context. I believe there's about 160 to 170,000 retail gas stations in the US.

And, you know, in contrast, supermarket, the three largest chains, there's about 6,000 sites. The discount stores, Walmart, Target, K-Mart, there's about 5,600 sites. And the mass merchandiser is probably to about 1,000 now. So you don't have the same site density across the US.

But you certainly have quite a few sites. Another thing is, some of these hypermart sites do two to three times the volume of an average retailer per site. The players, and I'm sure you've seen some of them in the west, the big players is probably ten companies that control about 86 percent of the hypermart gasoline sites.

Some big regional players, supermarkets such as HEB in Texas, and the big three national players, Kroger, Safeway and Albertsons. One big differentiating factor on these Walmarts has tended to align themselves with three major oil companies, Tesoro, Sun and Murphy.

And in their case they lease out the land or property to the oil company. And the oil company actually builds and operates the retail site. In most all other cases, and this is another big change in gasoline marketing, the brand for the gasoline is the same umbrella brand used by the stores.

So Safeway gasoline is Safeway. They use Safeway brand at the pump, as well as the bakery. And that's the last four years. I think that's been one of the biggest changes in gasoline marketing is the increasing strength of I'll call it generic retail.

I shouldn't use the word generic, but the conventional retailer brands like Safeway or Walmart on gasoline selling, and somewhat the decline of the brand value for the conventional retailer.

Just some of the key drivers, I'm not going to go through every box here, but the thing that's driving sites, now here in the west, as we do in the northeast, we have unique constraints such as land constraints.

Some of the same constraints we've been talking about for the ports. A lot of retailers here do not have the parking lot sizes to accommodate gasoline. So in the northeast part of the US and the southwest, especially California, we've seen a lot lower growth rate on hypermarts as we've had in the interiors like Texas or the midwest.

And that's probably going to stifle the role of hypermart growth in those markets. Certainly the numbers indicate that, which I'll get into in a minute here. Another big change or driver for these business, when the hypermarts build gasoline business in the market they tend to be very aggressive on place to build traffic.

And that just started ramping down gasoline margins across many areas of the country. Dallas, which is a market we looked at in detail, which is a more mature market, probably has commodity, I'll say the very low margin level has actually improved the margin.

So it's not a long-term phenomena, but in general we expect retail prices to ramp down in the presence of significant hypermart competition. The thing that's driving the growth is available sites. New store builds a lot of companies like Safeway for example, or Albertsons, any new site that can accommodate a gasoline retail facility they are building.

So new site growth draws a big chunk of their gasoline retail facilities. However, existing site conversions is probably still the biggest drive. They're still building sites on existing, let's say, land plots. Some of the numbers I'm going to show you we try to track what's going on nationwide on hypermart.

There's a market research that tracks this. I think we polled or called 21,000 sites, hypermart sites, to see if they have the land or accommodate gasoline, if they were planning gasoline. Currently, this is as of March, April, it's probably on the order of 2,700 hypermart sites with gasoline across the US.

So a pretty big number when you consider, again, they're doing two to three times the average gas volume of a conventional retailer. This is a snapshot at 2002 of the fuel site existing gas sites for the hypermarts across the different regions, and then the annual rate of bill.

So you can see out here in the pacific southwest region we referred to earlier in our slides, about 160 sites building at a rate of about 56 per year. You can see the midwest and the gulf coast are the dominant areas. Texas is probably where this started. And, again, there's been two or three generations of hypermarts and gas.

This is the third generation. We had many, many years ago Sears had gasoline. I think there was a department store called Zares that had gasoline. That kind of went by the wayside. I think what they're doing now is taking hold and they're continuing to grow. Most of the retailers that have gotten into gasoline are staying aggressive about it.

This is fourth quarter snapshot, the ten biggest players on volume. This is our estimate of gallons sold, a billion gallons sold per year. So you can see Walmart, Sam's, Costco and Kroger are the top four. And we estimate Walmart is well over, probably about 1.3 billion gallons.

So they're becoming very, very significant players in the gasoline market. Again, Walmart is really Tesoro's, Sun and Murphy.

So, you know, one of the things we've looked at is where is this all going and how is this changing the retail business in the US.

Now, keep in mind a lot of this has happened maybe for different drivers in Europe, France, Great Britain, some other companies. The hypermart role of gasoline marketing is much greater than it is here. So some of the things that we're showing here are early stages of what we've seen in other countries around the world and, again, maybe for different driving reasons.

Our most recent estimates is for the hypermart gasoline sales to increase to 11 billion gallons in 2003. So by the end of the year 2003 we'll be at about that level. And by 2005, at about 23 billion gallons. In contrast, we did our hypermart study in 2000. We were at about 4.4 billion gallons.

It has slowed down a little bit with the economic downturn, you know, the rate of new store built, and investment has gone down as well. So we've seen a little bit of downturn, but still fairly aggressive. As we'll show, that probably represents -- today's volume represents about a six or seven percent US gasoline market share.

Depending on where you are in the US, we've seen market shares as high as the low 20s. And out here in California we're probably more the three to five percent range. And then during the latter part of this forecast period, based on our projections, about seven companies were responsible for 77 percent of all gasoline, hypermart gasoline sales.

And that's Albertson's, Kroger's, Safeway, Costco, Walmart, Sam's and Myer's. Myer's is a midwest regional mass merchandiser. So pretty phenomenal growth in a very, very short period of time. I think, you know, unlike the first and second generation of growth, you know, with underground storage tank programs, and companies feeling more safe, and the tanks they're putting in, and the potential liability, I believe it's gotten a lot easier to enter the business, and probably less feeling of liability.

Probably the biggest concern in some markets has been supply. This just kind of summarizes the total inventory of sites out there that could be targeted for gas. I think we had on the order of 52,000 sites on the part of the hypermarts. So that's everything.

And I believe in a lot of the research work our market people did, maybe 30 to 40 percent of these sites are amenable to gas and retail, meaning having land, not the zone restrictions to add gasoline pumps. So this is the projection of gasoline markets. This is for the whole US.

Now, we have a base volume and a speculative volume. The speculative is if we have some new entries in the gassing business on the part of certain companies. We're constantly seeing some small regional planners getting into gas and retail. So as you can see, with the speculative category we had about 17 percent in the year 2007.

So, you know, 15 percent in a market is very significant. I mean ten to 15 percent, you know, if you're an oil company and you're at that percentile, that's kind of the minimum level where you think you have good market concentration, you know. Your unit cost are low. You've got a good market presence, you know, among most areas of the market.

So it's almost as if collectively these seven companies are collectively another major role company out there in the market place.

That's pretty big. And this is looking at it by channel, again, breaking it down into supermarkets, mass merchandisers and discount stores.

And I should mention, each one of these channels has had a different personality in the market place. The mass merchandisers tend to be the most aggressive on price on a consistent basis. Kind of a no frills. I mean at Costco you can't even find a squeegee. It's pure fuel sales, drive traffic.

Some of their stores do 800,000 to a million gallons a month, which it's almost like the movie Road Warrior sometime in the parking lot with traffic on a Saturday afternoon. But customers go. They stand in line and they wait to get their seven cent discount a gallon.

Supermarkets, less discount. They're relying more on their in-store customer. The discount is often offered with the discount card, like a three cent discount. So as we're showing, the shift is supermarket we're forecasting, just because of their share of density out there, will have about nine billion gallons of sales by 2007.

The mass merchandiser will be about six

billion. And the discount stores will be about a little under four billion. And most of that is Walmart. K-Mart was part of this, but they put they're developed program on hold, you know, with their bankruptcy. Now, this keys in on the western regions.

This is I believe the red bar is Pacific Northwest, again, Washington and Oregon, Pacific Southwest, Nevada, Arizona and California, and then the Rockies. And you can see the Pacific Southwest is greatly lagging the other trade areas on gasoline markets. We're 2002 and we estimate we're at three to four percent.

And you can see that. I was in San Francisco yesterday driving, and these retail stations are little pockets of land, you know, surrounded by buildings. And the supermarkets have very little parking space. So where most of these sites are going tend to be in the rural to suburban areas where there's still some open land.

The Pacific Northwest, among the western regions has the highest penetration. We're already about nine percent and forecast had almost hit 20 percent by 2007, very aggressive market. In the Rockies is somewhere in between, again, this is Colorado, Utah, Wyoming.

So California, or the western states, Arizona, California, Nevada we're expecting about nine percent. The biggest influence right now is Phoenix, Las Vegas, and there's a third market. Phoenix and Las Vegas have the greatest penetration. And I think we have some of the micro markets.

Our micro markets across the west that we use in some of study work cover all the real estate across the west. So these are pretty large markets. I mean Los Angeles is everything from Ventura, and even further north, all the way to a divide line between it and San Diego.

So it's a very large market area. But when we look at these markets, Los Angeles, we're probably under three percent. San Francisco is probably about two percent. And as I mentioned earlier, Phoenix, Las Vegas, and then Salt Lake City in the middle there, anywhere from seven to 14 percent.

Generally, we've got some definitions here. When we define maturity in a retail market, let's say the ramp up of hypermarts and where they are in market share, you know, the ten to 15 percent level they're starting to reach some maturity where they've been there for a while.

They're competing with each other, meaning hypermart versus hypermart. They're pricing against each other. After we enter that phase we tend to see some raise in pricing. They're tired of beating each other up. They're moving the same customer around. So they're not getting what they call store-life.

Store-lift, you know, they define as how much more inside store sales am I getting because I'm offering gasoline? Well, if you've got, you know, two supermarkets across from each other marketing gasoline, you're kind of, you know, you're not gaining any more store-lift.

So that's when we've gasoline prices and margins go from the doldrums back up again. So even though we've seen a dip across many markets, we're expecting margins to return to retail, but maybe not to the level we have seen in the last, you know -- two years ago, and then back five, retail margins were very, very healthy across the US.

And they've been on the skids for about two to three years. And that's what we're defining here, kind of the different phases. I would -- and, again this is kind of qualitative, but the quantity in the part is where are we in market share? But California is I would consider in its early hypermart phase, no very mature on the hypermart growth.

Pacific Northwest, Phoenix and Las Vegas tend to be, you know, in the fast expansion phase. And then a market like Dallas, Houston is kind of in the same position. They in what we call a very mature market base. So one of the things we've done is study some of the mature markets to draw some inferences to other markets around the country and where they're going to head.

So, you know, I would expect California, again, maybe to top out at ten percent just because of the line of constraint on market share. So I don't see the same kind of impact in the California market as maybe the Texas market for example. But nevertheless a significant player.

I guess this very busy. This is a profile of about ten markets, big markets, across the US and retail growth margins. So this is retail price, less acquisition cost for wholesale gasoline, and what the differential is. So it's a measuring of margin before discounting their operating cost, labor cost, in-store utility cost.

And as you can see, most markets have been on the decline. And if you look at some of the markets that we indicated had high concentrations of hypermarts, generally that's where we see the lowest margin. So it is bringing street prices down. I guess in the short term that's very good for consumers.

Consumers have shown very little brand loyalty. We did some survey work in Dallas of customers on site. And the trigger point for shifting from a brand used to a hypermart was less than three cents a gallon. It was like two to three cents a gallon. So very sensitive to price change, and very easy to shift brand allegiance.

So I think you've seen this in the press when you talk about diminishing a brand value. This is one major issue facing -- the oil companies have spent a lot of money in brand recognition. I'm not going to read all this. I guess just point out some highlights here, we already mentioned the margin deterioration.

And ultimately that leaves the lower price to the street and to consumers. You know, when you look at eight companies, five of those are national players. We're really talking about introducing four to five retail players in every market. Add it to what we already had, and then maybe some of the smaller guys moving out of the market.

So we're building a much more competitive market across the US among retailers. I mentioned the Dallas market. I think everything else I've pretty much mentioned here. The other thing is on pricing, some of the pricing is a little bit deceiving. The other big thing going on out there is slowly ramping up, is what they call loyalty and cross merchandising.

And that's if you buy a number of store items. I think the stores that are participating in these programs may have 900 items of which you buy and get a gasoline discount for those purchases. So what you see on the street sign is not necessarily their effective purchase price for gasoline.

It's that street price minus the discount they're getting for in-store shopping. That's a growing trend. So street signage on pricing is going to mean less and less over time for companies that employee these loyalty and cross merchandising programs. I've heard it coined stealth marketing, you know.

Rather than flashing the price up there, you know, every customer may have its own price. And with the technology out there, and customer recognition, this is probably going to grow. I have a couple more slides. Just on the supply channel, I think one big difference here in the US relative to Europe when hypermart gasoline marketing got rolling, you know, Europe had excess refining capacity.

