JOINT COMMITTEE WORKSHOP

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

In the Matter of:	)	
	)	
Preparation of the 2009	)	Docket No.
Integrated Energy	)	09-IEP-1K
Policy Report	)	
_____	)	

CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

TUESDAY, JANUARY 13, 2009

9:00 A.M.

Reported by:
Ramona Cota
Contract No. 150-07-001

COMMISSIONERS PRESENT

James D. Boyd, Vice Chairman
Presiding Member, Transportation Committee
and Associate Member, Integrated Energy Policy
Report Committee

Karen Douglas, Associate Member, Transportation
Committee

ADVISORS PRESENT

Kelly Birkinshaw, Advisor to Commissioner Boyd

Susan Brown, Advisor to Commissioner Boyd

Diana Schwyzer, Advisor to Commissioner Douglas

STAFF and CONTRACTORS PRESENT

Suzanne Korosec

Ken Koyama

Jim McKinney

Darren Nguyen

Donna Parrow

Michael Smith

Valentino Tiangco, PhD

PANELISTS PRESENT

Bob Fletcher, California Air Resources Board
(CARB)

Paul N. Argyropoulos, United States Environmental
Protection Agency (US EPA) (via telephone)

Fernando Bert¢n, California Integrated Waste
Management Board (CIWMB)

Steve Shaffer

PANELISTS PRESENT (CONTINUED)

Steve Kaffka, PhD, University of California, Davis (UC Davis)

Alex Schroeder, Western Governors Association (WGA)

J. Alan Weber, National Biodiesel Board (NBB) (via telephone)

Don Stevens, PhD, Pacific Northwest National Laboratory (PNNL) (via telephone)

John Scahill, United States Department of Energy (US DOE) (via telephone)

Bryan M. Jenkins, PhD, University of California, Davis (UC Davis)

Harvey Blanch, PhD, Joint Bioenergy Institute (JBEI)

Susan Jenkins, PhD, Energy Biosciences Institute (EBI)

Tom Jacob, DuPont

ALSO PRESENT

Chuck White, Waste Management

Fred Wellons (via telephone)

Joe Sparano, Western States Petroleum Association

Greg Shipley, Bioenergy Development (via telephone)

Rain, Source One Records (via telephone)

Sharon Shoemaker, PhD, University of California, Davis

Jeff McElvaney, Proterra Bio

David R. Rubenstein, California Ethanol + Power

Matthew Frome, Solazyme, Inc.

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1 P R O C E E D I N G S

2 9:08 a.m.

3 MS. KOROSEC: Good morning. Let's go

4 ahead and get started. Today's workshop is a

5 joint workshop being conducted by the Energy

6 Commission's Transportation and Integrated Energy

7 Policy Report Committees.

8 I am Suzanne Korosec. I am the

9 Commission's lead for the Integrated Energy Policy

10 Report. I April 2006 Governor Schwarzenegger

11 signed Executive Order S-06-06 which outlined the

12 benefits of bioenergy for California and set

13 targets to increase the production and use of

14 bioenergy in the state.

15 The Executive Order also requires the

16 Energy Commission to report to the Governor and

17 the Legislature through our biennial Integrated

18 Energy Policy Report on the progress that has been

19 made in achieving the sustainable biomass

20 development in California.

21 This workshop is going to focus on the

22 biofuels component of the state's bioenergy goals

23 and we intend to hold a separate workshop later in

24 the year on bioenergy production and use for the

25 electricity and natural gas sectors as part of the

1 development of the Integrated Energy Policy
2 Report.
3 So just a few housekeeping items before
4 we move to the technical subject matter.
5 Restrooms are out the double doors and to your
6 left. There's a snack room on the second floor at
7 the top of the stairs in the atrium under the
8 white awning. And if there is any kind of
9 emergency and we need to evacuate the building
10 please follow the staff out the doors to the park,
11 kitty-corner to the building, and wait there for
12 an all-clear signal.
13 Today's workshop is being broadcast
14 through our WebEx conferencing system and
15 instructions on how to participate are contained
16 in the workshop notice, which is posted on our
17 website and also out on the table in the foyer.
18 And the workshop is also being webcast.
19 For parties in the room who wish to
20 speak during the public comment period, which I
21 believe is identified on the agenda as Company
22 Presentations, we ask that you please fill out a
23 blue card with your name and affiliation. And you
24 can give those to Donna Parrow who is over here
25 next to the WebEx operator. Blank cards are

1 available on the table out in the foyer.
2 We ask if you wish to make a company
3 presentation if you would please note that in the
4 upper right hand corner of your card. All others,
5 you don't need to put anything special on your
6 card other than your name and your affiliation.
7 When you do come up to speak if you
8 could provide a business card to the court
9 reporter so that she can make sure that your name
10 is spelled correctly in the transcript that would
11 really be very helpful.
12 And we are also asking that because of
13 the number of parties that we have here today if
14 you could limit your comment time to five minutes
15 so that everybody has an opportunity to speak.
16 And with that I will turn it over to
17 Commissioner Boyd and Commissioner Douglas to make
18 opening remarks.
19 PRESIDING MEMBER BOYD: Thank you,
20 Suzanne. We it's indeed my pleasure to welcome
21 you to this workshop on biofuels, as Suzanne has
22 indicated. As she indicated I am Jim Boyd, the
23 Presiding Member of the Energy Commission's
24 Transportation Policy Committee and Associate
25 Member of the Commission's 2009 Integrated Energy

1 Policy Report. I also happen to chair the
2 administration's bioenergy working group so this
3 is a topic of great interest to not only this
4 agency but to me in particular.
5 The working group that I mentioned
6 includes all those state agencies with important
7 biomass roles and responsibilities. And as I look
8 around the room I see many members of that group
9 who are with us here today.
10 I am joined at the podium here, or at
11 the table I should say. I'm used to sitting at
12 the podium but this is a workshop. We are trying
13 to keep it a little more open, informal and not
14 intimidating. I am joined on my left by
15 Commissioner Karen Douglas who is the Associate
16 Member of the Transportation Committee.
17 Commissioner Jeffrey Byron, the other member of
18 the Integrated Energy Policy Report Committee
19 unfortunately was unable to be here today.
20 The purpose of the workshop, as
21 indicated in the Notice -- I should say the
22 purposes are many. There is certainly the
23 indication that Suzanne gave and that the Notice
24 gave, i.e., to evaluate our state's progress in
25 achieving the Governor's very ambitious biofuels

goals.

But in addition the CEC is working to implement Assembly Bill 118, which is to finance activities to carry the goals of the alternative fuels plan of the state of California which was jointly developed by the Air Resources Board and the Energy Commission.

The Air Resources Board is working to implement its Low-Carbon Fuel Standard as directed by the Governor. The Energy Commission continues its work under its Integrated Energy Policy Reports to pursue these goals in the Integrated Energy Policy Reports of the past so we are extremely interested in this topic. And it is one of great interest to lots of communities and organizations throughout the state if not throughout the nation.

We are really interested in hearing from the invited speakers and those of you who are interested stakeholders who sign up to speak later in the day and we welcome you to do just that. We are interested in the technical, economic and market issues that are influencing the subject and that may be influencing progress or lack thereof on this topic.

1 As Suzanne indicated it was almost two-
2 and-a-half years ago that the Governor signed the
3 Executive Order in question urging state agencies
4 to expand the use of biofuels, both to reduce our
5 dependance on petroleum, and frankly, in an effort
6 to address climate change. Particularly at that
7 moment to combat volatile gasoline and diesel
8 prices. And I don't have to say anything about
9 petroleum price volatility since that date and
10 time two-and-a-half years ago, you have all ridden
11 that issue up and down for quite some time now.
12 At the time in 2006 the Governor did
13 approve this Executive Order he said, quote:
14 "Turning waste products into
15 energy is good for the economy,
16 local job creation and the
17 environment."
18 Close quote. And that is certainly a true
19 statement of fact for what faces us today. As I
20 said, he challenged the state agencies that
21 comprise the bioenergy working group to undertake
22 a series of specific actions, establish
23 milestones, to promote sustainable biomass
24 development in California.
25 So that kind of followed on the Energy

1 Commission's 2005 Integrated Energy Policy Report
2 and then was amplified again subsequently in the
3 2007 Integrated Energy Policy Report, underscoring
4 the significance of harnessing California's
5 resource stream. Some people call it a waste
6 stream. Urban forestry and agricultural residues,
7 as a source of biopower, biogas, biofuels, et
8 cetera.
9 It's safe to say that now that climate
10 change has become the major policy driver for
11 concerted action in our state the pursuit of
12 renewable fuel sources, especially biofuels
13 produced from California's waste streams, has
14 taken on certainly added and even greater
15 importance.
16 And I would note that the Governor's
17 Order establishing the Low Carbon Fuel Standard
18 further recognized the potential contribution of
19 quote, second generation, unquote, biofuels in
20 reducing the carbon intensity of California's
21 transportation fuel supply.
22 So for all those reasons we are here
23 today to talk about the subject. And although we
24 feel progress has been made we want to hear more
25 about that. The promise of second generation

1 biofuels is dangled out there as something that
2 will move everything forward, yet we need to get a
3 better handle on what that really means in terms
4 of progress.
5 We feel more needs to be done to ensure
6 that biofuels are produced and used in California
7 in a sustainable and environmentally acceptable
8 manner. That reflects the goals of many of the
9 documents produced by this agency and the Biofuels
10 Energy Action Plan that multiple agencies helped
11 produce.
12 So with that I again thank you all for
13 being here, welcome you. I look forward to a
14 productive and educational day. And I will turn
15 the microphone over to Commissioner Douglas before
16 we get to our first panel for the day.
17 Commissioner.
18 ASSOCIATE MEMBER DOUGLAS: Thank you,
19 Commissioner Boyd. Good morning, everybody. As
20 Commissioner Boyd noted I am the Associate Member
21 on the Transportation Committee. And the
22 Transportation Committee is working very hard with
23 staff on AB 118 implementation, which gives us the
24 goal of using this funding stream to help
25 transform California's fuel and vehicle types.

1 Under the statute we are trying to
2 achieve a mix of goals. We are trying -- The
3 statute tells us to support California's climate
4 policy, maintain or ideally as much as possible
5 improve air quality, reduce petroleum use, provide
6 economic benefits to the state, and meet and set
7 and attain sustainability goals that can be looked
8 at both in terms of for a specific project and
9 also more broadly in terms of the state's future
10 strategies for transportation fuel and vehicles.
11 So we are coming into this workshop from
12 a place in which we have been spending a lot of
13 time on these issues and hearing from a lot of
14 people. I am really looking forward to this
15 specific workshop on biofuels and to hearing from
16 the people who will be both testifying and
17 providing public comment later.
18 So anyway, thank you all for being here.
19 I am definitely looking forward to this workshop.
20 PRESIDING MEMBER BOYD: Thank you,
21 Commissioner Douglas. And I guess we are ready to
22 move to the first subject matter area, which on
23 your collective agendas is policy drivers. On
24 that topic Susan Brown is going to moderate a
25 panel consisting of Mike Smith of the Energy

1 Commission, Bob Fletcher from the Air Resources
2 Board. Or maybe Susan I should let you introduce
3 your panel, I know you have done this work.
4 (Laughter)
5 PRESIDING MEMBER BOYD: I'll turn it
6 over to Susan Brown to introduce the subject, the
7 panel members and to moderate the discussion. Sit
8 back and relax and enjoy it.
9 ADVISOR BROWN: Thank you, Commissioner
10 Boyd. My name is Susan Brown and I am here today
11 in two capacities. First I am Commissioner Boyd's
12 senior policy advisor, and second, I am also the
13 lead senior staff for the bioenergy interagency
14 working group, which has been meeting for about
15 two years. And I am pleased to welcome many of
16 our members, some of whom are on my first panel.
17 As Commissioner Boyd indicated in his
18 introductory remarks, there are multiple policy
19 drivers here in California that support the
20 sustainable development of biofuels in California
21 from California's many waste streams. We are
22 pleased today to have representatives from the
23 Energy Commission, the Air Board, the Integrated
24 Waste Management Board, and by WebEx we will
25 invite a representative of the US Environmental

1 Protection Agency to speak to us this morning.
2 So the topic of the first panel is
3 policy drivers and we posed a number of questions
4 to our speakers. What we are about today is to
5 get a sense from the speakers and from the
6 participants in the workshop on the progress being
7 made in reaching the Governor's biofuels
8 production and use goals.
9 And we would also like to get a sense
10 from the speakers on what market, economic and
11 regulatory barriers may still remain that we need
12 to take notice of. To the extent that we can
13 formulate specific recommendations that can be
14 included in our Integrated Energy Policy Report
15 and be sent back to the bioenergy working group
16 for further discussion and activity, that would be
17 to me the most desired outcome.
18 I am not going to belabor this by
19 extending my remarks but I do want to make a
20 couple of other announcements. We have five
21 speakers on the first panel. Mike Smith will be
22 speaking to us first and he is the deputy director
23 for transportation for the Energy Commission. And
24 he will be putting biofuels in the context of the
25 Alternative Fuels Plan and Assembly Bill 118,

1 which is a massive incentive program that was
2 established by legislation in 2007.
3 Next we are happy to have Bob Fletcher,
4 who is the stationary source division chief for
5 the California Air Resources Board. And his
6 division and staff are busily working on
7 completing the rulemaking for the Low-Carbon Fuel
8 Standard. Which, as you will hear from Bob, will
9 also have a tremendous impact on biofuels
10 development in California.
11 Our third speaker will be Paul, and I'm
12 going to blow your name, Paul, Argyropoulos from
13 US EPA. He works in the office of mobile
14 emissions, I believe. And Paul, are you with us
15 by WebEx and by phone?
16 MR. NGUYEN: He's muted.
17 ADVISOR BROWN: He's muted but he is
18 with us. Next we will have Fernando Bert¢n who is
19 the manager of research and applied technology for
20 the Waste Board.
21 And the last speaker, the clean-up
22 speaker, Val, is Valentino Tiangco, who is our
23 senior lead in the PIER renewables programs. And
24 he is our resident expert on biomass and biofuels.
25 I also want to recognize Ken Koyama. If

you will raise your hand, Ken. Ken has had the responsibility for pulling together this workshop. So many of the speakers who are here today are largely as a result of his efforts.

So with that I am going to introduce Mike Smith.

MR. SMITH: Thank you very much, Commissioners. It's a pleasure to be here this morning. What I want to do is talk briefly about some of the policy issues, the policy drivers as the agenda reads, here at the Energy Commission on alternative fuels. Starting with the Alternative Fuels Plan and leading very quickly into the Alternative and Renewable Fuel and Vehicle Technology Program, which is where we are spending a great deal of our time at this point.

I won't belabor a number of these points since Commissioner Boyd very eloquently described some of the policy, historical policy, in the opening remarks. But just suffice to say that back in 2003 the Energy Commission and the Air Resources Board produced a strategy to reduce petroleum dependance.

We came up with some rather aggressive goals for reducing petroleum dependance and

1 increasing the amount of alternative fuels in
2 California. And those were later adopted in the
3 2003 Integrated Energy Policy Report.
4 Later, as you said, the Governor, we
5 developed the Bioenergy Action Plan and the
6 Governor subsequently issued an Executive Order
7 which included some production goal targets, in-
8 state production goal targets.
9 (Some telephone line interference
10 was heard.)
11 MR. SMITH: Which included some in-state
12 production goal targets for bioenergy in
13 California starting with 2020 -- excuse me, 20
14 percent of the fuels used we would produce in
15 California by 2010, 40 percent by 2020 and 75
16 percent by 2050.
17 Following that the Energy Commission and
18 the Air Resources Board were tasked through AB
19 1007 to produce the State Alternative Fuels Plan.
20 Essentially what this document did, which we
21 adopted, we jointly adopted in December of '07.
22 It's essentially a plan to increase the
23 amount of alternative fuels in California. It
24 does so on a full fuel cycle basis. And this is
25 really a very important aspect because this is now

1 becoming sort of the common thread through all the
2 work that we do related to alternative fuels, both
3 here at the Energy Commission and at the Air
4 Resources Board.
5 The statute also asked us to establish
6 goals for the use of alternative fuels in
7 California in 2012, 2017 and 2022. And it
8 directed us to establish this plan and at the same
9 time optimize environmental and public health
10 benefits, minimize economic costs and maximize
11 economic benefits to the state.
12 And just very quickly some of the key
13 findings that we produced in the document. We
14 showed that we could meet the petroleum reduction
15 goals that we established back in 2003 in the
16 strategy document. We showed that we could
17 produce, meet the in-state production goals that
18 were identified in the Governor's Executive Order.
19 And what we also showed is that we could
20 partially meet the greenhouse gas targets with
21 existing programs. And what would be needed is a
22 comprehensive program that fostered a greater
23 introduction of alternative fuels in California in
24 order to assure that we could meet the longer term
25 greenhouse gas targets.

1 We also talked about a program, a
2 comprehensive funding program, a long-term
3 comprehensive funding program to accomplish the
4 introduction of alternative fuels.
5 We also showed that over the long-term,
6 between now and 2050, that rather sizeable private
7 investment would be needed in order to make this
8 transition from a petroleum-based economy.
9 And lastly, the goals that we
10 established in the 1007 Plan, as asked for in the
11 statute, was that we showed we could meet 9
12 percent of our transportation needs with
13 alternative fuels by 2012, 11 percent by 2017 and
14 26 percent of the fuels by 2022.
15 And just to put these numbers in context
16 there's a little statistic that we have used from
17 time to time in workshops. The 20 percent figure
18 that I alluded to earlier, if we used 20 percent
19 of the fuel demand in California, that would mean
20 that we would have to add each and every day
21 between now and 2020 approximately one million
22 gallons of new alternative fuel supply in
23 California. So it's a daunting number, it's a
24 huge number. But I just want to make sure
25 everybody has this context of what we, the

1 challenge that we face.
2 Once this document was adopted we
3 immediately began work on the Alternative and
4 Renewable Fuel and Vehicle Technology Program.
5 And we used this document, the State Alternative
6 Fuels Plan, as the basis for designing and
7 implementing this new program that came about, was
8 established as a result of AB 118 and then later
9 modified or amended by AB 109.
10 Essentially as Commissioner Douglas
11 referred to in her opening remarks, the purpose of
12 the program is simple, which is to deploy
13 innovative technologies that transform the
14 transportation market in California to meet the
15 state's very aggressive climate change policies.
16 The statute provides us up to about $120
17 million a year for the next seven-and-a-half
18 years. This first year, fiscal year '08-09 which
19 we are in the middle of right now, we have a
20 current appropriation for 75 million.
21 The grant -- excuse me. The statute
22 provides us a great deal of flexibility in how we,
23 how we dispense this money and gives us a good
24 deal of flexibility in the types of financial
25 instruments and mechanisms we can employ.

1 And it tells us we can award these funds
2 to a fairly broad, excuse me, a fairly broad suite
3 of entities to develop and deploy alternative
4 fuels.
5 I am not going to go down each one of
6 these but the statute essentially says with the
7 money that we are giving the Energy Commission you
8 can fund just about any project that's related to
9 alternative fuel development in California, from
10 research to deployment and implementation.
11 Now interestingly enough the statute and
12 the authors of the statute were wise enough to
13 also include eligible projects such as workforce
14 training, education, promotion and public outreach
15 and the development of technology centers in
16 California. These are very, very important.
17 Particularly we are placing a lot of
18 emphasis on workforce training and economic
19 development through this program. It's one thing
20 to have a program in which you deploy fuels and
21 vehicles in the market. But to sustain that
22 market you are going to need a workforce that is
23 trained to service, to service these new
24 technologies and service these new vehicles.
25 The statute also tells us that in

1 implementing this program we need to develop an
2 investment plan and the investment plan is to
3 identify the priorities and opportunities that the
4 Energy Commission will employ in implementing the
5 program. In doing this we have developed our
6 Draft Investment Plan, it is posted on our
7 website. In fact we had most recently, we had a
8 hearing -- excuse me, an Advisory Committee
9 meeting last week in which we presented, staff
10 presented its recent Investment Plan.
11 The focus of the plan is to make use of
12 existing alternative and renewable fuels that we
13 could put into the marketplace now to begin this
14 transition as quickly as possible away from
15 petroleum. To grab and accrue as much greenhouse
16 gas reduction potential as possible and as early
17 as possible. And to also then begin to create
18 this impetus for the long-term transition to a
19 more diverse market.
20 And what we developed in the Investment
21 Plan is a goal-driven strategy in which we would
22 achieve the AB 32 target, the 2020 target, as well
23 as provide investments looking over the horizon to
24 the 2050 target.
25 And we did this through a two-step

1 process. The first step is just basically to
2 identify the relative contributions of a number of
3 alternative and renewable fuel options, the
4 relative contributions to reducing greenhouse gas
5 emissions.
6 And we started with the 2050 Vision that
7 was developed in the State Alternative Fuels Plan.
8 And that vision was developed jointly with the Air
9 Resources Board when we developed the plan to give
10 policy makers a glimpse of how significantly the
11 transportation market would have to change if we
12 are truly indeed going to meet the Governor's 2050
13 targets. I'm sorry, Susan?
14 ADVISOR BROWN: Five more minutes.
15 MR. SMITH: Five more minutes, okay. We
16 broke this or divided this plan up into several
17 categories of fuels, super-ultra-low, ultra-low,
18 low-carbon and vehicle efficiency.
19 We did this analysis both for light-duty
20 vehicles as well as medium- and heavy-duty
21 vehicles. And the analysis that we did took into
22 account the most recent demand, fuel demand
23 forecast, the effects of the Pavley regulations
24 and the effects of the Low-Carbon Fuel Standard.
25 We also built into the analysis assumptions for

1 reduced vehicle miles traveled leading up to 2050.
2 And I'm sorry the image isn't any bigger
3 but this is essentially our scenario. It is one
4 plausible scenario of obviously many different
5 scenarios that could be constructed but this is
6 the scenario we developed for our Investment Plan
7 for the light-duty sector.
8 The other thing I want to point out here
9 is the purple bar, which is the super-ultra-low-
10 carbon penetration vehicles as being largely of
11 hydrogen and electric drive vehicles. The next
12 bar down is ultra-low-carbon-vehicles, which is
13 fueled largely by biofuels. And I only want to
14 point those two out given the subject of the
15 workshop today.
16 Corresponding then we did a medium- and
17 heavy-duty analysis to examine the types of
18 vehicles that would be needed out through 2050 and
19 the penetrations of different fuels and vehicles
20 to achieve the greenhouse gas reduction totals.
21 I'll very quickly pass through this.
22 It's a Gap Analysis we did to identify where our
23 funding would be most effectively used. And we
24 identified other non-greenhouse gas activities
25 that we would need to fund as part of this

1 program, including workforce training, more work
2 in identifying and understanding sustainability
3 issues, standards and certifications for fuels and
4 vehicles, public outreach and education,
5 analytical support to the program, and
6 importantly, funding that would provide incentives
7 for manufacturing and production facilities in
8 California for fuels as well as alternative fuel
9 vehicles.
10 Given the very short period of time I
11 have left I will not go through each and every one
12 of these recommendations for each of the fuel
13 categories. Suffice to say that there is a large
14 reliance on alternative -- excuse me, on biofuels
15 as we, as we march toward 2050. And that I think
16 is the essence of what we want -- the question
17 that at least I want to raise and the question
18 that is my staff's mind as we develop this
19 Investment Plan. Are we analytically over-relying
20 on biofuels?
21 I want to raise the question just simply
22 for purposes of discussion because we are, as you
23 can see from these tables, we are looking at
24 rather large contributions to the 2050 targets by
25 biofuels. And so we want to be certain that we

1 have enough feedstocks that we can rely on to
2 produce these fuels and meet the targets.
3 This is just a summary of the
4 recommendations that we proposed in our Investment
5 Plan.
6 And I will conclude with this one slide
7 that basically points out the concern or the issue
8 that we want to raise. At left the years are
9 simply the 2012, 2017 and 2022 target dates that
10 came out of the Alternative Fuels Plan. The 2020
11 and 2050 dates are the greenhouse gas target
12 dates.
13 But we wanted to show here that the
14 biomass needed in order to meet these
15 transportation goals, and we are going to add to
16 that the biomass that might be needed to meet
17 electricity goals, you have a total, the fourth
18 column over, the total biomass demand.
19 When you compare that with what we know
20 is available today you can see that we really
21 quickly, by 2022 we really start to bump up
22 against what we believe is economically
23 retrievable today. And certainly to achieve the
24 2050 goal we see that.
25 Now this is analytical. I guess the

1 question that we need to answer as part of this
2 workshop and future workshops is how can we
3 produce more feedstock and more biofuels in
4 California. I'm hoping that's what we will learn
5 more today. Thank you very much.
6 ADVISOR BROWN: Thank you Mike for that
7 excellent presentation. One of my tasks today is
8 to try to keep us on track and on schedule. I am
9 going to hold to our 15 minute per speaker limit
10 to the extent possible.
11 I also want to comment that the issue
12 that Mike raised on limits on feedstock
13 availability will be discussed in our next panel
14 on feedstocks so hold your thinking on that.
15 Procedurally what we would like to do
16 today is -- first of all we are going to allow the
17 Commissioners to interrupt you speakers and ask
18 questions at any time. But I am going to suggest
19 that to keep this orderly and keep it moving that
20 we hold questions from the audience until the
21 conclusion of the panels. So I am going to allow
22 time at the end of our five first speakers for
23 questions, comments, from the audience.
24 Our next speaker is Bob Fletcher. And
25 we are very happy to have Bob here today. And he

is going to speak to you about the Low-Carbon Fuel Standard.

MR. FLETCHER: Commissioner Boyd and Commissioner Douglas, thank you for the opportunity to present here, live and in person. It's a pleasure to be here and to talk about one of my favorite subjects at the moment, our Low-Carbon Fuel Standard. Let me get my time clock going here so I don't get yelled at by Susan.

I think many of you may have seen this slide already. It's basically the motivation for doing the Low-Carbon Fuel Standard and what we hope to achieve. I know because of the smallness here of the slides it's going to be a little difficult to see. I know I was having some trouble and I'm closer than the rest of you.

And our objective really was to create this durable framework for a near- and long-term transition to low-carbon fuels, which of course includes biofuels.

And to establish a stable investment environment. One of the things that we always hear is that there needs to be a motivation to do this. We are hoping to do that.

We expect to expand the alternative fuel

1 market by three to five times by 2020.
2 And really to encourage technology
3 investment and to reward those transportation
4 fuels that have a lower carbon footprint.
5 We also know that with the LCFS we will
6 be promoting both alternative fuels and
7 alternative, lower carbon vehicles to use those
8 fuels.
9 The overall approach is to achieve a ten
10 percent reduction in the carbon intensity of the
11 fuel.
12 We do that by setting a declining carbon
13 intensity standard separately for gasoline and
14 diesel fuel.
15 We then compare the alternative fuels to
16 either the gasoline or the diesel standard
17 depending upon what fuel that they are replacing.
18 And the whole system is set up on a
19 system of tracking credits and deficits of the
20 transportation fuels.
21 The key, kind of one of the most complex
22 parts of the regulations is that we are requiring
23 a full lifecycle analysis including indirect
24 effects, both land use and other effects. And of
25 the -- You know, just kind of a general comment.

1 The rates that I have worked on over the years,
2 this one is one of, clearly one of the most
3 complicated regulations that I have been involved
4 in. There's just lots of little Inside Baseball
5 issues associated with the LCFS that makes it a
6 real challenge.
7 These are the baselines that we are
8 using for the standards. Setting the carbon
9 intensity in 2020, you know, based on what we
10 think gasoline is going to be like in 2020. Which
11 we are currently thinking it should be about a ten
12 percent ethanol fuel.
13 Diesel fuel then is 2010 and ULSD
14 without biomass-based diesel because there really
15 isn't any significant penetration that would
16 affect the carbon intensity.
17 The next two slides basically just show
18 the pathway for the standards for gasoline and
19 gasoline substitutes. You can see in the early
20 years -- This runs from 2010 to 2020. And you can
21 see in the early years we have a fairly gently
22 slope allowing for fuels to come in. And then we
23 ramp that down in the back end of the, of the
24 schedule in more or less of a linear fashion. I
25 think by the time we are done futzing around with

1 this one it probably will be looking pretty linear
2 from 2015 on down to 2020.
3 Credits can be generated in any year for
4 fuels that are cleaner than the standard. And
5 those credits right now would have a unlimited
6 lifetime.
7 You can see the diesel looks remarkably
8 similar to the gasoline standard.
9 We are providing flexible compliance
10 options. You can produce fuels that meet the
11 standard.
12 You can blend a mix of higher and lower
13 carbon fuels that on average meet the standard.
14 You can use previously banked credits.
15 And then you can purchase credits from
16 other fuel providers who have earned credits by
17 exceeding the standards.
18 So there are a number of issues.
19 Forefront to that is actually determining what the
20 carbon intensity of the various fuel pathways are.
21 And, you know, for example, I think we have
22 something like ten different pathways for ethanol
23 depending upon what the process is, what the co-
24 products look like.
25 I am quite certain we will not have all

1 of the pathways figured out by the time the
2 regulation goes to our board. And then there will
3 be other fuels that will come into play at later
4 dates and so we have set up mechanisms in the rule
5 itself that allow for these alternatives to come
6 in and play in the LCFS regulation.
7 The availability, cost and impacts of
8 the low GHG fuels and vehicles using these fuels
9 are certainly an issue that we are addressing.
10 There has been, as many of you know who
11 have been paying even the remotest sense to the
12 LCFS, the indirect land use is one of the more
13 controversial aspects, and direct effects as well
14 for other fuels. So that one we are breaking some
15 ground on and trying to do a thorough technical
16 analysis and I'll talk about that one in a minute
17 a little bit more.
18 Simple things like defining the
19 regulated parties you wouldn't think would be that
20 complicated but it is. Things like electricity.
21 Who actually generates the credits, you know. Is
22 it the consumer who are the ones that are actually
23 putting the fuel in the vehicles, is it the
24 electricity provider? Who exactly is the
25 electricity provider? So just sort of the

1 mechanics of that become very challenging. We
2 have literally spent hundreds of hours just
3 talking about how to do this. Again, it may be
4 that we don't have that completely figured out in
5 March either and we may need to be coming back at
6 the end of the year.
7 And then as Commissioner Boyd mentioned,
8 the objective is to really have sustainable fuel
9 production so we are looking at that. We are
10 looking at how you establish sustainable
11 feedstocks, what sort of reporting that
12 represents. The indirect land use is part of the
13 sustainability provisions but it's only part of
14 it. There are many more aspects associated with
15 sustainability.
16 We do have contracts in place with the
17 University of California at Davis and at Berkeley
18 that have been looking at various ways to
19 establish sustainability metrics. And my guess is
20 this is going to be one that will be coming back
21 in future years with more defined. Because this
22 one goes well beyond the borders of California so
23 this is really becoming a national and
24 international issue.
25 The fuel pathway carbon intensities.