So, you know, an independent could hypermart and put in gas and retail facility, and find a ready supplier as refiners were eager to ramp up refinery utilization. Here in the US we don't have that situation. As we've been talking about, we've got very tight refining capability, very tight supply situation.

So in some markets it's actually been inhibiting to hypermart's growth. Although, you know, not a lot, just midwest has been an area that's been tight. I think you've seen in LA and Phoenix we've had, when there's been supply problems, you know, it's been a very tight situation for wholesale market.

So we have a little bit different situation than we do Europe. Generally, I mean what's been happening as the hypermarts gather more and more gasoline market share, I think we've gone from them buying at the rack and maybe buying from distributors, to buying more and more direct from the majors.

I mean they're becoming such a volume force out there. That really if you're a major you've got to market to them, because there's such a big presence in the market place. So over the next three to four years what these market share number means is that, you know, virtually every major is probably going to be selling significant volumes to a hypermart.

So they're going to have their own channels of retailing, as well as the hypermart channels. And that's kind of compressed, the branded wholesale price somewhat. And I think across the whole US we were looking at available unbranded wholesale supply across the US.

You know, most majors have product they sell in the wholesale market as well as what they sell to their own retail. And then we have in the

US we have a number of, I call it more pure wholesalers, you know. They don't have any retail. They sell only -- they sell either to majors that are short or to independent retailers.

And, you know, here on the west coast companies such as Valero is a big wholesaler because they don't have a lot of their own retail on the west. But I think across all 42 markets that we looked at only two refiners had unbranded supply presence across the US.

Again, the way this is shifting is, you know, if I'm a hypermart, if I capture the market, the supplier is going to follow me. I mean that's what has been happening. So slowly this mix of gasoline sold through brand and major is somewhat shifting through hypermart sites.

So I guess lastly, what does this mean? I guess there could be umpteen crystal balls here. But just some things to think about on the future gassing retailing, how this might impact supply, generally we're going to much larger retail sites, higher through port and lower unit cost.

It's not changing demand. It's just shifting how products are distributed to the customer. Increasing number of large independent gassing marketers and corresponding increase in wholesale market, it's more aggressive in supply and pricing at the wholesale and retail level.

So that's tending to be -- you know, we may not see it because of where crude prices have been, but on a relative basis it's tending to rap down gasoline prices, and I should say to some extent highway diesel. Shorter term price outlook, as I mentioned, dollar pressure on retail and wholesale, longer term, we expect some stabilization on retail margins.

And street prices, but no obtaining the high margin levels we were experiencing two years ago with retail gasoline. I think wholesale supply is going to continue to be an issue, you know, with refinery closures and more stringent refiners specifications will ultimately tighten product supply and result in higher product prices and refinery margins.

So that's kind, you know, the transition phase we're going to go through with the new environmental regs. Some of the major oil companies you've probably seen in the press there's a retrenchment from retailing, you know. We have some companies selling off major chunks of retail.

Others are restructuring how retail is done, and that's going to continue. So, you know, refiners, major integrated oil companies, some of them at least, are tending to focus more on EMP and refining and less on retail market. The aforementioned trend will increase opportunity for large independent retailers.

So, you know, in some cases we have the visions of expertise, you know. I'm going to focus on refining logistics and getting the product to you. And you the retailer, you focus on doing marketing. I believe in Europe we even have some alignments where you have -- I think Shell is one of the major supermarkets has a venture where Shell does a gasoline supply and marketing.

And their retailer handles the in-store sales, operations of the store. So, you know, that's something that certainly can happen. It seems a long way off, but certainly it's happened in other areas for some of the same companies we have here in the states.

And then on a longer term basis, as these retailers get larger, you know, we'd expect them to get more capabilities and logistics, scheduling, training, all of the things you need to do to get access to other product. When that happens, like we're talking about here in California, perhaps at cost will be source and gasoline Korea, and supplying the bills directly to the retail.

That's what volume can do either of themselves or through a third party. And that probably -- well, not probably, that would reduce the unit cost. It would bring more efficiencies to the screen on retail and, again, continue to make the gassing retail market very competitive on pricing.

So with that, I appreciate your time again. Any questions, comments, criticisms?

PRESIDING MEMBER BOYD: One quick question, Joe, and we didn't ask you to talk about this, but I mean you've very well described what's happening in the retail market and the advent of this new breed of independent marketer. If you go upstream a little bit to the refiners, and the role of independent refiners versus majors, do you see -- is there any connection between the retail trend back upstream to the refining business?

Is it hurting majors more than these independents? Is there any potential growth of the independent refining business? Which actually, from my observation, seems to be growing a little bit, where as a few years ago you would have written it off practically.

MR. LETO: Right. You know, I think it has opened up the marketing avenues for independent refiners without then having to go out and make all the investment, because they can access large volumes of market through the independents without having to go their own retail.

So I think it's been a very positive factor for independent retailer. Now, whether that will spur additional rope in independent refinering investment, you know, generally it's probably putting dollar pressure on pricing, which is compressing margins. So it's not providing any relief on refinery margins.

It's just opening up the market place to the independents, which is positive. But they still have to wrestle with, you know, does it make sense to put in investment with these. It's probably if anything more in the refining margins a bit.

PRESIDING MEMBER BOYD: Thank you very much.

MR. LETO: Sure.

PRESIDING MEMBER BOYD: There's one question here.

MR. MCKEEMAN: Mr. Leto, Jay McKeeman with the California Independent Law Marketers Association. A couple of things, first in your observation, one of the things that I've thought about is, especially with the grocery stores, I don't think they really know what kind of capital intensive program putting in a retail station is in terms of continuing environmental improvements.

And it's just been a thought that's occurred to me that once the bean counters really start seeing that they have to rebuild their service stations every three to four years because of changing requirements, that they're going to find that this wasn't the kind -- the margins are going to get sliced.

And I kind of go back to the White Fronts and other kinds of discounters that have gotten into this market over time, but have basically bailed out. Do you see that that might be a possible scenario?

MR. LETO: Well, certainly there's probably some unforeseen cost that might not be recognized. But I think the difference now, again, I think if anything the uniformity of tanks, how their installed, the UST programs imposed has, you know, uplifted what's being -- area site that a hypermart puts in is state of the art.

MR. MCKEEMAN: For three years.

MR. LETO: Pardon?

MR. MCKEEMAN: For three years. Then they have to rebuild it.

MR. LETO: That could be a (indiscernible) depending on legislation. But I don't think they're going to have the same uncertainties that we had ten years ago. But certainly there's probably some cause out there they've not counted into their economics.

The companies that I've talked to, at least the majors, and they're very happy with gasoline performance, in addition to their store. And they seem to be going, you know, gung ho. They don't seem to be slowing down right now. That's been my observation. They're not getting into convenience stores.

There's only one getting into convenience stores on the gasoline diesel side. They seem to be very aggressive. They're not stopping.

MR. MCKEEMAN: One more question if that's okay. A big issue nationally for the independent marketers is the whole issue below cost selling. And of course these are the retailers that tend to be the target of the discussion. Have you seen any evidence of continued --

I mean I noticed in one of your bullets it suggests that if you add the credit card discount it would be a negative return. Does that suggest that there is below cost selling going on?

MR. LETO: Well, we haven't quantified it but, you know, from things we've looked at, things we've observed, you know, I'll venture to guess that there have been periods of time where prices are set where, again, with a credit card discount they're not making a profit.

MR. MCKEEMAN: Okay. Thank you.

PRESIDING MEMBER BOYD: Jay, you're showing your age in your mention of White Front.

(Laughter.)

MR. MCKEEMAN: And so are you.

(Laughter.)

MR. LETO: I can say I didn't remember only because I didn't grow up out here.

PRESIDING MEMBER BOYD: Brian.

MR. COVI: Yes. It's interesting that so often California is a trend setter in so many things. And this is an example where we're really coming up in the tail end. And the benefit of that is we get to learn from the experience of others.

MR. LETO: Right.

MR. COVI: So looking down the road, I'm curious, if we go from two to three percent to ten percent hypermarkets, given the growth and demand for gasoline, who's going to be displaced by the hypermarketers? Will other stores just sell lower volumes?

Is it a proximity to the hypermarket issue, or is it a type of retailer? Do brandeds tend to withstand better the presence of a hypermarketer than an unbranded?

MR. LETO: Yes.

MR. COVI: That's the answer, yes, to

all?

MR. LETO: Really all those factors are branded. Some of the smaller efficient stores that are more gasoline dominate than in-store, they're going to go by the wayside if they're sitting next to a couple of hypermart players. Some of this is being absorbed by continued growth, you know.

If we're at a stagnate market then this has to come more out of the hide of existing retailers. And then we're spreading some of the retailers that remain out there, which brings the volume up, you know. Instead of doing 150,000 gallons a month, maybe they're doing 110.

So all of those things -- Dallas market, I think we saw with the hypermart growth over the last two or three years about 140 -- this is about at 122 sites, about 140 sites. Now, that's for whatever reason. But, you know, a lot of them where the smaller stores, not much in-store sales, total dependent on gasoline for their profits. And they were in competition directly with hypermarts. Those are the kind of stores that are closing.

PRESIDING MEMBER BOYD: I would imagine

the majors can help their branded stations if they end up across the street from a hypermart. But the truly independent retailer is where you're going to get squeezed.

MR. LETO: Yeah. Actually, probably one of the busiest station I've ever seen was a conventional retail sitting at the end of a driveway of a Sam's Club. Every car that came in I think stopped at this little -- so if you're going to compete with it, it will be right in the driveway.

(Laughter.)

MR. LETO: And pick up some of the traffic.

PRESIDING MEMBER BOYD: Okay. Thanks very much.

MR. LETO: Sure.

MR. MIZUTANI: Thank you, Joe. The next session is hydrogen infrastructure development. And what we're going to do is switch places between Dan and Stefan. So the first speaker will be Dan Sperling from the Institute of Transportation Studies at UC Davis.

PRESIDING MEMBER BOYD: We've just made a giant leap into the future after spending most of the day on traditional conventional gasoline. We're now on the path to hydrogen.

MR. SPERLING: Well, Jim, you took away my opening line here.

(Laughter.)

PRESIDING MEMBER BOYD: Sorry, Dan.

MR. SPERLING: Well, thank you very much. It's a pleasure to be here. Let me start off talking about some key insights over argent thoughts about this transition to a hydrogen. What is the path to hydrogen is going to be regional. And it has to be a regional focus partly for marketing reasons and so on..

But even more so because of the high cost of moving hydrogen around in terms of distribution. So we're going to see a regional approach as the hydrogen economy develops, whenever that may be. We'll get to that in moment. The other is that for the hydrogen and the fuel cell vehicles to be successful we need entirely new ways of thinking about energy systems, and about vehicles, and even automotive manufacturing.

We have to, in terms of on the vehicle side, on the vehicle market side, we really need to start thinking about fuel cell vehicles as new products. They have different sets of attributes. They're going to be perceived and valued in different ways. And in fact, they need to be to be successful.

And for it, and when they are successful, it's going to be because of these other attributes. So they're not going to be able to compete on cost with conventionalize ICE's for a very long time. And the other side of it, in terms of the fuel distribution, is that we also need to be thinking about hydrogen distribution in a very different way than we think of today's energy systems.

And we'll get into this in a moment, but I point out that with hydrogen systems we're talking about systems that are integrating, stationary and mobile energy use. We're talking about a much more diverse set of sources of hydrogen than we do with compared with petroleum.

And it's much more defuse as well. And I should say at this point, just so I don't surprise you, is my colleague Anthony Eggert is going to do the second half of his presentation. And I'll explain in a moment why. Okay. So with that in mind, as we think of hydrogen it's useful, in fact necessary from a policy perspective, from an investment perspective, to be thinking about how do you get from here to there?

What's the pathway? What's the transition? I can tell you what the long-term is. It's, you know, renewable energy, making hydrogen and electricity. But, you know, that's a long ways off. And so we need to know how to get started. The getting started part, and sustaining is key here.

And so we can think about pathways in a spacial sense in terms of building up the components of the energy system, and also in a temporal sense. Okay. So with this appreciation now, we really need to be thinking about in terms of pathways how do you get started in a clever effective way.

And how do you move this forward. We've created a major research and outreach program at UC Davis focusing on these pathways and strategies. And I'm going to use this as a framework for addressing some of the key issues. And I should point out that I'm going to be providing kind of an overview of some key insights and issues.

And then Stefan, after us, is going to get into some more quantitative calculations of this, a lot of these cost and so on. So anyway, so what we're talking about, we need to think about, as I said earlier, we need to think about energy and transportation in a very different way than we have before.

We need to start breaking down the disciplinary boundaries. We need to think about it in terms of working together with different partners and thinking through how do you make this transition and make these investments. In our program we're focusing on hydrogen for transportation.