1 This kind of just lists the pathways that we
2 posted.
3 We should be updating the corn ethanol,
4 the gasoline and diesel, CNG, hydrogen,
5 electricity. The soybean biodiesel and landfill
6 gas pathways should be updated with comments that
7 we have gotten hopefully soon. Very soon is
8 Fletcher-speak for I'm not really sure when they
9 are going to be posted but I think they are going
10 to be posted within the next week or so.
11 The additional pathways are listed here
12 again. I'll just list them because it's hard to,
13 hard to read them. But Brazilian sugar cane,
14 renewable diesel from soybeans, LNG. And there
15 are a number of different pathways for LNG
16 depending upon how many pathways you have. If you
17 are looking at Pacific Rim natural gas and you are
18 liquefying it, shipping it, bringing it in, re-
19 gasifying it, shipping it up, then liquefying it
20 and then, you know, either taking it off and
21 filling the vehicle directly, there is a number of
22 different energy processes involved in that.
23 Palm oil-based biodiesel. Cellulosic
24 ethanol, a couple of different pathways.
25 Renewable diesel from waste. GTLs. And I'm sure

there's other pathways that can play and will be ones that we will be continuing to work on.

Let's take a couple of minutes here on the land use change issue just to, to kind of ground ourselves. It is really the conversion of new or existing land brought on by an increased demand for a commodity.

And the example that we used is perhaps natural grasslands or forests converted to soybean farming due to an increased demand arising from soybean cultivation being replaced by corn cultivation. So it's this kind of trickle-down thing that happens and it is a, again, that's an international kind of a global issue that we are trying to bring some, some evaluation into.

We have done that using University of California at Berkeley and Purdue University running basically an economic model that's the Global Technology Analysis Project, GTAP, to estimate different types of land conversion in different parts of the world, depending upon this commodity change. So we use that, we figure out where the land is converted then we apply emission factors to that. And then that allows us to calculate a total GHG carbon intensity.

1 For purposes of the preliminary results
2 that we released in October, we annualized those
3 emissions over 30 years, although the time
4 reporting and how we do that is still an issue
5 that we are, we are looking closely at. There's a
6 number of different ways to do that.
7 This just lists some of the parameters
8 that become important in this analysis. The type
9 and volumes of fuel, the land types, the co-
10 products generated, yields, emissions factors, and
11 then I mentioned the amortization time line.
12 We do have a number of ongoing work in
13 this area. Just for perspective, the preliminary
14 estimate, and again emphasis on preliminary we are
15 still looking, was 35 grams for CO2 per megajoule.
16 this is the metric we are using for the Low-Carbon
17 Fuel Standard. That was for midwest corn ethanol.
18 So that, if you think of the gasoline being at 95
19 you can see that this is a fairly substantial
20 contribution.
21 We are also looking at land use change
22 impacts for biodiesel, Brazilian sugar cane. We
23 hope to have those in the next two or three weeks,
24 preliminary estimates for those. And then we will
25 be following that with cellulosic ethanol and

1 other pathways as we go forward.
2 A biofuel will likely have no land use
3 change when it is not derived from crops, it is
4 derived from cover crops or similar types, or is
5 derived from crops grown on land that's not
6 supporting other crop growth. So we are looking
7 at sort of the full range of doing it.
8 We have run to date, and have posted in
9 our October supporting documentation, seven
10 different compliance scenarios, four for gasoline
11 and three for diesel, that we looked at how we
12 would achieve the standard. And this is a mix of
13 different types of ethanol with different levels
14 of carbon intensity. And we have run different
15 estimates of fuel vehicles and advanced vehicles
16 to show that.
17 And that information is posted on our
18 website. We are running some additional scenarios
19 as well. But it does show that there is a
20 pathway, it is supported if you see the standards
21 that we put in. It takes a little while for the
22 second and third generation biofuels to come in,
23 which is why we are weighting the pathways a
24 little bit heavy towards, towards the tail end.
25 Paul is going to talk about this. This

1 is simply the biofuel volumes. You can see that
2 the green bars on this is the cellulosic biofuels.
3 And it is going to be really important for the
4 federal program to succeed for the LCFS to
5 succeed, because if they can meet the RFS it means
6 that they have figured out, we have figured out
7 the technology to do this and to get plants on the
8 ground. And that's really a key to, to the LCFS
9 successes as well.
10 These are the time lines as they stand
11 today. We have another workshop on January 30
12 where we will release revised language, updated
13 land use estimates, our draft economic and
14 environmental analyses. We will follow that with
15 our traditional rulemaking effort with publishing
16 the staff report and then carrying through to
17 March.
18 I have listed December 2009 on there.
19 Not only because it is the date that we hope to
20 have the -- well, we really need to have the OAL
21 process completed, but I am sure that we will be
22 coming back to the Board with additional
23 amendments in areas that we have not completely
24 worked out in the March time frame. And I will
25 say that March time frame, you know, watch the

space. There is a slight chance that we will move that to April but we haven't completely pulled that trigger yet.

So that's really the summary. The only other comment I would make is that the success of the LCFS is really going to be if we make it beyond our borders. We were very pleased to see the Northeastern States reach essentially a letter of intent and a memorandum -- to develop a memorandum of understanding by the end of this year to develop a low-carbon fuel standard. President-elect Obama has stated, you might have seen in the Sacramento Bee a couple of months ago, a statement that he was supporting a low-carbon fuel standard.

The standard will be much more effective if it is done on a national level because it avoids all sorts of problems like shuffling of crude oils, shuffling of fuels into California simply to meet our standard, where we might not get those sorts of greenhouse gases that we would otherwise -- benefits that we would otherwise.

So that's where we, that's where we stand and I think I have a minute left. But I'll donate it. I'll donate it to Commissioner Boyd.

1 PRESIDING MEMBER BOYD: You see me
2 poised over my microphone here. Bob, a question
3 for you. Can you back up to your bar chart. That
4 one. Is non-advanced biofuels code for corn-based
5 ethanol?
6 MR. FLETCHER: Yes.
7 PRESIDING MEMBER BOYD: Other advanced-
8 biofuels. Can you give me an idea what that
9 little slice means.
10 MR. FLETCHER: I am going to defer that
11 to Paul just because I suspect that he is going to
12 talk a lot about that in his presentation since
13 his is on the EISA.
14 PRESIDING MEMBER BOYD: Okay, that's
15 fine.
16 MR. FLETCHER: I mean, I can, I can do
17 it but he is going to go through in some detail I
18 think.
19 PRESIDING MEMBER BOYD: All right,
20 appreciate that. That's all I had.
21 ADVISOR BROWN: Thank you Bob for that
22 very comprehensive and complete presentation.
23 Again, keep your questions in mind because after
24 the next three speakers we will have an
25 opportunity for discussion and questions from the

1 audience.
2 Paul, are you with us now on WebEx and
3 audio?
4 MR. ARGYROPOULOS: I certainly am, thank
5 you, Susan.
6 ADVISOR BROWN: Excellent. Well Paul, I
7 am just going to let you take it away. We are
8 very pleased Paul could be here with us virtually
9 from the US Environmental Protection Agency. He
10 is going to put this discussion we just had on the
11 Low-Carbon Fuel Standard in the context of the
12 Renewable Fuel Standard at the federal level. So
13 take it away, Paul.
14 MR. ARGYROPOULOS: Okay, thank you. I'm
15 sorry I couldn't be there in person. Believe me,
16 I'd rather be in Sacramento today than here in DC.
17 I guess I can advance this just with the
18 normal function keys; is that correct?
19 MR. NGUYEN: Correct.
20 MR. ARGYROPOULOS: Okay. I don't know
21 if there's a delay or.
22 MR. NGUYEN: Can you click on the slide,
23 please.
24 MR. ARGYROPOULOS: Okay. And then just
25 page down?

1 MR. NGUYEN: Right.
2 MR. ARGYROPOULOS: Okay, thank you.
3 Just a real quick overview. I am going
4 to give a very quick overview of where we are with
5 the Renewable Fuel Standard we are currently
6 operating under which is set forth under EPAct.
7 I am going to get into an overview of
8 the development process for the Renewable Fuels
9 Standard, calling it the RFS 2 under EISA, working
10 on some of the more specific, detailed highlights
11 of that.
12 I'll talk a little bit about some of the
13 other implications coming out of EISA with regard
14 to biofuels. Kind of where we are, the status and
15 next steps.
16 EPAct established the first national
17 program, a lofty goal of 7.5 billion gallons by
18 2012. Starting in 2006 we basically implemented a
19 default rule. Congress basically gave us about
20 four months to put forth a proposal, a final and
21 implementation regulations into effect in a four
22 month period. So that didn't happen but we
23 quickly worked through that in record time. We
24 got a proposal out and ultimately implemented the
25 final rules in the spring of 2007 and then the

1 final program in September of 2007.
2 Of course EISA shortly followed that.
3 But what it required was that we apply a renewable
4 fuel obligation based on the volumetric
5 requirements that would impact. And then apply
6 those, turn them into a percentage basis to
7 obligated parties who would then be required to
8 either blend or trade for in credits, renewable
9 credits, for renewable products so they could meet
10 their obligations.
11 A flexible program was designed that if
12 you weren't, didn't have easy access or cost
13 prohibited access to ethanol or other renewable
14 products to meet your obligations you could also
15 meet that in a number of other ways. And again, I
16 won't get into that.
17 It was based on an energy value and we
18 equated the credits based on corn ethanol. We
19 looked at the energy values of other products such
20 as biodiesel that has a higher energy density
21 there and therefore you would establish those
22 credits. So one unique aspect of that was that
23 the Act specified that cellulosic biomass ethanol
24 would get a two-and-a-half to one credit. Again,
25 that was an incentive along with a very small,

1 volumetric that was set forth in the Act.
2 EISA was signed in December of 2007. We
3 quickly began work on that. Ultimately it set
4 forth a number of major modifications to the RFS 1
5 program so it began in 2009 and I'll talk about
6 those in the next couple of slides.
7 But we planned on and did utilize the
8 process that we utilized for developing the RFS 1,
9 a solid foundation to work very quickly and engage
10 often with as many stakeholders as possible to
11 develop the program. So that at the end of the
12 day when we went to proposal we were pretty much
13 near final and did the final sweep in a very
14 efficient and timely fashion. And then go towards
15 implementation quickly as well.
16 We have had a little bit of stumbling
17 blocks on those over the past couple of months.
18 I'll get into that a little bit later on. But we
19 obviously had to work very closely with our other
20 federal partners.
21 Here are some of the significant
22 changes. The first, it increased the volume
23 beginning in 2008. RFS 1 was 5.4 billion gallons,
24 it immediately moved to the 9 billion gallon
25 number set forth by administrative action last

1 February. The volumes are escalating from 2008 to
2 2022 to a total of 36 billion gallons.
3 And there's four new categories
4 actually. Before it was one category of renewable
5 fuels and you had a value for the various
6 renewable products. And I am going to get into
7 the specifics of what these categories are. One
8 of the keys here is that it included not only
9 volumetric standards for the various categories
10 but also requires that these new products meet
11 minimum reductions of greenhouse gases of the
12 products to replace.
13 I am not going to get into the waivers,
14 it's a very complicated issue there. But needless
15 to say, Congress did recognize there were some
16 potential issues associated with quickly expanding
17 renewable products, the various types of products
18 and also the fact that some of these products such
19 as cellulosic ethanol is really not commercially
20 available right now. Particularly in the volumes
21 that we are looking at to increase (inaudible).
22 So there are some provisions in there to address
23 this.
24 And there's also some other studies and
25 reports. This is an energy program. It does have

1 the environmental element, the base for the
2 greenhouse gas emission reduction requirements and
3 there are other environmental issues associated
4 with the report that need to be (inaudible).
5 Just really quickly, these are the
6 categories here. These are actually the specific
7 categories of the fuels, biomass-based diesel has
8 its own carve-out. It actually is a volumetric
9 requirement. Beginning this year it is moving to
10 one billion gallons. Basically these are static.
11 These are minimums, they are not active.
12 Non-cellulosic advanced fuel category.
13 I'll get into what the greenhouse gas values are
14 on the next slide or two. And then cellulosic
15 biofuel. And of course renewable, renewable fuel
16 as well.
17 The lighter, the column on the left
18 immediately there, really what we consider that to
19 be is corn ethanol. And I think, Jim, that gets
20 back to your question to the ARB. Conventional
21 biofuels, it doesn't have to be corn ethanol but
22 it was a cap of 15 billion gallons of corn starch
23 based ethanol that was included in this
24 conventional perspective.
25 The other key changes here. One, RFS 1

1 really only applies to gasoline. RFS 2 under EISA
2 moved from highway gasoline to both gasoline and
3 diesel and both on- and non-road fuels.
4 It also allows, even though these aren't
5 part of the obligated volume standards, jet fuel
6 and heating oil which are blended with renewable
7 fuel can also generate or use RINs for compliance
8 purposes. So it is an additional outlet for
9 renewable products to be able to penetrate
10 (inaudible).
11 There are some significant definitional
12 changes. One of them is, again, the life cycle
13 defined and it also sets the threshold.
14 The other one is the grandfathering
15 provision. Again, that is -- I am not going to
16 get into the details of that but basically what it
17 allows is for those facilities that were in
18 operation or basically under construction for that
19 volume of those products to be able to continue to
20 be sold into the market in a compliance fashion
21 without actually having to meet a minimum
22 greenhouse gas reduction threshold.
23 New renewable biomass definitions. It
24 basically says that the feedstock to produce the
25 fuels in order for it to comply have to come from

land that was previously cultivated prior to enactment. And there are some other specific land restrictions in there as well as those used from biomass (inaudible).

I want people to also recognize the advances of this program. We really have all the way throughout the supply chain issues that we have to deal with, certifying feedstock and the lands that came from, all the way to the distribution system for producing those fuels, impacting the greenhouse gas emissions. Both from the direct and indirect land use issue, the conversion of that. Energy sources and impacting how the co-products (inaudible). Really looking at everything all the way to the end use and how it affects greenhouse gas emissions. So there are compliance requirements, regulatory requirements that have to be imposed in order to verify all of this.

And again, we are not living in the conventional world that we had in the past with crude oil from a refinery and you regulate the emissions of the vehicles. And then adopt the emission control devices and the fuel restrictions that are applied to help support these emission

1 standards.

2 We have multiple interests, various

3 sectors, multiple parties in those sectors. And

4 the interests vary even within the sectors and

5 it's all across the board. So it's kind of a

6 game-changing initiative that we have had to deal

7 with here. A very comprehensive effort going on

8 to develop this program.

9 The critical element, as most people

10 have been aware of and are interested in is the

11 lifecycle assessment. Again, other than the

12 grandfathered fuels conventional fuel must meet a

13 minimum 20 percent lifecycle greenhouse gas

14 reduction threshold. These are all compared to an

15 established 2005 petroleum baseline.

16 Advanced biofuels. And Jim, this also

17 gets to your point. They need to be a minimum of

18 50 percent lifecycle greenhouse gas reduction. We

19 are expecting that sugar-based ethanol from Brazil

20 is one of those that might have an opportunity to

21 play in the advanced category and there are

22 specific advanced volumes that are there. But the

23 standard is that it must meet a 50 percent

24 lifecycle reduction.

25 And again the biomass-based diesel.

1 That has its own volumes carved out. It also must
2 be a 50 percent reduction.
3 And then the cellulosic biofuel. The
4 most aggressive reduction requirement.
5 We do have the authority, and this is
6 one of the little nuances that was also set forth
7 in EISA, to adjust the lifecycle thresholds by as
8 much as ten percent. We don't have to go a full
9 ten percent. But really what that means is you
10 can move from 60 down to 50, 50 down to 40 and 20
11 down to 10. You don't have to go all the way.
12 But if some of these fuels aren't meeting those
13 categories there has to be some way for these
14 obligated parties to comply. So an adjustment is
15 ultimately allowed under the authority.
16 This is a quick pass-through slide. one
17 of the biggest issues, again, is the definitional
18 requirements that we have the duty to evaluate.
19 Really where most of the emphasis and focus has
20 been, from the comments that we have been
21 receiving externally on the analysis that we are
22 doing, the indirect emissions are significant
23 impacts on our assessment. And therefore that's
24 why I would say over the course of the last four
25 or five months really when the general results

1 have been put forth people have had some eyebrow
2 raising over this. That's one of the reasons why
3 we struggled a little bit to get the rule out.
4 This is what we are covering. Again,
5 the direct emissions. All the way from feedstock,
6 planting the seeds to harvesting the feedstock.
7 The energy used to harvest those, the energy used
8 in distributing the feedstocks to the
9 biorefineries or the production of the biofuel
10 ultimately to the final point of distribution.
11 There's significant assessment going on.
12 We have multiple models that are being used.
13 Actually certain recognition of the various
14 models. I'm not going to get into these but we
15 have, I think from an international perspective,
16 the most advanced. Obviously we are working very
17 closely with California and the international
18 group, including the European Commission, on this
19 framework. And also the information that is going
20 into a significant amount of models that are
21 necessary. There is no one, one model tool.
22 This next slide here is kind of a
23 schematic of how all of these things fit together.
24 The various models and the various parts of the
25 supply chain from the biomass production all the

1 way to the fuel use. And then the types of models
2 are there on the side that I won't go into.
3 But again, we have an incredible effort
4 going on here. And there's one thing I do want to
5 make mention of. We didn't just start this
6 (inaudible). We actually did work under RFS 1.
7 We were doing a lot of work for the refinement
8 under the initiative, the Executive Order the
9 President put forth in 2007, which was
10 (inaudible). So it's not new to us.
11 The rulemaking as a whole. As I
12 mentioned earlier there's a lot of different
13 things that need to be analyzed under our
14 regulatory impact analysis and framework for
15 developing regulations. We really have to do an
16 analytical approach to assessment for our
17 rulemaking. These are many of the areas that we
18 are covering in the impact analysis. Of course
19 the agricultural section impacts analysis is
20 critical along with the water and soil impacts and
21 (inaudible).
22 Where we are right now. The package has
23 been in inter-agency review for a while.
24 Basically we sent to the Office of Management and
25 Budget back in late October or early November.

1 What is required in the inter-agency process. We
2 distribute that to the other agencies. They
3 review it, they provide comments back through OMB
4 to us and then we go into the process of making
5 any necessary changes. They have a 90 day period
6 to do that. We are nearing the end of that 90 day
7 period right now.
8 We basically believe that we have
9 received al comments other than comments actually
10 from the Office of Management and Budget.
11 Obviously we are not going to get this done before
12 the administration changes but one of our
13 priorities (inaudible). Therefore I have no idea
14 when the proposal is actually going to come up but
15 we hope it will be in the near future. How that
16 matches up with what California is doing yet
17 remains to be seen.
18 But we will need to ultimately issue a
19 final and provide some level of lead time for the
20 industry to be able to prepare for implementation.
21 And again, our intention is to implement the
22 program in 2010.
23 You had asked a number of questions. I
24 think there's a number of things that are going
25 on. Really what things are happening out there

1 both at the federal and state regulatory programs
2 or policies that are forcing certain issues.
3 One of those is the Blend Wall, where we
4 have restrictions about the percentage of ethanol
5 that can be used in gasoline in volume percent.
6 And at some point with these volumes, increased
7 volumes, every gallon of gasoline in the country
8 will need to have ten percent ethanol and then we
9 will be beyond the ability to absorb in the
10 additional gasoline pool the additional volumes
11 required. So they need to go somewhere else or
12 there needs to be some other type of biofuel such
13 as biodiesel or biobutanol. Or actually
14 penetration, higher penetration levels.
15 So that's one of the type of issues that
16 out here. There's a host of them. There's a lot
17 of federal work going on. Sustainability. Food
18 versus fuel issues. Obviously the lifecycle
19 modeling framework is a critical issue on the
20 international front as well. Many, many
21 activities, many, many issues, which I know you
22 guys in California are confronted with.
23 And then the last couple of slides here.
24 There are two other things. One is Section 204 of
25 EISA. Again recognizing this is energy policy

1 even though there is a greenhouse gas component to
2 it. There's a lot of environmental issues, air
3 quality, water quality, biodiverse ecosystem
4 issues associated with expanding the production of
5 these biofuels all the way from feedstocks to the
6 end use. So we are required under 204 to develop
7 and to report every three years about the impacts
8 or the potential impacts of the renewable fuels.
9 We are working on developing that internally here
10 at EPA and (inaudible).
11 One other interesting is Section 209
12 which basically says, okay, we're telling you that
13 you need to implement this new Renewable Fuels
14 Standard. But if there are adverse impacts in air
15 quality as a result of these changes you need to
16 look at what those are. And then ultimately we
17 have been given, through authority, to require
18 additional fuel regulations to mitigate to the
19 greatest extent possible these impacts.
20 So that fuel program and our energy
21 policy, they are giving us authority based on
22 potential air quality issues, to look at and
23 potentially develop another fuel regulation to
24 mitigate that.
25 And that is a very quick, hopefully not

too quick overview from my end. Thank you for your time. I'm sorry I'm not there.

PRESIDING MEMBER BOYD: Thank you, Paul.

ADVISOR BROWN: Are there questions from the Commissioners?

Paul, thank you so much for that comprehensive presentation. I hope you can stay with us through the end of this panel because I believe there will be some comments and questions from the floor.

MR. ARGYROPOULOS: Certainly.

ADVISOR BROWN: Can you?

MR. ARGYROPOULOS: Yes, I will stay for the panel, thank you.

ADVISOR BROWN: Excellent, thank you.

With that I am going to introduce Fernando Bert¢n from the Integrated Waste Management Board.

MR. BERT N: I'm delighted to be here. I'm glad it is much bigger on the screen because I was noticing that I was having trouble seeing the slides, even with glasses. Which means I need to make an appointment with the eye doctor.

A catchy little title, Harvesting the Seeds of Change -- Harvesting Emerging

1 Technologies. There seems to be an aversion to
2 change in many ways but one of the things that I
3 am going to be talking about are some of the
4 policy drivers at the Waste Board. And a lot of
5 it is related to the feedstock that I think can be
6 provided for biofuel production.
7 So what I am going to be talking about
8 specifically are the Integrated Waste Management
9 Act then a series of strategic directives that the
10 Board adopted back in February of 2007.
11 But before I do that I do want to set a
12 little bit of context. And that is, you know,
13 when the law, the Integrated Waste Management Act
14 was passed in 1989 we were looking at a landfill
15 crisis so the law required a 50 percent diversion
16 by the year 2000. And while this slide shows data
17 for 2004 we obviously need to be updated. We have
18 actually achieved a 58 percent diversion rate for
19 this year.
20 Unfortunately we have also increased our
21 disposal. And we are still actually disposing of
22 about anywhere between 40 and 43 million tons
23 annually. So all we really have been able to do
24 is divert our population growth. We haven't
25 really seen any disposal reduction.

1 You will probably see this slide a few
2 times today. This is basically the biomass
3 resources in California. About 80 million bone
4 dry annually from three main sectors, agriculture,
5 forestry and waste. And obviously I'll be
6 focusing on the waste part. A lot of that is in
7 the LA Basin and the San Francisco Bay Area.
8 If you look a little more closely at the
9 waste characterization in California, about 42
10 million tons is disposed of in 2005. Of that 42
11 million, 23 million tons is biological in origin.
12 Plus we have about 5.7 tons of plastics and
13 textile. So about half the energy value, 56
14 percent, being biomass materials. So we are
15 burying a lot of BTUs and a lot of energy
16 potential.
17 One of the things that we did was we
18 undertook a study to look at the residuals coming
19 out a materials recovery facility. And overall
20 there's about 7.4 million tons of what we call
21 post-MRF residuals. This is material that all the
22 recycleables to the extent possible have been
23 pulled out. And even with that we have 7.4
24 million tons.
25 And what is interesting, of that amount

1 26.1 percent are organic in nature. You've got
2 32, almost 33 percent that's paper, more than
3 likely contaminated paper. What you have seen is
4 a lot of jurisdictions go to single stream
5 recycling. And while it may have a larger volume
6 of recycleables being collected, with that single
7 stream there has been some increase in
8 contamination of some of the paper too. So the
9 commodity brokers have rejected some of those
10 loads. So the paper which, you know, has the
11 cellulose in it, ends up being landfilled.
12 Also with plastic, just over 17 percent.
13 Plastic has a lot of BTU value to it.
14 The other issue that, you know, we are
15 dealing with is population growth. As this slide
16 and the next slide show, our population growth
17 will certainly increase our urban footprint. That
18 means more garbage, more people, more cars, more
19 need for gasoline or other fuels.
20 And as the next slide shows, a lot of
21 that growth will occur actually in the Central
22 Valley and in the Inland Empire. So we have to
23 look forward and set the stages so that we can
24 deal with the population growth.
25 It is increasingly difficult to site new

1 landfills. It is increasingly difficult to expand
2 existing landfills. It is tough to even site a
3 mini mart, forget about a compost facility or a
4 conversion facility. So there's a lot of
5 NIMBYism. Everybody wants their garbage picked up
6 but nobody wants to put it down.
7 While this slide is very busy the main
8 point of this slide is that of the biomass
9 components of municipal solid waste there's about
10 a 43.6 million ton barrel of chemical energy
11 equivalent that's being buried. If you factor in
12 plastics that's 23.4 million barrels of oil. All
13 total, 67 million barrels of oil, of energy,
14 chemical energy equivalent that's being buried in
15 our landfills. So there's a lot of feedstock.
16 And one thing I failed to mention when I
17 showed the slide about the post-MRF residuals, the
18 Board has been very consistent, the Waste Board
19 that is, has been very consistent in its message
20 that the target material for these kinds of
21 processes, whether it is for electricity or
22 biofuel production, are post-MRF residuals. Those
23 materials that are destined for landfills after
24 all recyclables have been pulled out. So, you
25 know, you have this debate of what's a higher and

1 better use, which I will discuss in a little bit.
2 From just another perspective. The
3 energy from solid waste that is currently being
4 produced, and primarily this is all electricity,
5 we have got 30 solid fuel combustion facilities
6 with a gross capacity of 640 megawatts.
7 About 60 landfill gas-to-energy
8 facilities. And, you know, it's difficult to
9 increase the landfill gas-to-energy production
10 because of some of the very stringent NOx rules
11 too. So we do have a project that is looking at
12 converting landfill gas to CNG or LNG that we
13 funded along, I believe along with the Energy
14 Commission.
15 Now this is the issue of the higher and
16 better use debate. Some of the technologies that
17 are used to produce the biofuels, that can be used
18 to produce the biofuels are high temperature
19 technologies. So there is a perception of these
20 technologies that they are incinerators in
21 disguise and there is a real aversion to
22 incineration.
23 Well from my perspective incineration is
24 just volume reduction without harnessing the
25 energy value or the chemical value. With

1 processes that can be used to convert the material
2 that is destined for a landfill anyway into a
3 biofuel, to me is not an incinerator.
4 There is also the perception that these
5 technologies would harm the existing recycling
6 infrastructure. Well a lot of these technologies
7 don't want your typical recyclables. They don't
8 want your metals, they don't want your glass.
9 They could do without the One and Two plastic
10 because they know that those have a higher
11 recycling value. The film plastic, which really
12 doesn't have much of a recycling market, are good
13 targets for these kinds of processes.
14 So in many respects these kinds of
15 technologies could enhance a recycling program.
16 We did a lifecycle analysis back in 2003, 2004
17 where the analysis showed that a jurisdiction
18 could increase their recycling by around 12
19 percent. Because what we would require from a
20 permit is some sort of up-front recycling prior to
21 conversion.
22 So you would essentially have three
23 degrees of separation. The first degree being at
24 the curb, at the home, the second degree being at
25 the MRF, the third degree being prior to

1 conversion. So I can't make a Kevin Bacon game
2 out of it, which is seven degrees of separation,
3 but at least this is three degrees of separation.
4 So, you know, everybody likes the product of
5 biofuels but nobody likes the process. Well you
6 can't have one without the other.
7 Regardless of that, the Board has
8 adopted some policies to move forward. Strategic
9 Directive 6.1 targets the organic, the biomass
10 fraction of the organics being landfilled. And
11 these directives were adopted by the Board in
12 February of 2007 to sort of better, you know, set
13 us down the path of achieving multiple goals for
14 multiple policies, both in terms of the Integrated
15 Waste Management Act, the Governor's Executive
16 Order on renewable fuels and the RPS as well. So
17 these kinds of processes using this kind of
18 feedstock could achieve a number of, a number of
19 goals.
20 This particular sub-directive, again, is
21 targeted toward the largest fraction being
22 landfilled and that's the compostable fraction.
23 So we have these aggressive, this aggressive goal
24 of 50 percent by 2020. What that really means is
25 we would need 50 to 100 new facilities of any