And what very important to this is we're engaging all the key stake holders, the car companies, the oil companies, other energy companies, the environmental community and government. And we've just started this program. It's a multi-year. You'll see our initial sponsors are BP, Exxon, Mobil, Shell, ConocoPhillips, Nissan, Toyota and Honda.

And there are a number of other companies that should be joined shortly. And so I am doing a little advertising. And I slightly apologize for that. But, you know, we are just down the pike here a little ways. And, you know, we do play a strong role in supporting the state efforts.

And we want to do much more. So in a sense we're communicating to you, you know, this is a major effort. This is a collaborative engaging effort, and we anticipate working -- we already are working both with the Energy Commission and ARB, and CAL Trans, and hope to be expanding this.

So part of the point here is we at UC Davis are making a major commitment to understanding these future energy and transportation systems. At the highest level of the campus we've just hired three new professors dealing with fuel cells and hydrogen, including one very famous researcher, Joan Ogden, from Princeton is joining us this summer on our faculty.

And we have a number of other junior faculty. And we have 45 researchers, including about 30 graduate students working on these activities. We have several multimillion dollar efforts program projects going on in several different areas of fuel cells and hydrogen.

One of them is a program with Toyota. We're working with them on demonstrating and testing, and analyzing, and studying their early fuel cell vehicles. UC Irvine is the other site that's working with Toyota on these. Another major program that has funding from the state is looking at fuel cells to be used as axillary power units.

And many of us believe that this might be the first major commercial application of fuel cells in the transportation sector, and that's using fuel cells in heavy duty trucks to eliminate idling. And in other kinds of vehicles, buses and trucks for other reasons, including running a refrigeration units on some of the trucks as well.

Again, this, as I said, involves some of the various state as a partner in this program. That's pretty much getting started now also. We have a hydrogen bus program that's, again, a couple million dollar program. So far it's using hydrogen mix with natural gas in an ICE engine, combustion engine.

And this is just an illustration, and

both of these are illustrations that the transition into hydrogen, there has to be some pathway. There's niches that have to be exploited, discovered and exploited. And the path is not a straightforward one. And none of us have a good idea how this path is going to proceed.

Another major effort -- oops, that was the hydrogen. And the other major effort that we're just finishing up is the big fuel cell vehicle modeling program, understanding what these vehicles -- how they're really functioning in efficiency and so on. We've had almost every major car and oil company in the world has been a sponsor of this, except for the French, and that was way before.

So what we're trying to do here, and this is the framework of what we're going to be presenting in the next few minutes, is that we're not only doing research trying to figure out what needs to be known, what are the key questions and how to proceed, but also creating a public process here of engaging all the key partners.

And we're not trying to reinvent the wheel. We're building upon and coordinating with the fuel cell partnership, with DOE, with the

International Hydrogen Infrastructure group, the industry group. And very importantly, I want to emphasize this is, in the energy, you know, more generally, and this is kind of a plea, especially to the state here, is that energy programs nationally and in California have really (indiscernible) over the years in universities.

And if we're going to make a transition to a new future we've got to be training people, the engineers, the scientists, the policy people, the leaders. And if we don't support the universities in doing that, you know, we're not going to move very far very fast.

So education is key to this. So we'll talk about some of the key issues and key insights here in terms of what we've divided up as kind of the five major components of our program. And we thought this through in terms of the key issues. The first one is the market research.

And this goes back to the idea that, you know, we can put fuel cell vehicles out there. We can demonstrate them, look at them. We can even tell the companies that have to make fuel cell vehicles. But in the end there has to be a business strategy to this. And we need to understand both from a policy perspective and an industry prospective how do you sell these vehicles?

How do you build these vehicles? How do you market these vehicles? And so some of the early, you know -- so we start thinking about some of the niches. You think about integrate with energy stations, integrating stationary together with mobile in terms of reducing the cost.

And also you can use these hydrogen vehicles, perhaps fuel cell vehicles, as emergents backup for houses and for buildings. That might be the killer in the end, the APU, using fuel cells for APUs, maybe hydrogen and total combustion engines that Ford and BMW are interested in maybe as part of the transition.,

Mixing CNG and hydrogen may be part of the transition. But in the end you have to hit the heart of the market, and that's the consumer market, the household market. And so how do you do that? And there's, you know, there's at least -- there's several key differences.

One of probably the most important is going to be this on board electricity. That's what fuel cells are. Just like battery electrics, but in this case this is a product more compelling to the automotive industry, and many believe to the consumer market as well. They've got this huge amount of electricity on board the vehicle.

And we can't even imagine all the things that we can do with it yet. And this is what's going to be the major attraction in the consumer market. It's part of this figuring out what are these extra services, you know, several devices you have on vehicles. And home refueling, you know, General Motors, or at least Larry Burns of General Motors thinks this is the key to the transition.

Certainly it's true that home refueling is valued very highly by consumers. Many of them are willing to pay a lot. All the market research shows this, willing to pay a lot to have home refueling. But the cost and the difficulty with hydrogen is daunting. So when you think about hydrogen fuel cell vehicles we need to think about it as a new product.

And these are just kind of all the differences that are associated in different attributes associated with fuel cell vehicles and all the reasons why there are new or different products. And these are ways to market based upon these attributes. And so this is kind of a fun slide.

This is from Shell. This tells all the new services and you can provide -- and the accessories you can provide with a fuel cell vehicle. But, you know, some of it is perhaps, you know, more entertaining than realistic. But it does hint at talking about it, thinking about a very different future.

And thinking about vehicles in a very different way than we have in the past. And indeed if they're going to be successful, this is the key to it. And I just want to -- and so I got this from Shell just to show you, you know, this is not just some hair-brain academics dreaming up some ideas, you know.

This came from a very reputable source. Any Shell people in the audience. So let me just close before I pass it on to Anthony Eggert, you know, saying that we really need a lot of deep thinking about where we're going here. Clearly we need to move to a different future, you know.

I think everyone here understands that in terms of energy and vehicles. And we need to be thinking much more deeply about what that means. And we've been doing a lot of market research for a while. But let me just toss out one little tidbit that just come out from some of the recent work we've been doing.

That just gives you a flavor of the kinds of new insights that we're going to be able to generate. And that is with doing a lot of surveys and interviews with hydro vehicle owners. And one of the things that's come out of it is that people that buy -- many of the people that buy the hydro vehicle seem to integrate that in a way that is a transforming experience for them, you know.

Many people, we know from all the market research for years people will not buy a vehicle people of its environmental attributes, you know. We've seen the studies. We've done them. But here is a case where they can buy a product that's doing good, that has these very positive societal values, and it's a major -- you know, it's not like recycling where you don't know what happens to it after you recycle it.

It's not, you know, a little thing. This is a big thing. This is the second largest product, you know, you buy after a house. And so what we're seeing with some people, and we don't know how general this is, and we'll be looking at this more deeply, but it seems that for many people being able to realize that do goodism without having to pay a lot more, in other words, buying a (indiscernible), it kind of gets them thinking that they can make more of a difference, you know.

We always say everything is local and, you know, people have to change their behavior and attitudes. But at least in some cases this is a case where people are changing their behavior and attitudes. They're starting to see they can make a difference. And it really sinks into them in way that hadn't before. That changing your behavior can make a big difference.

So I'm going to turn it over to Anthony Eggert who's my colleague at UC Davis. And he's the associate director for this hydrogen pathway program. And I'd point out that he did graduate work with us at UC Davis, and then he worked for Ford Motor Company.

Yeah, he worked for Ford Motor Company as well. And he headed up their fuel cell, their office at the California cell partnership in West Sacramento before he joined us. So, Anthony. There you are. I was looking over there. Okay. Thank you.

MR. EGGERT: Okay. Thank you, Dan. Okay. So now you know my bios. I'm from the automotive industry. And you may seen some of my statements. My views have been tempered with the automotive industry experience. Previous to working at the partnership, and previous to graduate research, I worked in a group called Vehicle Environmental Engineering at Ford Motor Companies responsible for all of the regulatory oversight for fuel economy and emissions.

And a very interesting place to work. I'm going to through these next few slides rather quickly, and then let Stefan get a chance to talk as well. But if there is anything in here that you want clarification on or have questions on, definitely feel free to ask me on that.

Let's see, some of the key infrastructure and distribution issues that we're evaluating within this program, you know, we're trying to look at things from a number of different disciplines. Of course environmental looking at life cycle emissions, and I think even he's going to be talking a little bit about that later.

Looking at economics, both just pure economics, as well as several cost for various supply and use options. One of the (indiscernible), and I think this not really a big surprise, and that is for hydrogen transporting hydrogen is a significant barrier economically.

And it presents a real challenge for centralized production, at least in the early interim period for introduction of the fuel. And so we expect that, again, as this transition takes place mimicking the petroleum system is likely to fail. Definitely a welcome for some push back on that.

Looking at what we are facing, there's really entirely new concepts and approaches that we need to acknowledge in looking at hydrogen systems. This idea of integrating both mobile and stationary energy, I'll talk a little bit more about that in second. The issue association with feedstocks for hydrogen obviously there's not a single source for hydrogen, and many people are looking at a brand of things, including natural gas, coal, some of the renewables.

Feedstocks are more diverse than transportation fuel system. And their availability and cost can vary quite dramatically, cross regions and even by time of day. And all that has implications for one as the best pathway for production. Okay. Just breaking up some of the different supply options, generally people talk in terms of distributing versus centralized broadly distributed as generally with the feedstock.

It would be either natural gas or electricity used in electrolyzers. That's usually done on site, the refueling station. Centralized is some mechanism for centralized production either from natural gas or some other feedstock, including coal. And then that requires the transport eventually to the station.

If we go to the -- one of the things that's often talked about as sort of the future of hydrogen, and everybody talks this utopian vision, using renewable energy to generate hydrogen for transportation. But we have to address, and that's the reality, and that is the economics associated with production.

And for especially electrolyzers type options it's a very expensive pathway. And so looking for opportunities to try to decrease the cost in that pathway is something that is one of the projects that we're addressing. One of the things, as you guys probably know better than I do, is the issue associated with the changing electricity prices over a period.

And one of the things that's looked for electrolyzers is whether or not there's opportunities to take advantage of that their ability in energy pricing, and run the electrolyzers only during the off-peak period. And we're talking with some of the people that were at UC Davis that are working in the wind concession.

And apparently there is a concern as we go at higher and higher levels of wind that we can see an increasing disparity between the low demand profiles causing an even increase in volatility and electricity prices. So when we start to look at that one of the things we see quite quickly is that for electrolyzers if you start talking about only operating at part load or only joining a short period during the day, you start to run into challenges of capitalization.

And this graph, I won't go into too much detail, but it says that when we have high capital cost for electrolyzers it's very hard to justify running these lower capacity factors to take advantage of this cheaper off-peak electricity.

Just for reference, this graph below is showing the distributed option for natural gas at various capacity factors. The bottom line is just the dispenser cost, purely just the dispenser advertised capital cost, and then the line above is the hydrogen cost. So that's sort of our benchmark.

And in these cases electrolyzers has a tough time competing. As we go to much lower electrolyzer cost, the situation does get better. These are very optimistic, $300 a kilowatt cost for electrolyzers. And economics do improve. And we can now think about using off-peak electricity, or lower cost electricity, to improve the economics, but we're still at a disadvantage if we're nearby a centralized natural gas plant.

So these are just sort of some of the, I should say, example results of some of the issues that we're looking at. The other issue, one of our researchers, Tim Lipman, has done a good deal of analysis on, and that is the combination of power production and fuel production.

Some of you are probably familiar, it's the idea where you intend to put in a -- well, either you're intending to put in a stationary power production facility, and you want to have a duel source of revenue by also generating fuel, or whether you're putting a fuel system and you want to have another source of revenue by generating electricity.

Some people have suggested that this is a bad business case, and adding another business case. But some of the results that Tim has come up with, and I don't have the full records here, but on the copies out there you can get a full reference of this paper, is to suggest that this particular situation of supplying both electricity and fuel is quite economically challenging.

And this is one of the conclusions from that. Looking at small scale production along the lines of 40 kilowatt distributed generations combined at the service station, they can be economically viable if you're talking about fairly high levels of hydrogen cost.

And of course this depends on the differential between natural gas and electricity cost as well. All this is sort of factoring into the report. And that's in the sort of optimistic cost projections. As you can to more, let's say, realistic cost projections you're still talking about losing money.

The good news is that you'd lose less money in this configuration than you might in just a standard fuel distribution or power distribution cost. So I guess if you wanted to translate that you might suggest that that means lower subsidy requirement for government.