1 sort, whether it's compost or conversion or
2 something. So that's a daunting task.
3 And part of that task, if we are to
4 achieve it, deals with Strategic Directive 8.4 in
5 terms of enforcement and permitting. What this
6 strategic directive does is have -- you know, we
7 are to look at our regulations and make sure that
8 the regulations are grounded in the best available
9 science, address the existing and changing market
10 conditions, and also to take advantage of
11 developing technologies.
12 We look at our, we look at our existing
13 regulations and a lot of these new technologies,
14 there is no way to classify them because, you
15 know, when these regulations were developed these
16 kinds of biofuels technologies were just barely a
17 glimmer in someone's eye. So the regulations
18 aren't flexible enough to accommodate these new
19 technologies. There is no box to check that says,
20 other.
21 So we have to look at the existing
22 statutes as well. Which is a whole other story.
23 I can go off on that for a long time, which I
24 won't because I don't want Susan's wrath. It's a
25 nice wrath though. At any rate, so the bottom

1 line is we are looking at the regulations to make
2 sure they are updated and take advantage of, and
3 make it flexible enough to accommodate changing
4 technologies.
5 Then the other important strategic
6 directive is Strategic Directive 9.0 dealing with
7 research and development of technology. You know,
8 this sub-directive sets the foundation for
9 coordinating our research activities to encourage
10 the necessary innovations and technologies that
11 are key to increased diversion and intelligent
12 resource management. As well as, as well as
13 accomplishing multiple policy goals, like the
14 Governor's Executive Orders and RPS.
15 So SD 9.1 is to develop a focused
16 process to coordinate those activities, 9.2 is to
17 encourage the development of alternative energy
18 and biofuels. It's pretty straightforward right
19 there, you know. It's a major policy. So we're
20 trying to, you know, see what we can do. Items 3
21 and 4 are pretty, pretty self-explanatory. Play
22 an active role in the bioenergy interagency
23 working group, which we are an active member, as
24 well as the Climate Action Team.
25 A couple of things that I do want to

1 highlight as far as Strategic directive 9.2 on the
2 alternative, as far as biofuels. We do have, we
3 have sponsored a number of things. We did have a
4 board-sponsored workshop back in March of 2007.
5 We did this in coordination with the California
6 Biomass Collaborative's annual forum.
7 In May of 2007 the Board awarded a grant
8 to the Gas Technology Institute for a liquified
9 natural gas system and a demonstration project at
10 the Altamont landfill, which might be discussed a
11 little bit further in Val's talk.
12 We also held a workshop in July of 2007
13 on bioenergy and biofuels-related activities that
14 included a presentation by UC Davis on the
15 feasibility of producing hydrogen from landfill
16 gas and using hydrogen in landfill gas
17 purification processes. That study, that report
18 is available on-line. If anybody would like a
19 copy just let me know and I can shoot you the link
20 to it.
21 (Whereupon, Commissioner Douglas
22 exited the meeting room.)
23 MR. BERT N: In addition the Board
24 approved a contract with among others UC Davis and
25 UC San Diego for a gasification project to look

1 at, to gasify among other things post-MRF
2 residuals to mixed alcohols. And that project is
3 taking place in Yolo County.
4 A couple of other things. There's the
5 BlueFire Ethanol project in the Lancaster landfill
6 that is moving forward. And we have also -- are
7 undertaking, trying to develop a lifecycle tool
8 that would look specifically at organic materials,
9 the biodegradable, organic materials.
10 So we have -- The company that did the
11 lifecycle analysis for us a few years ago is
12 developing a model that would look specifically at
13 organics that would be available to local
14 jurisdictions or anybody where they can, they can
15 tinker with it. It would be very user-friendly
16 and much more compatible to their local situation.
17 So they can, they can look at what the lifecycle
18 implications of a certain amount, a certain type
19 of feedstock using a certain kind of process would
20 have.
21 So we are a little bit delayed on that
22 project because with the Governor and the delay of
23 the contracts back in late summer we got a little
24 bit behind. But we do anticipate having that come
25 to completion probably mid-summer.

1 And lastly, there is a proposal in
2 Riverside County. It would be an anaerobic
3 digestion project that would be co-located at a
4 materials recovery facility. And the methane gas
5 would actually be converted to compressed natural
6 gas. That material, that CNG would be used to run
7 the fleet of vehicles that the waste management
8 company operates.
9 And that's about it. So if you have any
10 questions I'd be happy to answer them afterwards.
11 There's my contact information. If you want
12 copies of the hydrogen report there is my e-mail.
13 Thank you very much.
14 PRESIDING MEMBER BOYD: Fernando, could
15 I ask you a question before you get away?
16 MR. BERT N: Sure.
17 PRESIDING MEMBER BOYD: Since Susan gave
18 me permission to ask questions.
19 (Laughter)
20 PRESIDING MEMBER BOYD: You're getting
21 quite a reputation today, Susan.
22 ADVISOR BROWN: I know, I'm getting
23 embarrassed.
24 PRESIDING MEMBER BOYD: Fernando, before
25 you got to your slide on perception of

technologies but after you had started I was suddenly reminded of the long years you and I have worked this topic together, biomass in general and all the -- And I wrote some notes to ask you a question which was about barriers to getting to or getting at landfill resources.

And my note said, recycling fears stifling the landfill, business fears, compost interference fears, fear of mass burning for electricity or energy are just plain incineration. Then you got to your slide on perception of technologies, which is a much more diplomatic and polite way of addressing problems.

But I won't protract this too long today. I have been at this for over ten years really directly and indirectly for lots of years before that. And these fears or these concerns or these barriers have been there the entire time. It is taking, in my opinion, us just way too long to knock down these barriers and to address these fears, thus we have not made the progress, in my opinion, that could have been made in this arena.

And we are really desperate now to knock down these barriers, solve some of these problems. Some of them actually involve legislation that

needs to be modified. But the only way we can do that is address these perceptions and knock down these fears. But I think that is going to have to become a very major component of our ongoing program in this year 2009 when we still just have terrible times getting at this resource material because of these perceptions or fears.

I don't know if you want to elaborate any more on the barriers in this public setting or whether we just keep at it. But I think it needs to be made a little more public because within the bioenergy working group, you know, we have been incredibly frustrated by running into these barriers constantly and not being able to successfully knock them down. So I see this as a very major effort we need to undertake in this year if we are going to finally get at this resource.

And in this world of the desperate needs of all forms of energy, of diversifying our energy base. And this moment I am not limiting it to biofuels but this is certainly a big one, we have got to get at this material and convince all these people that, as you did in your description of the slide, that there's room for everybody and it is

1 not going to eliminate anything, so on and so
2 forth.
3 I don't know if that's a question or
4 it's turned into more of a statement since you
5 addressed the question. I don't know if you want
6 to say anything more on the subject or whether you
7 now become the key diplomatic leader of the effort
8 and I stand in the, in the wings with my
9 frustration and anger boiling up a little bit.
10 MR. BERT N: I'm not sure what else to
11 say other than I agree with everything you say.
12 It has been frustrating and it's frustrating for
13 local governments too. So, You know, what some of
14 the governments are doing, they're moving forward.
15 Irrespective of any state policy they are moving
16 forward. So that may be the policies will be
17 pushed from the bottom up rather than the top
18 down. Because they have a need to get stuff done
19 and, you know, they can't be waiting for us. They
20 have got waste management issues to deal with.
21 As an example, the Puente Hills landfill
22 is going to be closing in 2013. That's 13,000
23 tons a day that has to find a home. And, you
24 know, trying to parse that 13,000 tons a day in
25 the LA Basin is going to be very difficult. So

1 we're looking at a $500 million rail haul system.
2 And that's just to build a spur and the material
3 recovery facility. That doesn't include, you
4 know, some of the hauling costs.
5 You know, the other thing is that these
6 technologies, it is not a panacea. These
7 technologies are not a panacea. It's one in a
8 menu of many, many options. I don't think these
9 technologies will be built unfettered without,
10 without environmental controls. There's a lot of
11 feedstock to go around for everybody. You're not
12 going to see 30 of these kinds of technologies
13 built within the next ten years that will really
14 pull the market away from this, that or the other.
15 As far as definitions are concerned, you
16 know. Yeah, the definitions need to be based on
17 science. Real science, not political science.
18 And a lot of times you get addition by
19 subtraction. That is, just delete the definitions
20 in statute and let them be handled by regulation
21 or by guidance. That's all I have to say.
22 PRESIDING MEMBER BOYD: Thanks. Thanks,
23 Fernando.
24 ADVISOR BROWN: Thank you. We have one
25 last speaker before our panel concludes and we are

1 hoping to take a break around 11 o'clock. And we
2 will provide an opportunity again for folks to ask
3 questions or raise issues with the panel members.
4 At this time I am pleased to introduce
5 Valentino Tiangco. Dr. Tiangco is the lead for
6 our advanced generation program in our Public
7 Interest Energy Research group. So Val.
8 DR. TIANGCO: Thank you, Susan. I like
9 this subject area a lot. For some of you who are
10 involved in biofuels production since 1990, our
11 motto for this subject area is Drink the Best and
12 Burn the Rest.
13 (Laughter)
14 DR. TIANGCO: I make my own biofuel so I
15 can say that. This is a short and abbreviated
16 summary of what we have heard today. The
17 initiatives affecting biofuel production in the
18 state. Without spending much on this I have two
19 slides, and have to add the AB 118 in these slides
20 as one of the policy initiatives.
21 How much biomass resources do we have in
22 the state? We have over 80 million bone dry tons
23 of biomass fuels coming from agriculture, forestry
24 and urban wood waste from municipal solid wastes.
25 Out of this 80-plus million bone dry

1 tons of biomass resources we have about 30-plus or
2 32 million bone dry tons technically available.
3 Which is equivalent to about 507 trillion BTUs per
4 year. These fuels are distributed throughout the
5 state. And I will not dwell so much on this
6 because Steve Kaffka will share more of the
7 information on the amount of biomass feedstock in
8 the state.
9 In terms of energy conversion pathways
10 we have basically two conversion pathways. One is
11 the thermochemical energy conversion pathway,
12 second is the biochemical energy conversion
13 pathway. To convert biomass to biofuels using all
14 these biomass feedstocks that I have mentioned,
15 agriculture, residue, forest residue and municipal
16 solid waste.
17 In terms of using them for biofuel
18 production, of course you need to process and
19 handle properly these fuels. You need to have the
20 proper equipment to separate the process to handle
21 and also use them adequately for this conversion
22 process. You can produce ethanol, biodiesel,
23 methanol and other biofuels. And also you can
24 produce power and other value added products.
25 In terms of the current consumption in

1 the state. We are consuming over 900-plus million
2 gallons of ethanol in the state and also we are
3 consuming over 43 million gallons of biodiesel per
4 year in the state. In terms of diesel we are
5 consuming about three billion gallons of diesel a
6 year.
7 Executive Order S-06-06 set forth the
8 target goals for biofuel production in the state.
9 For 2010 there is a target goal to produce 20
10 percent in-state production of biofuel. The
11 demand for 2010 is approximately 1.4 billion
12 gallons per year so 20 percent of that demand is
13 about .3 billion gallons per year, gasoline
14 gallons equivalent.
15 And for 2020 we need to produce in-state
16 40 percent of the biofuel production. And the
17 demand by that time is approximately 2.1 billion
18 gallons per year so we need to produce in-state .8
19 billion gallons per year gasoline gallons
20 equivalent.
21 And by 2050 the demand is about 3.9, we
22 need to produce 75 percent in-state. And then the
23 production in-state should be equivalent to 2.9
24 billion gallons per year gasoline gallons
25 equivalent.

1 This chart shows also if we use E20,
2 E10, E5.7 and also the diesel if you use B10, B5
3 or B20. And you can see the trajectories of how
4 much we need to produce using those fuel blends.
5 We have in terms of ethanol production,
6 there are as of yesterday 175 ethanol plants being
7 built and producing about -- the capacity is over
8 10,000 million gallons per year capacity. This is
9 information that has been produced by the Ethanol
10 Producer Magazine yesterday.
11 And in the state we are producing --
12 I'll tell you. We are producing about 190 million
13 gallons per year currently from the seven ethanol
14 power plants using corn, cheese whey and beverage
15 waste. At the moment one of the Pacific Ethanol
16 plants is in idle mode. It was producing 40
17 million gallons per year.
18 Last year, early last year or late 2007
19 I reported over 80 million gallons per year. So
20 this is progress, you are producing 191. But if
21 you include the idle that's over 200-plus million
22 gallons per year.
23 In terms of cellulosic biomass to
24 ethanol. This graph shows some of the cellulosic
25 biomass to ethanol projects in the entire nation.

1 We have three projects currently going on, one in
2 Lancaster, one in Corona. They are both BlueFire
3 ethanol projects funded by the US Department of
4 Energy. And then the one in Brawley is the sugar
5 cane, potential sugar cane to ethanol plant.
6 This chart shows all the DOE biofuel
7 projects funded by the US DOE including the nine,
8 small-scale biorefinery projects that got funded
9 last year. The four commercial scale biorefinery
10 projects, the four improved enzyme projects, the
11 five projects for fermentation organisms, the five
12 thermochemical syngas projects, the three Office
13 of Science Bioenergy Centers, one located in --
14 You will hear a speaker on this one, on the Joint
15 Bioenergy Institute, one I believe in Des Moines,
16 Illinois (sic) and in Oak Ridge, Tennessee. And
17 also this chart shows the five thermochemical bio-
18 oil projects that got funded last year and also
19 the six university projects that got funded late
20 last year.
21 In terms of biodiesel. The entire
22 nation is producing over 2,000, about 2,500
23 million gallons per year of biodiesel from 142
24 plants.
25 For the state we have at the moment nine

1 active biodiesel plants producing 63 million
2 gallons per year. Last year I reported they were
3 producing 46 million gallons per year so some
4 plants added. And there are four idle plants.
5 And these plants are, shown in detail
6 here, using virgin oils, yellow grease, multi-
7 feedstock, waste grease, yellow grease, canola
8 oil. There are nine active plants, I said,
9 producing 63 million gallons per year of biodiesel
10 in total. There is one plant under construction
11 using yellow grease. Supposedly they will produce
12 two million gallons per year of biodiesel. And
13 there are four idle plants totalling 11 million
14 gallons per year. Hopefully they will resolve the
15 problem there so they can add more biodiesel
16 production, biodiesel production.
17 That's all that I have in terms of the
18 current biofuel production.
19 ADVISOR BROWN: Okay, are there
20 questions from the Commissioners?
21 At this time I am going to allow the
22 audience to ask questions of the five panel
23 members, including Paul from the US EPA who is
24 still with us on the phone. So if you have a
25 question please come to a microphone and identify

1 yourself for the record, your name and
2 affiliation. Chuck.
3 MR. WHITE: Chuck White with Waste
4 Management. Listening with great interest to
5 these regulatory hurdles or opportunities that are
6 in front of us.
7 I did speak last week at the AB 118 and
8 indicated that Waste Management is putting
9 together a landfill gas-to-LNG plant. We hope to
10 have it up and running at the end of this year.
11 I've got some fact sheets here if anybody is
12 interested. I did hand them out last week. About
13 13,000 gallons of LNG today.
14 And we are really looking forward to
15 expanding the generation of fuels and energy from
16 wastestream. Landfill gas the most immediate
17 because about one-half to two-thirds of landfill
18 gas is just simply being flared and not being used
19 beneficially. And to capture this landfill gas
20 and convert it into energy or fuels is really a
21 high priority for us.
22 But the plant that would be required to
23 do this, we are installing at Altamont, is a very
24 expensive facility and it is necessary to get some
25 help in funding to get these projects going and

1 off the ground. And in fact this project wouldn't
2 be going forward if not for the funding support
3 from the Waste Board, the Air Resources Board and
4 South Coast Air District and others. So it's
5 really important from the standpoint of the 118
6 program to really be able to provide some
7 additional support to get these expensive projects
8 off the ground and running.
9 In terms of -- So funding is a key
10 point. Regulatory certainty is a key point. And
11 one issue is this whole carbon intensity of fuels.
12 And we are really -- Bob and his group are doing a
13 great job with the Low-Carbon Fuel Standard,
14 although the Air Resources Board seems to be
15 having a difficult time getting its arm around
16 biogenic versus anthropogenic emissions. And the
17 recent Scoping Plan was kind of silent on how our
18 greenhouse gas emissions counted from biofuels and
19 biosources.
20 We have been asking for a long time for
21 some clarity on this to make sure it is clear that
22 a biogenic source of emissions is, the carbon
23 intensity of that can be determined. There was an
24 Errata sheet that came out from as part of the
25 Scoping Plan that addressed this issue then it was

1 withdrawn. And we just hope in terms of
2 regulatory certainty that the carbon intensity of
3 biofuels will be clearly understood how we can
4 calculate that and how it is going to be
5 determined.
6 The other issue that both Commissioner
7 Boyd and Fernando talked about is this whole
8 diversion of waste from landfills. And it is
9 certainly the need to be able to get diversion
10 credit from diverting waste and converting it to
11 energy or fuels. And there has been and continues
12 to be obstacles. Every time we get into a
13 discussion with an energy development partner to
14 want to divert waste from a landfill and covert it
15 to energy the first topic that comes up, well, is
16 this going to continue to be viewed as disposal or
17 will it continue, will it be viewed as diversion.
18 And it's by no means a certainty.
19 One final question I do have though has
20 to do with the funding. And the way AB 118
21 funding will help provide some funds for these
22 kinds of biofuel development projects, which in
23 turn may also generate Low-Carbon Fuel Standard
24 credits that could be sold. And one of the
25 questions we have, will the receipt of AB 118

1 funds to help put together one of these
2 biorefineries make it impossible to sell credits
3 from that program as part of the carbon intensity
4 or AB 32 cap and trade system?
5 An example might be just hypothetically,
6 if you were to generate potentially 100 credits
7 from a biorefinery and 80 percent of the funding
8 came from private capital and 20 percent of the
9 funding came from 118, would we still be able to
10 generate and sell 80 percent of those credits on
11 the open market to help provide additional
12 funding? Although it is speculative at this point
13 in time because we don't know exactly how that
14 market is going to play out.
15 But, you know, that would be able to
16 provide further encouragement if we could also get
17 some seed money through AB 118 and then also be
18 able to sell some portion of the credits that
19 would be generated under the Low-Carbon Fuel
20 Standard or a cap and trade system. So we hope
21 that there's some further clarity on the ability
22 to generate credits from a project, even though it
23 may be partially publicly funded. Thank you.
24 ADVISOR BROWN: Chuck, I heard about
25 five or six questions.

1 MR. WHITE: Sorry about that.
2 ADVISOR BROWN: I think I got some of
3 them. Did you want to pose a specific question to
4 any one or more of the panelists?
5 MR. WHITE: Well the most important
6 really is the 118 funding and will we be able to
7 generate saleable credits from a project that is
8 partially funded using public funds.
9 I got, through the AQIP program at the
10 Air Resources Board the last time they seemed to
11 be pretty negative on that concept. If any AQIP
12 funding goes to support a project then you are
13 never going to be able to generate any credits.
14 The unfortunate point is that you are not really
15 leveraging the maximum financial opportunity to
16 encourage these projects to come forward.
17 AB 118 funding certainly can't pay for
18 the whole thing, it can pay for a portion of it,
19 seed money. But if we knew there was a certain
20 portion we would be able to generate low-carbon
21 intensity credits, that would be a further
22 incentive to put more of these projects on-line
23 faster.
24 PRESIDING MEMBER BOYD: Bob or Mike, do
25 you want to each take a stab at this.

1 MR. SMITH: From the standpoint of the
2 AB 118 program, the regulations, pardon me. The
3 regulations, the proposed regulations that we
4 submitted to the Office of Administrative Law a
5 couple of weeks ago presently do not allow the use
6 of credits if AB 118 dollars are used.
7 MR. WHITE: My own feeling is that's
8 unfortunate. You are not taking full opportunity
9 of the leverage that the funding could provide.
10 ADVISOR BROWN: Other comments or
11 questions from the audience? We also have some
12 folks on the WebEx so I think maybe I should go to
13 those next.
14 ADVISOR SCHWYZER: Susan, I have a
15 question for Paul if he is still on the line.
16 ADVISOR BROWN: Okay. I have a question
17 from Diana Schwyzer, I have questions from others
18 here in the room and there are also folks on the
19 line. So Diana, I'll go to you first.
20 ADVISOR SCHWYZER: Okay, thanks. Paul,
21 are you still there?
22 MR. ARGYROPOULOS: Yes I am.
23 ADVISOR SCHWYZER: This is Diana from
24 the Energy Commission. I was wondering if you
25 could give us a sense of how your modeling results

1 for the indirect land use change emissions of corn
2 ethanol compared to the California Air Resources
3 Board's preliminary estimate, which I think was 35
4 grams per megajoule that Bob Fletcher presented.
5 And if you have a sense of how those results might
6 impact the role of corn ethanol in the RFS, if at
7 all.
8 MR. ARGYROPOULOS: Well I mean, ours is
9 still in the pre-decisional process right now so I
10 really can't speak very vocally about what the
11 results are and how they may or may not be there.
12 But from our perspective, from the program's
13 perspective anyway, we are just looking at the
14 overall emission reductions as compared to the
15 2005 baseline as to whether they comply or not.
16 So from a programmatic perspective, do
17 you comply or don't you? And it is not
18 necessarily, you know, how much better or how much
19 worse you are than what the standard is set at.
20 With regard to the specifics of the
21 actual emissions on that basis. I could put you
22 in touch with our modeling people and maybe you
23 could have an off-line conversation about that. I
24 know that they are coordinating with people in
25 CARB directly. I am not sure to the extent that

1 you guys at the Energy Commission are involved in
2 all of these discussions but we have had some very
3 detailed conversations on that. So whatever they
4 have provided to CARB I expect we can provide to
5 you.
6 ADVISOR SCHWYZER: Great, thanks.
7 ADVISOR BROWN: I am going to take one
8 question from the floor next from Steve Shaffer
9 and then I'll go to the WebEx question.
10 MR. SHAFFER: Steve Shaffer, now I guess
11 a technical expert, formerly with the California
12 Department of Food and Agriculture.
13 Paul, also a quick question for you
14 under RFS 2. You alluded to land use restrictions
15 to cultivated lands. Do you know how conservation
16 reserve program lands are expected to be handled?
17 Thank you.
18 MR. ARGYROPOULOS: My understanding is
19 that whatever the restrictions are that were in
20 the farm bill is what we will be applying in our
21 assessments for the RFS 2 rulemaking.
22 ADVISOR BROWN: We have a question from
23 Rain, a gentleman, I believe you were here last
24 week at the Advisory Committee meeting, for Paul
25 at EPA. Does EPA expect a delay in the

1 implementation of the biodiesel RFS in 2009?
2 MR. ARGYROPOULOS: We actually set forth
3 the new standard for 2009 back in November. It
4 was published in the Federal Register. And what
5 we did was we provided the information which --
6 Number one, we set forth the volume requirement as
7 was required in EISA for 2009, so 11.1 billion
8 gallons. That includes the requirement for the
9 biodiesel volume, biomass-based diesel volume.
10 In that we proposed a potential
11 compliance strategy for the industry. And that
12 was to basically say we are looking at, when we
13 issue the regulations, to allow for the use of
14 RINs that are generated this year in 2009 to be
15 used one time only in 2010 for a combined 2009/
16 2010 biodiesel standard.
17 So in other words, if you use them and
18 you have RINs generated this year, even though
19 there is not technically a biomass-based diesel
20 standard because we don't have a regulation out
21 for that, we are intending to, again this is pre-
22 decisional, we are intending to apply a combined
23 2009, a 2009 to 2010 volumetric standard to each
24 obligated party next year and to allow for the
25 RINs generated this year to go towards meeting

1 that standard. If you don't we expect it would be
2 difficult for obligated parties to actually comply
3 with the combined standard. Is that clear? Does
4 that answer your question?
5 ADVISOR BROWN: Correction here, that
6 question came from Fred Wellons. And we are going
7 to unmute the phone so if Mr. Wellons has a
8 follow-up he can audible-wise ask it.
9 Apparently that addressed his question.
10 Next Mr. Sparano has a question.
11 MR. SPARANO: Good morning, Commissioner
12 Boyd.
13 PRESIDING MEMBER BOYD: Good morning.
14 MR. SPARANO: This is a little awkward.
15 I have a few questions. But given the structure
16 of the meeting I guess I need to ask them all now
17 because all the panel members are here. The only
18 person I don't have a question for is Fernando
19 because the Drink the Best and Burn the Rest
20 comment blew me away so much that my mind was shot
21 for the rest of the presentation.
22 Being serious for the moment, I think
23 the first thing to do is compliment the
24 presenters, a lot of really good information
25 there. For Mike Smith, a question on your fourth

1 slide, Mike. You showed goals to increase
2 alternative fuels nine percent in 2012 and so on.
3 Can you tell the group where CEC views how we
4 stand right now at 1/1/09 versus meeting that
5 goal. The first goal I guess would be the only
6 one to address at this moment.
7 MR. SMITH: I don't have the numbers at
8 my fingertips, Joe. I can provide them to you
9 after this.
10 MR. SPARANO: Yeah, just looking for a
11 perspective.
12 MR. SMITH: Sure.
13 MR. SPARANO: You know, we have certain
14 goals and there's a lot of momentum and inertia
15 heading toward those goals, not just in the group
16 of folks who represent biofuel producers and the
17 community of folks that are working hard at that
18 but even with WSPA members who are investing in or
19 are already invested in those areas. So I am just
20 curious to get a sense of how that is going.
21 MR. SMITH: Right.
22 MR. SPARANO: And I would like to see
23 that when you have a chance.
24 MR. SMITH: Sure. Well the first goal,
25 if I recall correctly, we are well on our way to

1 the first goal, given the ethanol content of
2 gasoline and the amount of biodiesel that is being
3 used in California presently. So it's going to be
4 the farther goals, the 2017 and 2022 goals that
5 are going to be more problematic or more of a
6 challenge to achieve.
7 MR. SPARANO: Okay. On the thirteenth
8 slide, and I don't know any other way to do this
9 other than to count the slides and ask the
10 question. It showed light-duty greenhouse gas
11 reductions. And I think you pointed out that a
12 substantial segment of the emission reductions
13 would come from hydrogen. I think the top --
14 MR. SMITH: That's correct.
15 MR. SPARANO: -- purple part of your
16 chart. It was hard to see from the back, and even
17 at my age, reading the small print. So 2016,
18 2018. How reasonable an expectation is that? I
19 think that's where it starts. And right now we
20 still, it appears there still are not viable
21 hydrogen fuel vehicles out there. And certainly
22 the infrastructure system at this point is almost
23 non-existent; there are some but it's pretty
24 small. So what are the pieces that get us from
25 here to there?

1 MR. SMITH: Well the information that we
2 have been receiving from the OEMs as well as the
3 hydrogen and electric drive stakeholders is that
4 there will be viable fuel cell vehicles to begin
5 meeting and complying with the zero emission
6 vehicle mandate from the Air Resources Board.
7 You are correct in pointing out that
8 infrastructure will be, is absolutely essential to
9 the success of that roll-out. And we are working
10 very closely with stakeholders and with the Air
11 Resources Board in identifying opportunities to
12 invest in a hydrogen fueling infrastructure and
13 the most cost-effective means of implementing a
14 hydrogen infrastructure to begin to match the
15 initial roll-out of these vehicles resulting from
16 the ZEV mandate.
17 MR. SPARANO: And the third and final
18 question for Mike. There appears to be, you
19 showed on your last chart the potential biomass
20 consumption. And it looks like in the years
21 through 2022 there's a significantly greater
22 amount of waste biomass available as compared to
23 demand and then that switches out into the 2050
24 time frame. What is the --
25 I guess having biomass available is

clearly the first step and key to ensure that we use more and more biofuels from biomass. But the issue of the vehicles that will use the fuel and the infrastructure, again, just comes up in my mind as something that has to be a companion to having a viable and successful amount of material available. I guess that was more a statement than a question.

MR. SMITH: Well again you are correct, taking hydrogen, for example. Initially, in these initial years the hydrogen that will service the transportation fuels market is going to be largely produced from, reformed from natural gas. But as we move into the out years, to truly achieve the deeper GHG reductions that are part of our scenario and that I think that everybody is hoping for with hydrogen is going to require a substantial use of biomass feedstocks and renewable energy for that conversion process.

Electric drive in the out years. Also the electricity as the fuel will also need to be derived from, a sizable percentage from renewable fuels. There's also built into that scenario the demand for biofuel vehicles.

And so just about every fuel that is out

in the 2050 time frame, in order to be viable in the 2050 time frame, is going to have to have some sort of renewable component. So from that standpoint it was, in looking at the numbers, we only wanted to point out in this slide that, you know, we may have a challenge going into the out years if we are going to rely on biomass feedstocks and biofuels. And if we are going to pursue a policy in this state of relying on waste material as a feedstock largely and developing an in-state production facility for these fuels.

We may have some challenges facing us. Not that these numbers are cast in concrete. I think the challenge in front of us is how do we increase the amount of biomass feedstocks available to us to accommodate the growth and demand for these fuels.

MR. SPARANO: Thank you, Mike. I have a couple of questions for Bob Fletcher. I just wanted clarification. I think you -- And I couldn't tell because I didn't have a handout to read and I just couldn't see the slides as well as I would have liked. So if I am mis-informed, Bob, just cut me off. That's happened here before but not regularly.

1 (Laughter)

2 MR. SPARANO: I just wanted to make sure

3 you were still with us, Commissioner.

4 PRESIDING MEMBER BOYD: Almost made it

5 through the day.