Some of the other issues we're looking at for hydrogen energy stations, trying to figure out which of those business cases actually might be able to be positive. And there are new generation. And there are some situations with hydro fluctuating between gas, natural gas, and electricity.

Let's see, going on to sort of the final project. Within the program we've actually got sort of a whole host of projects, looking at a full range of engineering issues, technical issues, some of these economic analysis, as well as policy. And some of them is what I would call strategic issues looking at the introduction.

How do we get, you know, this whole issue, how do we get from here to there? When I was talking about a friend of mine in the energy industry asking about when should the stations be built, or when should the first stations be built, I thought the answer was interesting.

The day before the cars drive up and pay a full price for the fuel, and not a day earlier. I think that's a great quote. And while such temporal coordination is probably not entirely like that, I think it's a good benchmark to shoot for. Some people address the issue of availability of hydrogen as being a major area for the introduction of the vehicle.

And I would suggest that availability is not really yet the problem. The focus should be really on the research development of competitive low cost production, distribution and dispensing actions. It's really not the availability, but it may be the cost of the fuel that is still a problem.

And in establishing policies that will enable when the fueling and the vehicle technologies are ready. And then the standards, development to throw in there. This whole issue of how many stations where and when, we're trying to get a handle on. And at UC Davis we have one of more sophisticated GIS modeling capabilities.

And this is Sacramento County, if you don't recognize. And what we've done is we've tried to take a number of factors to try to predict, based on different sort of fuel, so the vehicle market introductions knows where the demand for fuel might be. And this is based on travel patterns.

It's based on a number of behavioral studies that suggest that people like to refuel sort of near their home and work. And then we've generated some of these fueling station location attractiveness factors where we can then intelligently set stations based on these factors.

And so the question is, there's a number of things that have been done that suggested that you need ten percent coverage, 25 percent coverage, 50 percent coverage. And what we really want to do is look at this from a much more intelligent perspective. And also look at if from a regional perspective.

So a particular region, based on the geography, you know, how many stations? It's really a matter of what is the disutility associated with increasing number of the stations. And this is just, again, just an example of a paperless --

And that is looking at the total driving time for all of the people in the Sacramento County based on all these factors, based on the number of available stations. Currently there's about 300 gasoline stations in Sacramento County. And I don't sort of have the benchmark here, but you see as you increase the number of stations, the driving time differential, or benefit that you get from out of each additional station, represents sort of a --

And the increase in value of each of additional station becomes less and less. And depending on the geographical region, you might concede that even as little as ten stations, intelligently sited, strategically sited, can offer a fairly substantial coverage.

And that's really just a question of how much additional driving people may have to do to get to those stations. I think this is interesting because it also allows us to look at issues such as how big these stations might need to be to serve a particular vehicle population.

And you can even start to look at how you might distribute the distribution capacity across these stations for a particular region. We haven't yet done that. Again, the question is, is this useful for policy? And I guess I would suggest that if we were looking at efficiently maximizing our resources, and we were looking at public socialization of stations, we may want to start to look at issues such as strategic and efficient setting.

Just some general recommendations for state government -- actually, I want to back up for just a second on the whole issue of temporal coordination. Within the automotive industry generally when new products cycle, you're looking at approximately about four years from concept to manufacture.

And that sometimes in the auto industry they talk about the 24-month cycle for new products. And that's usually for some of the freshening or new power train. If we're talking about something as major as a new power train such as fuel cell vehicles, you're really looking at about a four-year product development cycle for a large volume production fuel cell vehicles.

And the initiation of that program will likely come once the auto makers are relatively certain that a lot of the technical challenges either have that or will be solved in that period. I can assure with relative confidence that they're not to that point yet.

And so we've got at the very minimum four years before any sort of line on production. Now it's suggested quite a bit longer than that. I think the interesting thing is that as long as the auto makers might be willing to disclose the fact that they're lodging high volume programs, it gives us a sense of the time that we might have to integrate infrastructure in a particular region, going to a market.

Let's see, yeah, I think there's one thing as far as to mention, and I apologize, we don't actually have a date for it. Tim Lipman, one of the researchers has received a Kirsh Foundation award for organizing a meeting to discuss certain strategies in the pathways for introducing hydrogen in to the California market.

And once I get some more information on that I'll pass it along. Thank you very much.

MR. MIZUTANI: Is there any questions of Dan or Dr. Eggert?

MR. BEEBE: Sorry to do this so late in the afternoon.

PRESIDING MEMBER BOYD: Bud, you're an electricity guy. What are you doing here on hydrogen?

MR. BEEBE: Exactly my point. Hi. My name is Bud Beebe. I'm with the Sacramento Municipal Utility District. And I just want to take the opportunity here to first of all congratulate Professor Sperling on the good job he did of pointing out that if hydrogen vehicles are going to do something, if hydrogen can be a transportation fuel of the future, it has to offer something that society doesn't currently have.

And that will be the cornerstone of whatever turns out from this currently chaotic situation. But just first of all, hydrogen is different than fuel cells. And I know that in common speak we often go from fuel cells to hydrogen back and forth until --

For the general public it probably

becomes -- they become synonymous with one another. But they are not. They're very different things. And in a report of the type you're trying to build here, it really has to be very clear that hydrogen fuel cells are entirely different things.

Hydrogen is a transportation fuel, is it's own set of things. It's not totally unbubbled from fuel cells perhaps, but it needs to be looked at in its own light. First of all, hydrogen of course is not a primary fuel. Hydrogen is a primary energy source. Hydrogen is produced from something, and it takes some other form of energy to produce the hydrogen.

And that needs to be clearly stated in your reports. Hydrogen is not natural gas. Hydrogen is not a gasoline. Hydrogen is a number of things different than what currently powers our transportation pathways. But hydrogen can supplement the existing transportation fuels in ways that the State of California I think should recognize.

This is one way to kick start the hydrogen usages. If you add hydrogen to natural gas, and use that as a fuel, and an internal combustion engine, it tremendously decreases emissions, and is a very easy way to begin to understand both the physical and economic characteristics of hydrogen.

I know that at ITS Davis they are using these blend of natural gas and hydrogen currently. That was mentioned. But that is an important first step perhaps for many people getting into the hydrogen game. Hydrogen is currently produced in the United States in large quantities.

It's produced not just by people who currently make gasoline. It's made as a byproduct by those people in their refineries. Most of the people who make hydrogen for hydrogen sake are merchant hydrogen people, people like their products, people like BOC gasses and so forth.

And it's natural in a transportation forum to invite just the people who currently produce transportation fuels. But I would be incorrect to assume that those are the only people in the hydrogen game. And there's other people out there that make hydrogen too, people who make it from electricity.

In fact, if you start looking at what hydrogen really is it begins to look a whole lot closer to electricity then either natural gas, or coal, or any of those other primary energy sources, because you have to produce it, just like you have to produce the electricity.

You have to distribute it, just like you have to distribute the electricity. Sure it's done differently, but it still takes a distribution thing. And you have to have some sort of retail sales. All those things currently are done by the electric utilities in the United States.

So let me pause at that, perhaps electric utilities are one of the future primary purveyors of hydrogen as a transportation fuel cell, or transportation energy carrier. And I'd like that to be entered into the record as import future point.

It's awfully late on a Friday afternoon. I'll leave the rest. I just want to make that little alteration. Thank you.

PRESIDING MEMBER BOYD: Interesting question. Anyway, who's next, Chuck?

MR. MIZUTANI: Stephan.

PRESIDING MEMBER BOYD: Stephan. It looks like it's a tag team right now.

MR. UNNASCH: Thank you. I'm Stephen Unnasch with TIAX, formerly the Transportation Technology Group of Arthur D. Little. And today I'm going to talk about some of the issues that effect pathways to hydrogen. And I was asked a bunch of excellent questions by the Energy Commission, and they're so intertwined with some of the basic issues involved with the benefits of hydrogen vehicles.

It was very hard to come up with an outline. So I'm going to sort of step through some of the subtopics having to do with the energy, environmental and economic impacts. So you could kind of get a baseline, and then discuss some of the problems and the solutions.

So you have to understand why you care about hydrogen vehicles to look at the issues that you want to solve. And of course the cost need to go down. And it would be nice to know what to do first, what options are promising, and does the existing hydrogen infrastructure in California come into play.

Everyone talks about ZEVs being important. The ARB rules for the vehicles, in fact how many vehicles you might need in a term.

And of course customers need to buy these. And they're all going to be looking at the cost and safety while everyone else, who wants to see the benefits of the vehicles, want to know about energy use and greenhouse gas emissions.

So I'm going to focus on some of these issues related to trying to make the infrastructure work, taking these metric into account. We already saw an overview of some of the supply options. And I'm just going to point out some of the features.

Of course the on site reforming, you're looking at making hydrogen from natural gas. And it can be about 74 percent efficient if you look at a fueling station. And that's in the future, can bear it out today with a partial oxidation systems that are about 50 percent efficient.

And there's also the opportunity for combining the reformer with an energy station. Now, in addition to generating revenue from an energy station, you also look at that system there, and you figure you want to fuel a certain amount of vehicles. And you can back into how my hydrogen storage do you need?

And then you look at this reformer that

you really don't want to shut down. And you find yourself backed into a corner of do I put in more storage or do I run the reformer continuously? Do I shut it off? So the energy station could come into play, not only as a source of revenue, but also helping you manage the load from the reformer.

With the electrolysis, of course you're making your hydrogen from electricity, and it has the potential for zero greenhouse gas emissions with non-fossil power, and provides you with low emissions, zero emissions, at the fuel station. Just some statistics there on the efficiency, you're looking at about 50 kilowatt hours of electricity for kilogram.

And I'll show later how that translates into comparable numbers. Central plants allow for the opportunity to improve your efficiency from the reformer to possibly 80 percent, and there might be some combined opportunities by looking at a new central plant, hydrogen plant with transmission pipeline gas where the gas comes in at 800 psi.

And there might be some opportunities there to assist with liquefaction or steps that could perhaps be intriguing. As far as liquid hydrogen goes, there's quite an energy penalty for liquid fashion about a ten to 15 kilowatt hours per kilogram of hydrogen.

And one thing that's intriguing about liquid hydrogen is a gasoline truck that holds about 8,000 gallons of gasoline, and if you don't have your fuel economy with a hydrogen vehicle, you look at a liquid truck, and it holds about 3,000 kilograms of hydrogen, which is about the same energy as gasoline.

So you really wouldn't be increasing your truck traffic that much. Another point to look at with liquid hydrogen is managing run off. You certainly would need a continuous demand for a liquid hydrogen station if you want to worry about run off or considering using a fuel cell to consumer some of your hydrogen if it needs to sit for a long period.

Mobil systems and tube trailers are intriguing transitional options because in K bottle, which you see in your science labs, you have one kilogram and 3,000 psi. And if your goal is to achieve some kind of infrastructure distribution, you could perhaps easily achieve a

300 -- many, many small fueling stations if you're trying to look at how do we get from the vehicle into introduction with all fueling stations running on day one.

So that has some intriguing aspects. And there's also, with pipelines of course eliminate the local distribution and also help a little bit with the compression energy requirements. So you can combine the efficiency of the central plan with the efficiency of transportation.

The hydrogen supply options also lend themselves to certain production capacities based on many considerations in addition to cost with the bottom line is pipelines, and an on-site reformers. You need a certain demand to justify the capital cost, the systems, either installing the pipeline or building the outside reformer.

You're looking at possibly over a million dollars. Electrolyzers maybe you scale down a little bit more. With liquid, you hopefully would use enough liquid to avoid burn off. So that limits the amount. And with tube trailers you might want to maybe have only a tube trailer delivery every couple of days. We get into a traffic issue.

And mobile fuelers could be nifty. I'll show you in a moment why. So I'm going to go through some of the metric that come into play. What we heard before is there's always the near term and long-term. And now we have to think about what we're going to do, how many vehicles are we going to build?

And in the future we're going to have to solve a lot of vehicles in terms of environmental impacts. Right now we have the ZEV program, maybe you have a hydrogen economy in the future. And as far as energy consumption we have various degrees of efficiency for producing hydrogen, and different kinds of plants.

And in the future we might be looking at energy stations or more slightly more efficient loads. There's a lot of different resources that come into play. And the ones that are in blue might be the most promising. And in the near term, with the hope for having some non-fossil power be the source for electricity for electrolysis.

I don't want to take away any of Mark's presentation, but you might want to understand some of the subtle differences between different reforming options. So if a central plant is more efficient, their local plant and the pipeline compression energy might be contributed to -- you might have a smaller compressor at the fueling station.

All those factors might amount to the ten percent reduction in energy compared to producing hydrogen at on-site facility. Metal hydride vehicles are also intriguing because the fuel is lower pressure. So compression energy requirements are lower. And with liquid you can see the impact on energy.