6 MR. SPARANO: Bob, I think you talked

7 about a phased approach. And if I read it and

8 heard you right we were all looking at March as a

9 date for adoption, or at least an adoption hearing

10 for the LCFS. And I thought I heard you say given

11 the tremendous amount of work still to be done on

12 examining, doing the full life cycle analysis for

13 a pretty broad suite of fuels and looking at the

14 carbon intensity and verifying carbon intensity

15 for each fuel, that you were looking at going

16 ahead, you being CARB, and then in December or at

17 year-end revisiting that. Did I hear that

18 correctly?

19 MR. FLETCHER: Yes. I think there are

20 some issues that are going to be really difficult

21 to square away by March and probably are not

22 critical to square away by March but need to be

23 squared away, you know, fairly soon thereafter.

24 And I think we took a few more months to do that.

25 One of them may be things like the electricity

1 regulated party, for example. To make sure that
2 we get that right. So there's, you know, probably
3 a half a dozen issues like that that we would
4 expect to come back for rulemaking in December.
5 MR. SPARANO: Do you expect that by
6 March you will have the indirect land use
7 components pinned down or is that something that
8 would be done in the intervening period? Because
9 I know that is something you have addressed a
10 little later in the process than when you first
11 started.
12 MR. FLETCHER: Well our expectation
13 right now is to have an indirect land use for
14 corn, for sugar cane ethanol and for soy biodiesel
15 as a start.
16 MR. SPARANO: By March?
17 MR. FLETCHER: Yes, by March. And
18 cellulosic if we can get it but I am not sure we
19 are going to, we are going to have it by then.
20 MR. SPARANO: Okay. And speaking of the
21 cellulosic. I guess I'm interested in, and maybe
22 you could clarify the basis for concluding, again
23 if I read the material right that I could see,
24 that cellulosic ethanol will be available in
25 commercial quantities by 2012. I think that was

1 the date at which it first showed up in the, in
2 the LCFS.
3 MR. FLETCHER: I think you are not
4 reading that right. What we have is a compliance
5 path that comes down and, you know, there are --
6 If that's the graph if you are referring to.
7 MR. SPARANO: Yes.
8 MR. FLETCHER: That's the EISA. That's
9 the federal act. That isn't our, you know, that
10 isn't our estimate. That is the biofuel volumes
11 that are required to be in place under the federal
12 EISA. So my comment was it is going to be really
13 important that the federal EISA is met to ensure
14 that the LCFS is met. I mean, we believe
15 cellulosic, particularly in the later years, maybe
16 not so much in the early years, but in the early
17 years are certainly going to play a role.
18 MR. SPARANO: Is it CARB's expectation
19 that the federal EISA will result in enough
20 cellulosic being available to meet the LCFS needs?
21 MR. FLETCHER: I think that what my
22 point was, if there is that volume of cellulosic
23 ethanol to meet the federal EISA then we figured
24 out the technology of how to do it. And if that
25 is the case then it's a question of economically

building plants and producing the fuel necessary.

If we just look at the federal EISA we think that that gets us about halfway to the LCFS on a quote, you know, sort of a fair-share perspective. Our objective is to not suck up all the clean, cellulosic ethanol in the country and bring it to California for various reasons. So it's a question of ensuring the technology is developed and is working.

MR. SPARANO: Okay, thank you, Bob.

Commissioner, I still have a number of questions and I feel like I'm monopolizing the mic. I don't know if you want to have me stand aside and someone else ask questions and come back later or what.

PRESIDING MEMBER BOYD: How many more questioners do we have, Susan?

ADVISOR BROWN: We have one on the phone and at least two in the room.

PRESIDING MEMBER BOYD: Joe, why don't you --

MR. SPARANO: I have three more questions.

PRESIDING MEMBER BOYD: Keep going, yes, keep going. Let me make one quick comment. We

1 had a meeting in this room Thursday of last week
2 of the, as Mike Smith indicated, of the AB 118
3 Investment Plan Advisory Committee. I am not
4 sure, I don't recall seeing any of your folks in
5 the audience. There may have been members in the
6 audience.
7 You might want to have folks look at the
8 materials that were presented there, which I am
9 sure are posted on our website. Honda had a very
10 interesting presentation on their views of
11 hydrogen and their program, which is admittedly
12 extremely aggressive, including carbon footprint
13 data from studies on hydrogen from either reformed
14 natural gas.
15 And then you can always -- The Fuel Cell
16 Partnership didn't make a presentation but they
17 did give us extensive comments in writing, I
18 believe Mike, which are probably also posted on
19 the Energy Commission website for that, for the
20 topic of the AB 118 Plan. It might be a little
21 additionally informative.
22 And the other, the other comment on your
23 question about where we stand on progress. Mike,
24 probably sometime during the day you can take
25 Val's data and the two of you can do a little bit

1 of, a little math and quickly come up with, well
2 how close are we to meeting the current day or the
3 almost present goals of biofuels in the California
4 transportation fuel mix. Just for a one-pointer.
5 Anyway, go ahead with another question.
6 MR. SPARANO: The next two questions are
7 for Paul. Are you still there?
8 MR. ARGYROPOULOS: I'm still here.
9 MR. SPARANO: Okay, thank you. Based on
10 the information that you communicated I'm curious
11 what the EPA's view is on how renewable fuels
12 production is coming along, specifically with what
13 I will call the next generation of biofuels.
14 Starting I think this year and moving forward
15 there is an increasing amount or there are
16 increasing amounts of next generation biofuels,
17 whether they are biodiesel or what I am concluding
18 is mainly cellulosic ethanol, ethanol from
19 cellulose. How does that look to EPA at this
20 point in terms of meeting those goals,
21 particularly in the near year?
22 MR. ARGYROPOULOS: Okay. Yes, there are
23 some standards that are coming along. We have
24 some that were advanced this year which would
25 require technically that compliance provisions in

1 place (inaudible) production and then actually
2 cellulosic beginning in 2010. So a much lower
3 volumetric requirement. But they do escalate and
4 ramp up fairly quickly.
5 We meet with a lot of technology
6 providers, there's a lot of optimism out there.
7 There's a number of different pathways which are,
8 we believe can be commercially demonstrated. The
9 reality is whether they are, whether the economics
10 are there given current or future circumstances.
11 I think those are things that we still have to, to
12 kind of work through.
13 But what our requirement is is to -- we
14 actually set the standard. Even though there are
15 volumetric standards for cellulosic biofuels each
16 year, we are required by the Act to use energy
17 information, administration data, as well as we
18 will be analyzing market data.
19 So going out to the market and looking
20 at, is there concrete and steel being put in the
21 ground? How far along are those? What are the
22 volumes that those facilities are looking at
23 producing over the course of the year? Are the
24 feedstocks there? Do they have suppliers in line
25 and so forth? Then to actually set the standard.

1 So let's say it's a billion gallon
2 standard just for the purposes of speaking. And
3 we do an evaluation and we believe that the
4 commercial viability of the market in that
5 forthcoming year is only 750 million gallons.
6 Then we would set the standard at 750 million
7 gallons.
8 But again, it's premature to say what it
9 is or isn't at this point but we do continue to
10 meet with those people. There's a lot of
11 optimism. I know there's, I think there's one
12 facility that is coming on-line or came on-line
13 recently at 20 million gallons a year. So there
14 are stories out there and we believe that those
15 stories are actually becoming a reality. And over
16 the course of this coming year we will need to
17 actually make the assessment and set the first
18 year's standards.
19 MR. SPARANO: Thank you. The other
20 question I had was you mentioned facility
21 grandfathering. My interest is, would that
22 grandfathering apply say to corn-based ethanol
23 facilities that are under construction but not
24 completed?
25 MR. ARGYROPOULOS: Yes, there's two

1 levels of grandfathering provisions. The first
2 one is if you were in production or began
3 construction prior to enactment of December 19 of
4 2007. Then technically if you are a corn ethanol
5 facility you are grandfathered, your volume is
6 grandfathered. So whatever the production --
7 And again this is pre-decisional.
8 There's a number of ways that we are looking at
9 approaching this, whether it's actual historical
10 volume that was produced or if it's actual
11 production capacity. So, you know, whatever that
12 ends up being and where we finalize it I don't
13 know yet. But those are some of the, some of the
14 ways we would be looking at it. You would then,
15 your volume would be grandfathered in in meeting
16 the compliance requirement.
17 The second aspect of that on
18 grandfathering is after enactment. If you began
19 construction after enactment, so between starting
20 in 2008 and 2009, between that time and 2010.
21 Then your facility would be deemed to be compliant
22 if it is fired with natural gas, biomass or co-
23 with natural gas and biomass. It is required to
24 meet the 20 percent greenhouse gas threshold but
25 it basically says that you will meet it if you are

1 using those two energy sources in production.
2 And again, how we will end up finalizing
3 all the nuances of that remain to be seen. But
4 those facilities generally speaking would be
5 grandfathered. So if you -- Even if you hadn't
6 completed construction, if you began construction
7 prior to that and you completed it before the time
8 period, then you are going to be grandfathered.
9 MR. SPARANO: Okay, thank you. And
10 finally for Valentino. I thought I heard you or
11 saw in the, in the materials that there was a
12 component of E20 used in 2010. I'm not sure how
13 that is accomplished given the current auto view
14 on E10 and warranty -- E20 and warranties.
15 We are just moving by CARB in the
16 direction to E10, Bob, correct me if I'm wrong,
17 1/1/10 for E10. So E20 seems a bit optimistic and
18 I am just curious how that enters into the, into
19 the formula here.
20 MR. FLETCHER: I am not sure in
21 reference to Val's but, you know, we are moving --
22 MR. SPARANO: It was slide seven.
23 MR. FLETCHER: We are not requiring
24 E-10, that is an option for meeting California's
25 predictive model. And those volumes, that is not

1 an E20. What that is saying -- If that is the
2 slide you are referring to.
3 MR. SPARANO: Yes it is.
4 MR. FLETCHER: What that means is of all
5 of the fuel that's produced in California -- Of
6 all of the biofuels that's used in California, 20
7 percent of it must be produced in California.
8 Those are goals from the Executive Order S-06-06.
9 So it is not an E20 requirement, it is just 20
10 percent of how much ever biofuels are used in
11 California at that time should be produced in
12 California.
13 MR. SPARANO: I thought there was E-20
14 in the parens there and maybe that's my confusion.
15 MR. FLETCHER: No, I don't think so.
16 DR. TIANGCO: It's 20 percent. Likewise
17 in biodiesel, 20 percent biodiesel.
18 MR. SPARANO: Okay, those are all my
19 questions and I thank you for giving me the time.
20 ADVISOR BROWN: I have one more question
21 for Paul at US EPA.
22 MR. McKINNEY: Hi Paul. My name is Jim
23 McKinney, I'm staff here with the Energy
24 Commission. I had a quick question on the
25 Renewable Fuel Standard and the definitions around

1 forest biomass.
2 And as you may be aware the Energy
3 Commission decided not to use that definition in
4 its implementing regulations for AB 118, which a
5 particularly challenging issue for the agencies in
6 California working on this. And can you talk a
7 little bit about what the federal agencies are
8 doing on defining sustainability standards for
9 forest biomass.
10 MR. ARGYROPOULOS: Well, I am not going
11 to be a very good one to respond to this when we
12 have a couple of people that are knee-high,
13 cornfield deep into a lot of these issues. The
14 requirements that are set forth in EISA is what we
15 are trying to apply on the biomass side. They are
16 very complicated, we know what the intent is. But
17 actually developing a program to enforce those
18 provisions is very challenging given the
19 availability of data.
20 The definition is fairly clear in the
21 Act. However, how you go about assuring that the
22 actual feedstocks from the various lands to the
23 ultimate producer, renewable fuel producer, are
24 indeed meeting all of the not only the renewable
25 biomass definitions but the land use restrictions,

1 requirements, et cetera, is significantly
2 challenging. To get into detail on that I think
3 is probably -- It confuses the hell out of me.
4 (Laughter)
5 MR. ARGYROPOULOS: So I think it would
6 be better that we had an off-line conversation on
7 those specific issues. So we can let you know at
8 least generally what we are doing and potentially
9 what we plan on proposing. Because there will be
10 a number of options. But it's something that we
11 are actually still working through and have been
12 working very intently. Not only with the
13 feedstock producers but USDA and a host of others.
14 PRESIDING MEMBER BOYD: Paul, this is
15 Jim Boyd. A quick comment. I want to thank Jim
16 McKinney for raising the question because -- and
17 for pointing out that we have got some differences
18 of opinion on this subject. And I want to
19 reference something that was said by Fernando when
20 he talked about the Waste Board. And that's just
21 this perception of technologies or perceptions of
22 issues standing in the way of our ability to make
23 progress.
24 And one of these long, long held
25 perceptions that we have encountered, obviously

1 for a long, long time, has been that -- and it's a
2 problem for us therefore with this federal
3 definition and it's been a problem for us within
4 California government. We have different points
5 of view on this, quite frankly.
6 But the problem being there is a
7 perception that if you let people -- I'm just
8 going to say, us. If you let us in the forest to
9 gather waste material the next step will be maybe
10 addressing forest trimming and thinning for forest
11 health issues. And there is a perception out
12 there the next step would be logging all the old-
13 growth forest down.
14 And we are having a terrible time
15 convincing people that, you know, not everybody is
16 evil. You know, those of us who would like to
17 address getting that waste material and putting it
18 to good use.
19 And those of us in a past life, as
20 Deputy Secretary of Resources I was worried about
21 forest health and a fairly strong-held belief
22 that, you know, some thinning and trimming might
23 not be a bad idea for forest health. And oh by
24 the way, we are burning them all down anyway with
25 all this mass material in the forest. We have got

1 to get in there and begin to address that problem
2 and knock down this myth and this barrier.
3 And to have taken the easy way out --
4 sorry Bob Fletcher. To have taken the easy way
5 out and accepted the idea that we will just
6 embrace the federal definition, which has stopped
7 us dead in our tracks again and caused no debate
8 of this issue and preclude therefore maybe some
9 progress on this issue. We are in a position
10 where we just can't wait that much longer. One,
11 we are burning the bloody forests down hand over
12 fist now because of population densities getting
13 close to all this waste material. Smokey the bear
14 was wrong, et cetera, et cetera.
15 So I appreciate the dilemma you are
16 going to have in discussing this at the federal
17 level. And just recognize that we here in
18 California have wrestled with it, have different
19 points of view and probably have some things to
20 contribute to the national debate on the subject.
21 So thank you.
22 MR. ARGYROPOULOS: I appreciate those
23 comments Jim and I hear you loud and clear. I
24 know you probably know we are struggling with this
25 on many fronts. Figuring out how to work through

1 this, be as flexible as possible and as logical as
2 possible, given the definition that we have been
3 handed in meeting the legal, the legal tasks that
4 are before us. I won't say we'd welcome the
5 debate because I think we have been having it, but
6 we'd welcome the opportunity of a more productive
7 outcome.
8 PRESIDING MEMBER BOYD: Thanks.
9 ADVISOR BROWN: Thank you. We have one
10 last question on the WebEx. I'm sorry. Bob, did
11 you want to make a comment?
12 MR. FLETCHER: Just two quick comments
13 actually. One to Jim's comment. We have not yet
14 made a decision on how to handle the renewable
15 biomass. We are actually meeting with a number of
16 the forestry folks. Last week, we are meeting
17 again this week. We will be meeting with some of
18 the environmental folks later in the week.
19 What we have in the LCFS right now is
20 just simply we extracted the federal definition
21 and put it in there and said, we're accepting
22 comments. But I don't want that to be interpreted
23 as that is our decision on what we are doing with
24 this definition because, quite frankly, we haven't
25 made a decision.