If you make electricity from natural gas power you're looking at using a lot more energy to make the same amount of hydrogen. However, in the future with renewable power, or non-fossil power, the list of greenhouse impacts could be lower. And there you can see the comparison of the life cycle or greenhouse gas emissions for different hydrogen options.

And while liquid might be a convenient way to provide hydrogen for large demands like transit buses, you are looking at quite an increase in the greenhouse gas emissions. Now, there's some funky units there. And in the appendix to this I'm going to present that.

I've provided comparison of how this comes into play on grams per mile. But if you look at a kilogram of hydrogen being about the same as a kilogram of gasoline, you have about the same grams for mega jewel for kilogram of hydrogen produced with on-site production from natural gas, as you do to make a kilogram of gasoline.

So if you're making hydrogen from natural gas your benefit comes mostly from the vehicle fuel economy, and with electrolysis it will help to introduce a non-fossil source that emits no CO2. Another angle is the zero emissions, vehicle will give you zero emissions.

And if you were to look at an energy station you can take credit for emission reductions from the heat, even though water heaters and thermal power, thermal energy, doesn't have turbine emissions. You can achieve a significant reduction in criteria from reductions from the vehicle and from your heating.

And that would also translate into about 50 percent reduction in greenhouse gas emissions from the vehicle. And, again, you know, it allows you the opportunity to maybe come up with a use of your capital. And a lot of this has to come into play with the notion that fuel cell vehicles are produced in large volumes.

So for fuel cell cost, $100,000 today, the goal is to get the fuel cell down to maybe $5,000 or even $1,000. Ideally, goals are tens of dollars a kilowatt rather than thousands. So that would come into play as far as making the fuel cell available for an energy station.

To compare the cost of hydrogen production options, this compares most of the production modes that you would think of. And the capital cost for most of the on-site options are fairly comparable. And this is for a mature market built at fairly large volumes.

So either reformer or electrolyzer system might have comparable cost. But the (indiscernible) cost are significant. And as Anthony pointed out, looking at the energy cost is very important for electrolyzers. So these energy cost here represent IEA projections for power and natural gas.

We have seven sets of kilowatt hour for electricity, and a million BTU for natural gas.

There might be slightly different ways to skin the cat. And if you look at the range of costs, most of the natural gas base options fall into a comparable range. And you're challenged to come up with a scenario for electrolysis that looks more favorable, unless there was a shortage of petroleum resources, and you have an abundance of power.

And then the power prices were changed. Here we also looked at sort of trading off night time power with lower utilization of the electrolyzer and maybe cheaper prices. It helps a little, but maybe it doesn't solve the cost problem entirely for electrolyzers.

Next I'm going to go through some of the things that you can do with all of the different infrastructure options. With liquid hydrogen it's a fairly established technology. There might be some intriguing ways to manage boil off, certainly size of the station to consume all of the vapor that's generated.

And some folks are looking at other tanks, which will help with some siting issues. Hundreds of plants also have their challenges. There's about ten of them in the US, and building the next one is a major engineering challenge. And basically they've been going with capacity expansion.

There's also some pipeline capacity in California that's tied to the oil refineries. And there might be opportunities to expand hydrogen production capacity. And it might be deals to be made to allow these capacity expansions to occur, but those become complex environment and regulatory issues.

Here we go with the Mobil Fueling Stations. These could really help you with your introduction if you're going to do a -- if you're contemplating a large scale commercial introduction, any passenger car, you and I buying vehicles, a Mobil Fueling Station could quickly allow you to populate a region, maybe Sacramento.

And then as the volumes is built up you start building permanent stations, and then these Mobil Stations go drive off to the next city. And tube trailers are more conventional hardware that's already available today. And there's substantial space constraints with these tube trailers.

First you have to have a place to put

the tube trailer, then you need parking spaces for two more tube trailers, or at least you need to take up parts of your service station while you're doing a complex switching operation. So there's a lot of constraints involved in trying to find room for all of the hydrogen infrastructure.

From electrolysis, I pointed out how nice it would be to have abundant renewable power. One of the challenges shown in the chart up on the right is looking at the where the mix of power comes from. And we've prodded this issue from many angles. And it's hard to see the nuclear power today as being anything but a base load.

And even if you were able to contract for your renewable power, if you buy that slot of hydropower because you have a contract with someone, someone else's hydropower is going away. So there's sort of a paradox there. And the key to getting the zero greenhouse gas emissions is to find ways to build more renewable power.

And this is not helped by the power deregulation. Or the way to get sort of the goal of power generation is to generate revenue and get value. Reducing greenhouse gas emissions isn't the primary goal of primary production. And that doesn't help the challenge of adding renewable power.

A lot is being done with on-site reforming. There's the Air Product Energy Station on the bottom corner helping to utilize the reformer capital. This might illustrate some of the packaging issues. That station were being sort of difficult to site in a retail outlet.

And the hydrogen appliance, which is being considered by H2 GEN might help with a lot of the permitting issues. Typically, if you look at the insides of the box where there's a reformer, there's what's called air classifications to have explosion proof fittings, and equipment and pumps.

And there's the possibility of ventilated enclosure where you can use conventional motors, conventional valves, and have significant cost reductions. We're working that out with the permitting folks. It's going to take some time. Finally, how do you get from here to there?

Right now we're working with UC Davis to analyze the supply and demand of hydrogen in California. And you want to look how many vehicles are there, how many -- what you get from ZEV program, from the transit buses, from other applications. And this is just sort of a baseline analysis of what might your minimum hydrogen demand be if everyone tries to get out of doing hydrogen.

So the transit bus folks might buy their buses at the very last minute. They might find inter-data. The ZEV people might find inter-data credits. They might build a lot of battery electric vehicles. And maybe those hydrogen vehicle options like hydrogen IC engine vehicles, which by the way, with the hydro vehicle you have an opportunity to put a fuel cell on the vehicle, which would be very cheap in terms of actual dollars.

But would do great wonders for reducing the future cost of fuel cells. So if you look at this scenario, we're talking about 1,000 kilograms of hydrogen per year. A lot of transit agencies are looking at liquid hydrogen because it's sort of a low risk option.

You don't have to worry about, well, if I build this reformer, you know, what's the guarantee that it's going to work? And it's more conventional technology. And the merchant hydrogen capacity in California today is about 10,000 tons per year. So 50 buses would consume about a tenth of that.

And based on some of the prodding that UC Davis has done, there appears to some excess of pipeline capacity. And of course siting the vehicles with the existing capacity is of course very important, especially for pipelines. And then of course local production of reformers, based on what I presented, are going to be an even cheaper option in a mature market.

And so a combination of all these hydrogen production options will come into play. And that will also beg the question of where's the natural going to come from? If you think about buses alone you probably have a baseline situation of all the buses running on natural gas.

So switching those over to hydrogen isn't going to have a substantial impact because any losses in the conversion efficiency of making the hydrogen will be up for by the efficiency improvement of the bus. How many stations, that was addressed here. We feel comfortable that the ten percent number is a pretty good target for the very first day that the commercial vehicles are sold to the public.

This works for diesel, cars. Some folks we've talked to in the energy industry told us that they'd like to see 25 percent of all metropolitan stations and ten percent of rural stations. But you have to get somewhere from where you are today to what it's going to be in the future.

And this doesn't address, you know, how many of these stations can be, you know, two kilogram top off stations on I-5. We just expect, you know, only emergency customers. How many can be mobil stations. There's a lot of strategy that will come into play.

So you're trying to make the customers happy. You're trying to minimize the capital expenditures. You're also trying to build enough production capacities so that your learning curves can come into play. Which brings up this next chart, which is an analysis that we're working on for GOE, which is looking at what's the cost of building up hydro infrastructure.

And this is looking at a very aggressive fuel cell vehicle introduction throughout the

United States with the green line being the capital investment, and the blue line being the cash flow. So this is great. Eventually, off to the right, you get this huge amount of money.

Of course you can build hydrogen stations for 30 years, and then your competitor will start wrapping up around right here. So there's a lot of issues with the capital involved in building up hydrogen infrastructure. One of them is, you know, why work on it now when you have vehicles later?

Another issue, which is very important would be to take out your magnifying glass and just look at this part of the chart here. And how do you get this part of the curve to be manageable. Maybe this involves energy stations or mobile refueling, or niche markets doing -- see, if you have dedicated fleets, transit buses, your issues or capacity factor are reduced because you have a pretty good idea what your transit buses will need and you have control over your fueling station.

However, building a lot of dedicated fueling stations doesn't do that much for the public. I'm not aware of too many CNG users fueling transit buses, and very few methanol buses ever fuel at a transit fueling station.

So there's all sorts of clever ways we've got to think about improving capacity utilization and learning curve. How do you build these hydrogen fueling stations so that your goes down so that you don't have to build them for 30 years before you can get a reasonable cost, and vehicles with fuel cell IVUs, the fuel cell and the fuel.

So these have been mentioned before. And the goal would be that this curve hopefully would crash sooner than 20 years. So it's really hard to find new ways to skin the cat, but we're going to have to if we want to find a way to get going now rather than waiting for future hydrogen to be necessary.

And this just shows some of the different ways to skin the cat. If you choose to sell hydrogen and the DOA goal, it seems like -- and you have to compete with gasoline at today's prices, and you get to sell the same sets per mile as gasoline, this shows the net present worth of the entire infrastructure system.

So you lose money. The base case is you

might make money if you hang in there with a 15 percent internal rate of return and a payback period of 30 years, which by the way I would keep my retirement money. And if you're looking at low capacity factors, that could spoil you investment too.

So what does this mean? What could the state do? Some ideas, you might interpret how this could actually fly to what could really be done is find a way to recognize the value of renewables, maybe the way electricity is valued right now is a way to sell the kilowatts to make money on the capital.

And maybe if the goal of selling electricity to minimize energy you might see a somewhat different investment decisions. An example is older power plans where people don't really want to touch an older power plant to -- you know all about this. There's DOA programs.

There's the Big Kahuna procurement where car makers will be doing demonstration programs. Maybe there's more that California could have done to get some projects here. I know a lot of people are trying, and it certainly can raise some action. But reducing the paperwork to get different agencies to work together.

We talked about hybrids and IC engines. Utility interconnect issues with energy stations, I think it would great if the utility was involved in the energy station and the generation, and they would just turn on your energy station whenever their power plant was short on hydrogen.

It would also be great if that fuel cell in the energy station was pretty cheap because you're selling thousands of fuel cell vehicles a year. Bio-mass, my gut feel is that bio-mass runs itself better to make alcohol, and you can run alcohol cars. Making into the hydrogen seems like a challenge, but that may work, or favorably, if you think about it.

And there's lots of siting issues. How do you lay out these fueling stations? Energy companies want to sell the stuff for gas stations, have you package things. How do you make the pipelines work? And how do we make our codes and standards be consistent so that we can benefit from economies of scale across the world?

Thank you. I spoke a little bit quickly at the end to not keep us here late on a Friday.

MR. MIZUTANI: Any questions or

comments?

MR. MARGOLIN: My name is Rick Margolin. I'm with the Environment Now Foundation and Energy Coalition. My question for you is referencing slides 14 and 21. Is there any attempt to correlate your projections at hydrogen demand with natural gas supplies, especially in lieu of all the talk we've been hearing recently about --

MR. UNNASCH: Yeah. This is something I did last night. And we have a task to do this for the Energy Commission, which is going to involve a lot of analysis. And my gut feel is that on transit buses it's not going to make a difference because they're using CNG. They're using natural gas one way or the other.

But that's an important issue. Where does the natural gas come from? And we're going -- I don't have anything to add to that right now other than Greenspan thinks this is an important topic.

MR. MARGOLIN: Do you think that -- I've seen studies by Joan Ogden that says in the Southern California Basin there's enough natural gas to maintain demand down there. But do you know, in lieu of the statewide projects that you have for demand, have you come across anything yet?

MR. UNNASCH: I don't have anything to contribute to this right now. I do have a gut feel that L&G, there's a lot more action on L&G now than there was five years ago. So that makes me think that, you know, not all of our future gas is going to come from Canada.

MR. MARGOLIN: Okay. Thank you.

COMMISSION GEESMAN: What about the electricity requirements under the electrolysis scenario, can you give us some sense of the magnitude of new electrical capacity?

MR. UNNASCH: Kilowatt hours, I didn't seriously -- I don't think that -- I have a hard time -- I can't see a situation why a transit bus user who has many buses would choose to do that based on electrolysis. Everything depends on, you know -- I didn't think the electrolysis would be a big factor. I kind of think it more would come into play out here.

And it would come into play at these home refueling stations so that you could have convenience, and customer satisfaction, and a quick refill. But in terms of the big volumes, I was thinking more natural gas based production. But that's something we'll look at in our study.

COMMISSIONER GEESMAN: I saw a number attributed to the American Nuclear Council displacing all of existing US transportation fuel with hydrogen. It would take about 241,000 megawatts of new capacity. Do you have any senses to whether that's a reasonable estimate of the --

MR. UNNASCH: That feels about right. One other intriguing paradox is that if you look at making a kilogram of hydrogen from electricity -- if you make a kilogram of hydrogram from natural gas it takes, you know -- it's 120 megagrills. It's got 200 megagrills of natural gas energy. That same kilogram of hydrogen made from electricity would take 400 megagrills of natural gas.

So if you're taking natural gas -- if you're taking electricity out of the system, you're causing even more natural gas or more fossil fuels to be used. So clearly, there has to be more non-fossil generation, the resources for this to make sense if it's going to be a big fraction of the hydrogen production.

There's nothing wrong with having lots

of electrolyzer stations. That's sort of, you know, it economically makes sense to get station coverage. But if it's a large thrashing of the kilograms the energy required in the near term doesn't seem to pan out.

MR. MIZUTANI: Thank you Stefan.

PRESIDING MEMBER BOYD: Bud's got a question.

MR. BEEBE: Bud Beebe. The question this time, in looking at the cost for electrolyzers with electrolysis you produce not only hydrogen but oxygen.

MR. UNNASCH: Right.

MR. BEEBE: And in small electrolyzers. The oxygen is a problem, you know.

MR. UNNASCH: Yeah, that's a great idea.

MR. BEEBE: But in large facilities you'd certainly want to capture the oxygen.

MR. UNNASCH: Yeah.

MR. BEEBE: And use it some societal fashion.

MR. UNNASCH: Right.

MR. BEEBE: Have you looked at what that might do to the economics, or what new social things could be promulgated by the existence of this sudden large oxygen stream?

MR. UNNASCH: Well, that's a great idea, especially when people talk co-generation. The first place you look for co-generation is the hospital because they have a hot water demand. So you upgrade the energy station at the hospital. They're going to buy my hot water. They're going to buy my electricity. Everything's great.

So now maybe instead you're going to give them what they really need, which is oxygen, which you spend a lot of money on. You probably don't need that on-site co-generation as much as they need the oxygen. And that's expensive oxygen. So those could be some of the opportunities.

Any of the life cycle energy required to make that oxygen is going to be quite high because you're running just liquidfiers.

MR. BEEBE: Thank you.

MR. MIZUTANI: Thank you, Stefan.

MR. UNNASCH: Okay.

MR. MIZUTANI: Maybe not.

MR. HECKEROTH: Steve Heckeroth. I wanted to ask if you've done any life cycle efficiency relative to battery electric vehicles compared to hydrogen fuel cell vehicles?

MR. UNNASCH: Right. We've done quite a bit of work on this both modeling and surveys of car makers and, you know, we've expressed this as the EER, energy economy ratio, where we try to look at consistent vehicles, which are all these blue ones. So we're not comparing like any of these to a Hummer.

So basically what we find is that the battery electric vehicle might be about 2.9 times as efficient with the gasoline car requiring about 2.9 jewels of energy. For every jewel of energy that the electric car would require, of course that's, you know, something that's lost in the generation.

And the number for hydrogen fuel cell vehicles is a much broader range. There's a lot of cost associated with the whole part of the hydrogen vehicle, and it involves the high pressure stack, whether you have a high temperature or fuel cell. So in a perfect world we actually -- you can actually achieve about EER of about 2.7 with a hydrogen vehicle.

But that involves so many things that car makers may not choose to do. And I think that the near term number is going to be more if the gasoline car is 30 miles per equivalent, the hydrogen car might be about 60 or 66.

So then when you compare -- if you look at electrolysis, so if you're taking electricity and putting it in battery, electricity of the hydrogen, putting it into the vehicle, back to electricity, that purely has to be a customer convenience point of view, or an abundance of renewable electric power.

MR. MIZUTANI: Thank you, Stefan.

MR. UNNASCH: Thank you for your time.

MR. MIZUTANI: The last speaker is Mark Delucchi. Mark will be talking about transportation fuels and life cycle greenhouse gas emissions analysis. Mark.

MR. DELUCCHI: Well, a few people left. I will talk today about issues and life cycle analysis transportation fuels, life cycle analysis and greenhouse gas emissions from transportation of fuels. I'm going to focus on methodological issues. I will give you some results and talk about some of the results.

It will be in the context of methodological issues because I believe that life cycle analysis has been a little bit oversold as a tool for analyzing the change impacts of some of the transportation fuel options that are on the table for discussion. I will begin with an ideal model of life cycle analysis, what we'd really like to accomplish.

Then I'll talk about the strength and weaknesses of conventional or actual life cycle analysis that are done today with respect to this ideal. I will give a brief look at the structure of some recent life cycle analysis that have been done, have been discussed a lot. I will discuss some results of life cycle analysis and present some conclusion.

Okay. What is the purpose of a life cycle analysis? What are we trying to do with the life cycle analysis? Well, generally, is trying to figure out how some environmental impacts, some measure of environment impacts, EG, climate change or change in mean global temperature, changes as a result of taking some action in the world, some policy action.

In order to do that we need to know what particular kind of policy action we're talking about, and then we have to have some model of how the world changes. And ideally, life cycle analysis is imbedded in a model of how the world changes as a result of a policy action and tells us at the end of all this modeling how the environmental measure of interest, climate change, mean global temperature, what have you, changes as a result of the initial policy we're talking about.

That's clearly the idea. In practice, as we'll see though, or as I say here, most life cycle analysis don't do the policy analysis, specified policy. And then of course they don't do an analysis of how the world changes as a result of the policy. They start with an assumption about what set of activity that currently happens, say making gasoline from crude oil, is replaced by another set of activities, making fire diesel from soy beans.

And this has some limitations in the interpretation or relevance of life cycle analysis and results. Let's look a little further at what an ideal life cycle analysis would look like. This is important because I am trying to show that life cycle analysis have some limitations in some of their current applications.

We want to end up with a measure of some change in the environmental system, again, global climate is what we're talking about, some measure of climate change. As a result of some policy, say subsidizing ethanol or not, or mandating a certain type of vehicle or not.

In between the policy action that we're interested in, and the environmental system that is impact or measure we're trying to model, are some steps that we have to include to get that policy action to environmental systems changed. Immediately environmental systems are effected by changes in emissions.

Changes in emissions are related to changes in production and consumption of energy in materials. And both of those steps, production and consumption of energy in materials, and changes in emissions, are typically included in life cycle analysis.

However, key point number one, an inextricable part of this whole system is the economic world where price is. No matter what action you take, policy action you take in the real world, whether it be to regulate production in consumption of some energy in materials directly or indirectly, or to regulate prices, or even to regulate emissions, no matter what action you take you will end up effecting prices of major commodities in the world.

This will happen. And changes in prices in major commodities in the world will change production and consumption of energy materials. With me so far? And changes in production and consumption of energy in materials will have an effect on emissions, which will impact the environmental system of interest.

So in the real world, ideally you ought to include prices or a model of economic world attached to, or superimposed by, or integrated with, the physical input/output world and emission factor modeling world that you normally include a life cycle analysis in order to get a correct complete picture of how this changes, which you care about, is a result of whatever policy you're considering.

Now how does life cycle analysis, as its practice, what I called conventional LCA, compare with this ideal? We'll go step by step. As I said in the previous slide, to begin with conventional life cycle analysis don't perform policy analysis, don't even specify a particular policy typically.

They usually just start with this step by saying let's assume that instead of doing X, Y and Z activities, pulling this much oil out of the ground, refining it and delivering it to consumers, we plant this much soy beans, and then refine it into this much bio-diesel and then deliver it to consumers.

The problem with this of course is that without specifying a policy you're not able to determine what these important linkages are, namely linkages to prices or directly to prices, indirectly by production of consumption energy materials. So you miss these important feedback effects.

Prices effect production of consumption of energy materials, effects emissions, effects environmental systems. The next step, most transportation life cycle analysis the fuel life cycle, that part of production and consumption of energy, is well represented. That is in fact essentially what transportation life cycle analysis, they've been done.

This includes most of my work too. Have represented, what they've focused on is production consumption of energy and materials, particularly as it involves fuel commodities, fuel energy, fuel related materials. I'd say about at 90 percent, maybe more, of the relevant inputs and outputs related to the life cycle of fuels are covered in most transportation life cycle analysis.

However, the materials life cycle as related to, in our case, the production assembly and delivery of vehicles, typically is not included. In some cases that may be important. And the infrastructure of life cycle is often not included. That's probably not important if you're comparing alternatives all in one mode, like different fuels for internal combustion engine vehicles.

If you're comparing cross different transportation modes, the infrastructure might be important. The next step, as I said, prices are not in most life cycle analysis. This means that that important feedback effect again changes in prices that will happen, no matter what you do in the world, is omitted.

And that omission failed to include prices in the feedback effect of prices on production and consumption of goods and services. And ultimately on emissions on environmental systems could change their results of the life cycle analysis by more than ten percent.

I'm speculating. Unfortunately, nobody has done this analysis. Whereas I can give you some examples of the magnitude of the likely -- the emissions that I'm talking about or other cases like omitting the materials life cycle for motor vehicles.

I'm not able to give you any analysis that backs up my claim that the failure to include prices in life cycle analysis, by changing the result by more than ten percent. It's a feeling I have. The other thing that life cycle analysis conventionally do do reasonably well is look at emissions.

At life cycle analysis essentially are, with respect to this framework, input/output models of energy and material flows with emission factor estimates attached to them. That's basically what they are. So they do this step and that step reasonably well. But even then, there's some limitations.

I'd say I think 90 percent development

emission sources, or emission factors, life cycle analysis are characterized. There are some emissions that we'll be able to talk about some of them that might be potentially serious. That is emissions which include it. It might actually change the results by considerably more than ten percent.

And then finally, ideally you would like to have some representation of getting from emissions, like emissions of methane or emissions of nitre oxide in the case of life cycle analysis and greenhouse gas emission, to measure of the change in the environmental system.

In the case of transportation life cycle analysis that we've seen, the measure of the way of doing that, getting emissions to interchange in environmental systems, is relatively crude. It's something called level I potential or a CO2 equivalency factor. And these have very serious limitations.

And for example, some CO2 equivalency factors are omitted for black carbon. Most life cycle analysis don't include the effect on climate by carbon emissions, which we've recently found out maybe significant. It turns out that this is illegible on the end up there.

I was going to refer to it when I was talking, but since I can't refer to it because you can't read it, I'm not going to talk that much about it. What I will say is that I looked a recent life cycle analysis and fuels done by General Motors and others. When a person uses the model they often cite an MIT 20/20 study, a European study done by a company that does a lot of these things, eco-traffic.

One by A.D. Little, Carnagi-Mellon group, my own work at the bottom. And I've looked at these studies or analyze them with respect to a bunch of relevant aspects that determine their completeness, the extent to which they follow the idea outline or not, and what their strengths or weaknesses might be.

These include such things as the analysis, timeframe, transport modes, all the way down to vehicle energies, models used, vehicle energies, of course being important to determine the total, life cycle emissions, fuel life cycle analysis models use.

And then more importantly, getting towards the end here, the ones that typically are not covered, what greenhouse gasses and CO2 equivalency factors are used in these studies, or whether the infrastructure is included. Whether the vehicle life cycle refers to the life cycle and the materials that go in the vehicle.

The vehicle assembly and transport disposal is included. And then finally, whether price effects are included. And the price effects refer to that feedback that I showed you in the ideal life cycle model slide. And this is also illegible it turns out, the handout on that.

And the studies at a time by groups of the evaluation criteria. And just jumping ahead to the interesting ones, the end, life cycle analysis, the ones that are often cited, typically do not include the vehicle life cycle, MIT 20/20 study actually does. And inclusion of the vehicle life cycle can be important, even the studies of greenhouse gas emissions if you're looking at relatively dissimilar vehicles like electric vehicles with a big lead acid battery versus efficient lightweight gasoline vehicles for example.

Almost all the studies include only a limited range of greenhouse gases and use IPC, GWPs or CO2 equivalency factors. This emission may be important if rock carbon or sulphur emissions, which leave the salt in aerosols, had a significant effect on climate as appears to be the case right now.

Then the studies include the infrastructure, emissions associated with the infrastructure. This is probably not important, again, if you're just comparing different fuels used by what type of mode. It could be important if you compare different transportation modes.

And price effects isn't included in any of the studies. And I believe that that could be significant. While looking at the same criteria for the other four studies, moving on to the ones that are of interest, we find, again, infrastructure that included price effects, included even the Carnagi-Mellon study.

This is actually the input/output tables in the United States. But those input/output tables are based on essentially fixed prices because they're fixed input/output ratios. So using the input/output table does not mean that they've considered price effects, because there's changes in prices as a result of policy directly or changes in production conception materials.

Some of these studies do include the vehicle life cycle, as I said. A Carnagi-Mellon worked as an advantage. Now, I'm going to jump ahead to that. Let me say something positive about life cycle analysis. This slide explains I think, illustrates nicely, why we've done life cycle analysis.

It does capture something important. Life cycle analysis is motivated in the case of transportation fuels by the realization that just looking at septal emissions, that is emissions from the transportation sector as it might defined in a GNPA count, or in the IPCC intergovernmental panel of climate change accounting, won't give you a complete picture, even the majority of the picture of emissions associated with using that fuel or mode because of what happens in other parts of the system of making the fuel.

So what I've showed here is upstream emissions from what are called well to take, that is from making their -- pulling their raw feedstock out of the ground, all to delivering to the vehicle, but not using it. All the emissions associated with those activities express as a percentage of the emissions from the vehicles itself directly, CO2 emissions or greenhouse gas emissions.

Another (indiscernible) emissions directly from the end use of the vehicle, the ones that typically look at let's say air quality. And this is done for 26 mile per gallon in a light duty gasoline vehicle to six mile per gallon in a heavy duty vehicle. What we see is this is actually for the light duty vehicle.

The higher the number, the higher the percentage, it means the greater the importance of upstream emissions relative to end use emissions. And indeed, any number greater than 100 percent means that you get more of the emissions upstream than you do from end use. We can get more of the emissions upstream than end use.

It clearly means that you ought to be paying some attention to what's happening upstream. And we've seen in a lot of cases we have numbers that are well over 100 percent. Particulate matter emissions from most fuel cycles, not all, but most fuel cycles, turn out to be larger upstream than for menus.

And particulate is, A, the most damaging from a health effects standpoint. And, B, also potentially an important climate change gas. SOx emissions are also larger upstream, largely because most of the sulphur is pulled out of all these fuels that we made before the fuel is delivered to the vehicle user.

And there are soft rocks and emissions association with removal of that sulphur. Even things like nitrogen oxide emissions, which are relatively large for automobiles. They're a very major source of NOX and the whole budget, can be significant upstream in some fuel cycles.

The only cases where you find in fact the end use emissions are routinely quite a bit larger than upstream emissions is with carbon monoxide, because vehicles are the major source of carbon monoxide in almost any inventory anywhere. And conversely, most upstream activities don't produce a lot of carbon monoxide.

So with that exception basically, you find that upstream emissions are very significant both in terms of CO2 equivalence, which are shown here, that's the CO2 for all these gasses, and with respect to emission of individual air pollutants. So this is why life cycle analysis is important.

And this is why it does contribute something valuable. You capture all these effects that have been emitted if you just look at the NGs only. Now let's take a look at the emissions from the vehicle life cycle, from the manufacturer and materials that are used in vehicles, and the assembly of motor vehicles, everything associated with a vehicle except using the fuel.

And we'll see why this is maybe important, and why studies that omit this, which most studies do, may, depending on how you're trying to interpret them, be leading up to something significant. I've shown here again all different pollutants. I've expressed the emissions from the vehicle life cycle, material, entire material life cycle and the vehicle assembly life cycle.

And grams per pound probably doesn't mean anything. And grams per mile, which might begin to mean something, but, again, most meaningfully as a percent of NGs submissions for light duty vehicles and heavy duty vehicles that's likely to gas the heavy duty diesel 26 mile per gallon, any vehicle that has a six mile per gallon heavy duty diesel vehicle.

And we can see, this may be surprising, that even in the case of just the material inputs to the vehicle and assembly, that there are cases where emissions from that part of the life cycle are very large, or even greater than, emissions just from end use in the vehicle itself.

Once again, particulate matter in SOx emissions are large from the upstream -- not upstream, sorry, from the vehicle life cycle material compared to end use, except in the case of heavy duty diesel vehicles emitting at 2,010 levels. They'd still have significant particulate (indiscernible) compared to upstream.

Interesting enough, you have some findings like methane emissions turn out to be higher from the end of material life cycle bin directly from vehicles themselves. And that is important greenhouse gas. So there are cases where in absolute turns certainly, certainly the vehicle life cycle itself is important.

Even in the ranking of alternatives if it turns out you have significantly different material inputs to one vehicle as another, compared to another, and you may if you're talking about, again, like a battery powered electric vehicle as a very heavy batter. Because some of these pollutants are so great from this vehicle material's life cycle changes from one vehicle type to another.

Material inputs may actually effect the ranking of the alternatives. Okay. Another issue, what might the effect be of failing to consider the greenhouse gas or climate change impact of all of the gasses that we think effect climate, as opposed to just looking at the three that are traditionally considered in life cycle analysis.

The three that have traditionally been considered in most life cycle analysis are carbon dioxide, methane, and nitrous oxide. The reason has just been those three because the IPCC, intergovernmental panel of climate change, has developed official conversion factors, actually use a greenhouse gas accounting.

And so most haven't wanted to just go beyond what the IPCC has sanctioned. But we know that in fact every single gas that's omitted practically has some potential effect on climate. Any gas for example that effects ozone, troposphere of ozone, that we know many gasses do, affects climate because troposphere goes in as a greenhouse gas.

And hydrogen even recently has been pointed out to be a greenhouse gas. (Indiscernible) has leaks of hydrogen as a greenhouse gas. It's effects on hydro and tropospheric ozone formation. So I made some estimates of what I think that global warming potential, if you will, of all these gasses are.

And it shows the IPCC down here. This is a number that you multiply emissions of a gas. It's an equivalent amount of CO2. And I'm going to explain what that is right now. And then these are the ones that I assumed or estimated. Some of them are crude.

And I've assumed or estimated, this is very tentative, a very large effect for PM based on recent work, which suggest that black carbon, most fossil PM is black carbon, has a significant impact on climate as a CDF or CO2 factor of 46. Sulphur air or sulphur oxides for sulphate air, which have a cooling affect on climate, they get a large negative impact.

And hydrogen is not shown there. So

what happens if you switch from doing the analysis with just the standard three gasses, two this full sweep of gasses with this full sweep of CO2 equivalency factor. I've shown two different ways of looking at what happens when you make this switch.

One is what happens for this to change in the gram per mile emissions? That's typically what gets reported in these life cycle analysis, is one of the total grams of CO2 gasses emitted per mile of travel by the vehicle type. And you can see that in almost all cases there's a modest to sometimes significant increase in the absolute gram per mile emissions as a result of switching from the limited IPCC set to this expanded sweep of CO2 equivalency factors.

And that's because mainly because of this high C02 equivalency effect for PM of 46, but also because a CO2 has a closing factor of three, and in some cases it's actually large emissions of CO. And it just shows you what little interesting things you can find out.

Here's a fuel cycle that has a lot of use of farm equipment, and the official MP42 estimates of emission factors for farm equipment show very large emissions of C0, huge emissions of CO. So large that when you actually include a CO2 equivalency factor for a CO it bumps up the greenhouse gas emissions itself by a an amount like three or four percent, surprising effect.

You find out things like that. And that's mainly why the CO2 greenhouse gas emissions per mile increases. It turns out though that in the case of battery EVs where the battery EVs are powered by electricities from coal plants, that should show a little bit of decrease because of estimated or model very large sulphur emissions from coal fire plants, actually outweigh on a mass basis the PM emission from coal fire plants.

Because PM controls actually a little bit tighter than sulphur emission control, although it's difficult to figure out exactly what happens to sulphur emissions from power plants, as the Energy Commission wells knows. Anyway, you could see some effect like that where sulphur rocks had emissions is on the decrease.

The other way to look at this is in relative terms, this is absolute terms, here I show the percentage change in (indiscernible) emissions from each of these alternatives, okay, relative to this baseline. So what this means here is that an ICE vehicle, ICE vehicle using diesel fuel, has 30 percent lower emissions than a baseline gasoline vehicle given the IPCC set of CO2 equivalency factors, right?

If you switch over to the expanded sweep of CO2 equivalency factors, this is what the percentage change in emissions for this, relative to that, looks like. The difference in the change is relatively small for most cases, because the baseline and the alternatives are kind of effected equally.

So in terms of ranking the effective switching from IPCC to LEM isn't quite as great. Although there are a few cases where there are some significant changes, again, battery EVs from coal fire plants, and ethanol from core. You see the ranking here. They look pretty -- they're at a 14 percent decrease.

That's only a nine percent decrease. But in most cases there isn't much of a difference in switching from the IPCC to the other CO2 equivalency factors because the alternatives in the baseline are effected sort of equally. Now, I've got to go back and do this one. Yeah. Okay.

I'll give you some more results. I know people just love to have results, even though I spend my whole talk say, no, no, no, don't pay any attention to the results. I've just explained whey they're all flawed, even my work.

It's still interesting to look at the results, especially given this background. I'll show this one here and then I'll be concluded. This shows of my estimates a life cycle greenhouse gas emissions. It's from heavy duty vehicles because they're a more interesting case.

It's shows gram per mile, CO2 emissions for the baseline. That's the baseline diesel combustion engine vehicle at six miles per gallon. That should be grams per mile. And then all these others are percentage changes relative to that baseline. And it shows for two ways of bounding the system, one is just a fuel cycle only.

Yet there's fuel plus vehicle materials in assembly. We can just look at this one for now. In fact, I'll just talk about the three bio-mass options here because they just made a wide range of results, and they also tie into some of the methodological issues I mentioned earlier.

We show, first of all, most

surprisingly, let's just get a look at these three, of bio-diesel made from soy beans, ethanol made from corn, ethanol made from scholastic material. Here we have -- where is anybody that represents the fire diesel here? Bio-diesel from soy beans, 47 percent increase, that's not a misprint. That's not a misprint.

That is what I estimate. Why do I estimate a 47 percent increase? Have I failed to take into account the fact that CO2 emitted from the use from the bio-fuel is recaptured by the plants? No, of course I haven't failed to take that into account.

Let's go on here, is if you harken back to my ideal versus the actual slide, and look at the emission box, I said that most life cycle analysis cover 80, 90 percent import emissions. But some emissions are potentially serious. Here's my favorite emission. Soy beans fix nitrogen.

That nitrogen fixation, according to the actual guidelines by the IPCC and some available data, that nitrogen fixation results in large emissions of N2O. N2O is a very potent greenhouse gas on a mass basis. It turns out that estimated by the guidelines, N2O emissions from nitrogen fixation, even in a relatively conservative assumptions, are enormous. They're huge.

They cancel out whatever benefit you get from recycling CO2 and result in an increase in life cycle CO2 equivalent emissions compared to a diesel. Now, there is controversy starting to brew about whether these IPCC emission factors for N2O, emitted dissolved of nitre fixation, are valid.

Of course there's going to be. But if you use the estimates that are available now, you get that number. I don't know of any of the study that's used those N2O emission factors and come up with -- well, if they did they'd come up (indiscernible) N20 emission factors.

That's an example of an important omission. There are other less serious, but this is the most important one. At the moment I think what we can say is we don't have any clue as to what the use of bio-diesel made from soy beans will do to global climate. That's only the beginning of the issues.

We have with ethanol from corn and bio-diesel from soy. We have the question of the price effects, even in conventional LCA you can't away from that because, some of you may have heard this, there's what to do about co-products. When you make soy beans or ethanol from corn, actually make any of these materials from any bio-mass source, you usually produce something else besides the fuel of interest.

Well, what do you do with that other something else you produce? In the case of corn, depending on how you produce it, you may have something suitable as animal feed. I forgot what it is in the case of soy beans. But what assumption you make, methodologically, about what you do, or what is done I should say, with this other stuff that you make has a very significant effect on the results.

This is connected to my ideal model now to bring this full circle because you cannot answer that question about what happens to this without doing an economic analysis. There's just no way. You can't answer correctly I should say. You can make an answer. But any answer about co-products has to involve economic analysis.

I've taken some relatively crude estimates that account for I think economic effects, I come up with less of a co-part credit it's called. That is less of a reduction of greenhouse gas emissions due to marketing the co-product other studies have. That also partly explains why ethanol from corn numbers a little bit higher.

And things work the other way though. In the case of ethanol from cellulose you co-produce another fuel. You can at least by subproduction process as electricity. And that electricity can displace directly generation or fossil fuel power so you can get an additional greenhouse gas emissions reduction benefit there.

But exactly what the magnitude of that is can't be determined really without economic analysis. So we see a very wide range of results from almost complete elimination of greenhouse gas emissions to an actual increase. And that depends, true, in large part on the inherent characteristics of the process.

But also on what emissions sources you consider, how broadly you've expanded the analysis to include economic effects, and also it's beginning to, you can't see that here of course, but as implicated in the other slide, what CO2 equivalency factors you use, whether there's particulate emissions that are significant AD cycles, and some ethanol for corn analysis particulate emissions are significant.

And if you use that high particulate emissions, CO2 equivalency factor, that could become important there. So my conclusions then is, these are my findings actually, it still remains true that assumptions regarding energy use and relative energy use are generally the most dominate factor.

That isn't surprising because the main greenhouse gas in most of these fuel cycles, or life cycles, is carbon dioxide, and carbon dioxide generally comes from combustion of carbonaceous fuels. And so the amount of fuel that you use per mile is of course is going to be a major determinate.

Point number two though, as I argue, the materials life cycle may differ significantly going from another, and for BVEs compared to SUVs, and it may be important in those cases. However, I don't think that the material life cycle, consideration of that life cycle, will make a big difference in LCAs. It just focuses on hybrids or fuel cell vehicles, or total combustion engine vehicles.

So that omission may not be serious for analysis. It focused just on those modes. And number three, climatic effects of these gasses that are omitted in most LCAs may be important in some cases. PM may have a large positive effect, but (indiscernible) emissions may have a countervailing negative of CEF.

I can't determine, or haven't determine yet, to what extent there's a sort of fortuitous canceling out of these omitted factors here, and whether future research showing that maybe one of the other of these isn't as big as we think, might result in more dramatic differences in having expanded --

But we can know that in some cases already it may be important. Then finally, I believe that the failure to consider these price economic feedbacks may not matter much when you're considering alternatives that affect the world in kind of similar ways.

Like if you're talking about alternatives that use a similar kind of conventional fossil fuel, don't produce a lot of co-products, right, have similar effects in the world out there. Failure to consider the economic system may not be important.

But in considering dissimilar alternatives, or alternatives that have a lot of co-products, or use radically different commodities as imports, I believe that failure to consider price economic effects maybe important. So the overall conclusion is -- well, there it is. I'll stop talking. You can read it. It speaks for itself.

Thank you. Any questions.

PRESIDING MEMBER BOYD: Thank you, Mark. Sorry we put you so late in the day on a Friday, and lost some of the audience. I might say this is extremely interesting to those of us who follow climate change real close. You may have turned the bio-diesel industry on its head. Whereas this agency hasn't heavily embraced bio-diesel for a host of reasons.

When I participated nationally in the international discussion of climate change, bio-diesel was always highly rated as a strategy in climate change. And you may change the whole view of that. The other reaction I have is as one who's among many here perhaps who's been trying to figure out good things to say about bio-mass and cellulosic use of the celloids, you've just given a large vote of confidence to do something.

Although economically there's no cash involved with this analysis, and that's always the hard part. You said the economics and the price in most analysis kill our ability to do some of these things. But you may contribute to additional debate, discussion, what have you of the validity of pursuing more aggressively use of our bio-mass. Observations, not questions.

MR. DELUCCHI: Economics comes into play in complex ways here. I have a study by folks back a couple years ago, which they analyzed the impact of various policies aimed at electric vehicles on air quality. And it turned out I believe that a significant impact was the effect on increase vehicle prices on people's demand for electricity, and how that played off against an assumed load curve.

And they ended up -- the point was that they just took a simple step of saying, well, actually, these vehicles are going to cost more, and that effects the household transportation budget I think is what they did. And that will determine how much they can pay for electricity, and that will determine emissions from power generation.

So there's an example of math economic, or indirect price effect. And people in the case of ethanol have argued that correct global analysis, this gets back to you're talking about (indiscernible), well, look at the fact that ethanol is subsidized. And that subsidy essentially reduces household income somewhere in the economy.

Household income will have an effect on household expenditures for emissions generating activities or goods and commodities, right? So it could be significant because the subsidy is significant. So in an analysis of bio-mass, as you implied, really in principle ought to look at the price of bio-mass relative to other commodities, and how it's being paid for, and how the payments for it effects overall expenditures in the economy.

Because expenditures are related to material flows. Material flows are related to emissions. And these may not be trivial effects.

They're just really hard to get a handle on. And so understandably, me and my colleagues have tended to ignore that sort of stuff. Also because we're not trained economic modeling.

But, yes, the issues of price of bio-fuels may turn out to be in principle very significant determinate of greenhouse gas emissions by indirect effects. Stefan.

MR. UNNASCH: I apologize for commenting after 5:00, but I'm mostly intrigued by the more important life cycle of soy bean to tofu versus corn to cattle, to burger. And it really makes me wonder how good you should feel about the tofu burger.

(Laughter.)

MR. UNNASCH: But like a lot of the bio-diesel models have a huge byproduct credit. So that's a huge uncertainly. I just wanted to point out two cases where I'm aware of some economic analysis that was brought into play. And one on the AB2076 study where there was a simple comparison of just like a hybrid vehicle that was 40 percent better in fuel economy.

So once you bought the car you saved 40 percent of their gasoline. And the cal cars model predicts how much people would drive. And they call that the rebound effect. So if you save 40 percent of the gasoline, the model predicted that there would be a three percent increase in driving due to 40 percent savings in gasoline.

So you'd lose three percent. Everyone I've talked to just absolutely cannot believe that. But that's something that also needs to be considered. There might be a lot of thought that goes into the model, but I find that maybe our income levels are all wrong.

But I find the result that if you drop the price of gasoline 40 percent that's going to cause me to drive three percent more. And I find that, you know -- that's a little bit unsatisfying. So there might be some sensitivity analysis that comes into play there.

And another important example has to do with the mix of generation resources for electric vehicles. A lot of work has been done on Elfin and other models that look at the generation mix for electric power production. And I just have to quote someone who told me once that -- who did a lot of work with power dispatch modeling, and they said about two years ago, we can't understand why power producers aren't selling at the marginal cost of production.

And I'll just have to leave it at that as how some economic modelling can lead you astray if you don't take into account all of the factors. So there's probably some huge uncertainties in the power generation mix, even if there was a well polished model that was able to figure out where the hydro was going and where the natural gas was, whether it was going to be displaced with natural gas.

MR. DELUCCHI: There have been other studies that have looked at what the marginal power mix is likely to be for electric vehicles. On the life cycle analysis that had used the results of those studies for marginal generation mixes had a jumping off point for their life cycle analysis.

So, yes, that's been done. I don't know any -- I think it doesn't exist, any model that his it all integrated. That's basically an economic model and a life cycle model imbedded. And there's two ways you can imagine. There are map economical models, policy models, that determine changes in the flows of major commodities.

You can imagine attaching emission factors to those. That was sort of then the 2076 project a little bit.

MR. UNNASCH: Right, right.

MR. DELUCCHI: But Berkeley got it.

MR. UNNASCH: I just wanted to point out that I'm unhappy with -- the results give me the creeps.

MR. DELUCCHI: Right.

MR. UNNASCH: One of them says I'm going to drive 50 percent more. The other one says the power producers are going to sell at the marginal price of production.

MR. DELUCCHI: Yeah. But for 2076 that's a California economy.

MR. UNNASCH: Right.

MR. DELUCCHI: And they tried to attach some CO_2 emission factors to some of the major sectors. Now, you'd have to refine that a lot more to get a suitable life cycle analysis model out of it because it just doesn't have the detail on the emissions side to be able to be a life cycle model.

But that's heading towards sort of the

model line I'm talking. I don't know of any work though that's done that. But the alternative is to take a model like what you do and I do and basically put price elasticity in it, and I don't know who's done that. We have a long way to go.

PRESIDING MEMBER BOYD: Well, to me is the alleged economist on the Commission. The issue here is the difficulty of quantifying into an equation human behavior, the evil human behavior, and maybe the positive human behavior. And we struggled with that very issue on the 2076 regarding rebound.

We had terrible internal debates on whether that was believable or not. And then those who designed the electricity system perhaps to factor in the evil side of human being. But that's maybe a good way to close a Friday night down almost. Anyway, I thank you all.

We now come to the part of genesis public testimony. And actually I have a blue card here. And poor old Doug Grandy has been out there all day. And there may be others who would like to say something.

Mark, thanks very much, intriguing work. Doug, you hung in there, although I saw you leave and come back.

MR. GRANDY: Yeah. Well, I stand between this room full of people happy hour on a Friday night, I will be concise.

PRESIDING MEMBER BOYD: I had the same thought myself.

MR. GRANDY: I am here this evening representing the California Stationary Fuel Cell Collaborative. As the name implies, this group is a voluntary collaboration between a group of organizations, all three levels of government, some public utilities, and some private sector organizations, fuel cell manufacturers, and fuel cell related companies.

There are four co-chairs, Dr. Alan Lloyd, chairman of the Resources Board, professional Samuelson who's head of National Fuel Cell Research Center and UC Irvine, Dr. Clark who's a policy evaluation of the Governor's Office of Planning Research, and Dennis Dunn, who is chief deputy in the Department of General Services.

This group, I think either are doing or plan to engage most, if not all, of the activities that were suggested by several of the previous speakers. And so it's off to a good running start. Commissioner Boyd, at our March meeting of the core group of the collaborative I believe it was you that suggested that we stay in close coordination with another with your EPR efforts, as well as the activities of the collaborative.

And so I'm here on behalf of the executive director to do just that, and to pledge the continued support and cooperation of the collaborative and supportive of your good efforts with the IPR. And that is the extent of my comments.

PRESIDING MEMBER BOYD: Thank you for you enthusiasm.

MR. BEEBE: I would follow up on that.

MR. GRANDY: Okay.

MR. BEEBE: I'm Bud Beebe with Sacramento Municipal Utility District. And we are a member of the California Stationary Fuel Cell Collaborative. And to mention that we have proposals into the Department of Energy currently, and as do others, both in the utility industry and in other people association with this California Stationary Fuel Cell Collaborative to do demonstration plants that will be combinations in various combinations of a hydrogen producing fuel cell electricity producing hydrogen going into the fuel cells.

In some cases there will be technology we'll be using fuel cell technology as electrolyzers to produce hydrogen and in a number of different combinations in stationary refueling sites for fuel cell vehicles. So there isn't a lot of interplay with the stationary side and the transportation side on this as we go forward.

And I know that the fuel cell partnership has already made great strides in doing the stuff on the transportation side. Maybe the stationary people have been a little bit lax, but we're on the road now, and we'll producing stuff within the next year.

PRESIDING MEMBER BOYD: Well, as a member of the advisory board of both of those organizations, I would say that I personally, and as we heard earlier today it's not me, stationary applications of fuel cells are going to be first anyway, although there's more activity in the transportation area, one would think.

But the first significant applications I think of fuel cells is going to be in the stationary arena, and that's going to , you know, foster additional progress I think in all arenas, which is probably why I said what I said way back in last March, which may you stay here all day for a very entertaining workshop.

But anyway, thanks to both of you for reminding us of that. Anyone else out there have something they'd like to add?

MR. HECKEROTH: I just wanted to say --

PRESIDING MEMBER BOYD: To somebody who has sat in the audience the entire day, I know you deserve the last word.

MR. HECKEROTH: This is the second time I've stayed all day through a hearing to make a short statement, and I turned it in. So I won't bore you with it. Steve Heckeroth again. And I was at the joint hearing at a CEC, and I stepped out for a minute and missed my chance.

PRESIDING MEMBER BOYD: I've been reading your e-mails ever since.

(Laughter.)

MR. HECKEROTH: Well, I did turn in a testimony for this hearing too. I appreciate it if you have a chance to look at it. Thank you.

PRESIDING MEMBER BOYD: We will by all

means. Chuck, anything else?

MR. MIZUTANI: No.

PRESIDING MEMBER BOYD: I would just like to thank everybody who's left for their participation, and particularly thank the hardy few who are left for sticking it out. It's been very interesting. It's been a tough day to do it on. And to have anybody here on a Friday at a quarter to 6:00 is a tribute to the work the staff did in putting this on, and to the content.

And so I thank you all, and look forward to the weekend frankly. Thanks for sticking it out.

(Thereupon, at 5:47 p.m., the workshop was adjourned.)

--oOo--

CERTIFICATE OF REPORTER

I, ALAN MEADE, an Electronic Reporter, do hereby certify that I am disinterested person herein; that I recorded the foregoing California Energy Commission Workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said workshop, nor in any way interested in outcome of said workshop.

IN WITNESS WHEREOF, I have hereunto set my hand this 1st day of August, 2003.