1 PRESIDING MEMBER BOYD: I appreciate
2 hearing that and I withdraw my comment.
3 (Laughter)
4 MR. FLETCHER: The other, the other
5 consideration is, is I think there is a common
6 objective. At least my sense is there is a common
7 objective. Is whatever is done to pull that
8 biomass out is done in a sustainable way that has
9 conditions associated with it.
10 And if that, if we can reach that sort
11 of consensus then you have a situation where it
12 really doesn't matter whether you define it as not
13 letting you use federal land material unless you
14 meet these requirements, or you can use this
15 material but you have to meet these requirements.
16 It shouldn't make any difference which
17 way you come at it if the objectives are clear and
18 the definitions are clear. But I think there's
19 some work. And you've hit it on the head in terms
20 of there's a lot of trust issues out there with
21 how you access this material.
22 The other quick comment I wanted to make
23 was to Joe. We were looking at the slide and
24 there is actually an E20 on there and that came
25 out of the AB 1007 work. And I think what it was

1 was a surrogate for the total amount of ethanol in
2 the fuel divided by the amount of fuel. And it
3 wasn't intended to be an E20 fuel, it was the
4 combination of E10 and E85 fuels I think. Is that
5 clear?
6 ADVISOR BROWN: That's my recollection
7 as well, Bob.
8 PRESIDING MEMBER BOYD: I think I an say
9 from a policy perspective our two agencies are
10 operating under the premise that E10 is the end of
11 the line for the foreseeable future, if not
12 permanently. And, you know, we are not engaging
13 in much in the way of debates beyond E10 at the
14 present time.
15 ADVISOR BROWN: Yes. I have one last
16 question I am going to pose to the panel. And it
17 may well be a question for the next panel, from
18 Rain. Why are we still researching corn and other
19 consumeables for biofuel when algae shows far
20 greater productivity and promise? Anyone here
21 want to address that or should I defer it to the
22 next panel, which I believe is going to address
23 the subject of algae as a feedstock?
24 MR. FLETCHER: I would defer it to the
25 next panel. It is a fuel that can play in the

1 low-carbon market. It is a competitive fuel and,
2 you know, a lot is going to depend on what the
3 price of oil is.
4 ADVISOR BROWN: Thank you. I think we
5 will do that then.
6 We would like to take a ten minute break
7 unless there are other comments. I'm sorry, Mike.
8 MR. SMITH: Yes.
9 PRESIDING MEMBER BOYD: Make it closer
10 to a five minute break.
11 ADVISOR BROWN: Okay.
12 MR. SMITH: Susan, I just want to
13 clarify my response to Chuck White.
14 ADVISOR BROWN: Sure.
15 MR. SMITH: To his question regarding
16 credits. In looking at our specific regulation
17 language, the default in the language is for non-
18 eligibility. However, there are some exceptions
19 to that that you may want to take a close look at.
20 MR. WHITE: I'll come and talk to you
21 during the break.
22 MR. SMITH: So there is a certain
23 flexibility built into it, so I just wanted to
24 clarify that.
25 PRESIDING MEMBER BOYD: I'm glad you

1 mentioned that Mike because I know internally we
2 debated this ad nauseam. We are quite concerned
3 about stifling and yet quite concerned about the
4 other issues. There is an escape route with lots
5 of checks and balances built in.
6 ADVISOR BROWN: Again my thanks to the
7 panel. We are going to take a break until 25
8 until the hour and I am going to ask the next
9 panel to convene. Thank you all.
10 MR. ARGYROPOULOS: Thank you. I am
11 going to sign off, Susan.
12 ADVISOR BROWN: Thank you Paul for
13 hanging in there with us.
14 MR. ARGYROPOULOS: Okay. Good luck with
15 the rest of the day.
16 ADVISOR BROWN: All right, thanks.
17 Whereupon, the morning recess was
18 taken.)
19 MR. McKINNEY: Hi, my name is Jim
20 McKinney. I am staff with Mike Smith's team on
21 the AB 118 program and I am going to be the
22 moderator for the second panel, which is going to
23 look at feedstock availability in California and
24 the West from a number of perspectives.
25 We have had a bit of a program shuffle

so first is going to be Steve Shaffer talking about the potential for energy crops. Then we will have Steve Kaffka, professor at UC Davis, talking about in-state resource availability. And then we will have Alex Schroeder from the Western Governors' Association I think giving us kind of a Western Regional perspective on this.

Due to the length of the discussions with the last panel I am going to ask the speakers to kind of move as smartly through their presentations as possible. We don't want to cut out the meat but we are going to try to make up a little, a little bit of time here.

So with that I want to introduce Steve Shaffer. So for 34 years Steve worked with the California Department of Food and Agriculture and he started his work in the biofuel sector in 1981. He directed the office of agriculture and environmental stewardship from 2000 to 2008. And as he said with a big smile in his voice, he is now retired and gets to come back as a technical expert and really have the best of all worlds. So with that let's welcome Steve and I look forward to his presentation.

MR. SHAFFER: It is a pleasure to be

1 back in this room. I have been here many, many
2 times. I expect I'll be in this room many more
3 times. I don't know if I will move through my
4 presentation smartly but at least quickly.
5 I feel my role today is sort of to tee
6 up a number of issues and questions. Steve Kaffka
7 will follow me with a lot more of the numbers and
8 the hard data I think. But I think there are some
9 tremendous opportunities for biomass to be a part
10 of the energy solution moving forward in
11 California.
12 You know, I am not sure if I coined the
13 term Energyshed or not but I Googled it and I
14 didn't really find much on it. But I want to put
15 out this concept just -- and I'll talk about that
16 just real quickly. Again, identify some of the
17 issues. I want to give some key examples and then
18 wrap it up.
19 So we are familiar with the terms
20 watersheds, airsheds, foodsheds, et cetera. Why
21 not energysheds? And really to address energy at
22 the local level as Fernando had mentioned from
23 more of a bottoms-up, grassroots perspective where
24 collaboration is key. But in order to do that you
25 need to build that human capacity, that human

1 infrastructure to do that.
2 I think the Energy Commission's RESCO
3 program is a good move towards that. I have my
4 own comments on that program in terms of it is
5 still I think a bit cumbersome and bureaucratic,
6 especially if you are working with local folks at
7 local levels but it is definitely the right idea.
8 We heard a lot on the biomass resource
9 potential. This is just, again, conceptually how
10 much biomass there is globally, how much the world
11 uses. This is food, fiber, energy. How much the
12 US uses. So just again to conceptualize the
13 potential.
14 Of course you are not going to utilize
15 all the biomass or even a large fraction of it.
16 But it is still, in my mind, an under-utilized
17 resource. We heard alluded to the different
18 feedstock assessments. I won't belabor that. And
19 then what that means in terms of production of
20 liquid fuels.
21 We all know, I think, that there is a
22 diversity of fuels. I like to say we are moving
23 towards a poly-fuel future and that just lists
24 those.
25 (Whereupon, Commissioner Douglas

1 rejoined the panel.)
2 MR. SHAFFER: I put energy crops in
3 quotations here because the agricultural residues
4 I want to consider as an energy crop as well.
5 They are part of the existing agriculture system.
6 They are quote/unquote the low-hanging fruit.
7 What is available currently irrespective of the
8 development of dedicated energy crops.
9 Again the sort of systems analysis,
10 lifecycle assessment, whatever you want to call it
11 in terms of highest and best use of these
12 materials. Whether it is better to put it back in
13 the ground. Whether it is better to utilize it
14 for other end use materials, construction,
15 clothing, whatever. Or whether it is best to use
16 it for energy. And that gets back to that
17 energyshed concept where local collaboration and
18 development of a strategy I think needs to take
19 place.
20 We know the conventional crops. I list
21 sugar cane in there because of course it's, there
22 has been a lot of agronomic work done on sugar
23 cane. Sugar cane ethanol, I want to be clear, is
24 not being considered a conventional biofuel in
25 those regulatory processes in the Low-Carbon Fuel

1 Standard and EISA and what have you. But it is a
2 conventional crop in terms of its agronomic
3 development globally and in the US and potentially
4 even in California. Dedicated crops. And just
5 conventional crops I did not list soybeans because
6 soy isn't grown in California.
7 Dedicated energy crops. Sudan hay is
8 more of a conventional one. That's why we have
9 grown some of the elephant grasses, energy canes,
10 energy grasses. Trees, eucalyptus, hybrid poplar,
11 a number of others. MegaFlora is another one that
12 has been getting some attention too and I'll talk
13 about that in just a little bit.
14 And then other unconventional crops.
15 And I include algae as an agricultural crop that
16 has come into the fore.
17 The issues we heard, these have been
18 alluded to in the previous panel as well. You can
19 read through those very quickly. I want to just
20 highlight multiple objectives management. Because
21 again it gets back to the systems analysis.
22 And looking at another term of art
23 perhaps is net environmental benefit. And so
24 there are, for example, anti-backsliding
25 provisions in some of the federal and state

1 regulations in term of criteria air pollutants,
2 for example, or water quality.
3 But are there ways to incorporate all of
4 that where you may have some transient de minimis
5 effect on say water quality or air quality in
6 getting some of these biofuels into production?
7 But those eventually through additional technology
8 improvements and what have you are eliminated in a
9 reasonably short period of time.
10 Biotechnology. Genetically modified
11 organisms. In plants, in microorganisms, what
12 have you. What are the rules of the game? What's
13 the regulatory process going to be? What's
14 consumer acceptance going to be? So I see that as
15 a big issue.
16 End use technology. A little bit of a
17 discussion on, you know, there's E10, there's E85,
18 there's not much in the middle. And how can that
19 -- That to me is one of the barriers if you are
20 just focusing on, on ethanol as a fuel. That
21 needs to be addressed. Further technology
22 development in terms of ethanol as a fuel cell
23 feedstock would be another for example.
24 And then economics underlies all of it.
25 Just again, these are a couple of slides

1 from Michael Wong at Oak Ridge National Lab and
2 also from Alex Ferrell at UC Berkeley. Different
3 ways of looking at the benefits of biofuels as a
4 petroleum replacement and its efficiency as a
5 petroleum replacement. Also in the previous
6 slide, its efficiency on an energy basis as well.
7 So very quickly to move through some
8 examples. And the reason I do this is there are
9 opportunities up and down the state of California
10 but they are very site-specific. They are very
11 regionally specific and therefore the work, again,
12 needs to be supported from the grassroots up.
13 So in the northeast part of the state.
14 The Klamath Basin used to be a large sugar beet
15 growing area. The economics of sugar have
16 precluded that. The industry basically doesn't
17 exist anymore up there, does it, Steve? But it
18 was thriving. It was in Solano County as well.
19 Are there, are there through agronomic development
20 of fodder beets, fuel beets, what have you,
21 opportunities to bring some of that back?
22 Sweet sorghum I demonstrated in an
23 Energy Commission program back in the late '80s
24 and early '90s when we grew it up and down the
25 state. And it grew well with lower inputs than

1 corn and on and on and on.
2 Again looking at the multiple objectives
3 management approach. Looking at rice straw
4 utilization, additional habitat corridors that can
5 be managed both for wildlife habitat and biomass
6 resource development.
7 Reinventing Delta agriculture. This is
8 where algae production may come into play. You
9 are looking at brackish water. You are looking at
10 CO2 from power plants and oil refineries. You
11 have a resource base there. Can the technology be
12 developed to take advantage of that resource base
13 and reinvent Delta agriculture into aquatic
14 agriculture that is compatible with some of the
15 objectives of the Delta Vision task force and all
16 the issues having to do with the Delta and
17 maintaining levees and moving water through the
18 Delta, et cetera.
19 Rotational crops and high value systems.
20 Some of the Salinas lettuce growers when they were
21 faced with the high energy costs were looking at
22 they may not be able to compete with East Coast
23 lettuce production for their summer crop. They
24 grow three crops a year, a spring, a summer and a
25 fall crop of lettuce. If they can't compete with

it because of energy prices and the cost of getting the lettuce to the East Coast with East Coast production what is their next highest and best use for utilizing that ground?

And they came to me talking about canola or wild mustard as an oilseed crop where they can defer some of their diesel costs. They get soil-building properties and pesticidal reducing properties from the wild mustard and so it fits into the system. And this is what, again, we really need to look at and focus on in terms of dedicated energy crop production. Is how it fits in best into California's most diverse agricultural system in the world.

San Joaquin Valley opportunities, especially on the drainage-impaired lands where cotton was 1.2 million acres or even higher than that. Now about 300,000 acres this coming year maybe. So there are, there's still salty water that's -- brackish water that's available for use. Some fresh water available for use.

Westside Resource Conservation District is working on MegaFlora, which is a biomass tree that is salt-tolerant, drought-resistant. Some of the growers in Westside Resource Conservation

1 District are collaborating together on a nursery,
2 on experimental plantings of the crop. Those
3 could be used for second generation biofuels into
4 biomass power plants.
5 Dairy manure, biogas from dairy lagoons.
6 Taking some of that to then concentrate and make
7 available in a more readily usable form organic
8 nitrogen and offset some of the use of synthetic
9 nitrogen in the agricultural system. All
10 opportunities.
11 The last one, sugar cane production. In
12 Imperial Valley Bryan Jenkins and I are finishing
13 up a report that is delinquent to Western Growers
14 Association on what we call virtual water, if you
15 will. And the concept is right now Imperial
16 Valley is transferring 200,000 acre/feet of water
17 to San Diego. And in order to conserve that water
18 they are fallowing land to do that.
19 What if they kept the water and grew an
20 energy crop such as sugar cane, co-generated
21 electricity and fuel ethanol. Can enough
22 electricity be generated to send to San Diego so
23 they can do ocean de-sal or some other sort of
24 localized water development?
25 Well it depends on how efficient the

1 system is and we have laid out a number of
2 assumptions and parameters. And it can be as bad
3 up you apply eight or nine acre/feet of water and
4 you get seven-tenths of an acre/foot of water on
5 the other end in the urban sector. But it could
6 be as good as applying five acre/feet of water and
7 getting 20 acre/feet of water in the urban sector.
8 So the technology needs to be assessed
9 and developed. Water management has to be refined
10 on the urban side. But I think the initial study
11 is showing at least there's an opportunity that
12 really needs to be explored.
13 On-farm considerations just very
14 briefly. It's got to work for the farmer. I'm
15 almost done, thank you. So integrating into
16 existing operations, ability to manage these new
17 crops and technologies.
18 And when looking at the farm, USDA had a
19 poster back in the early '80s on the integrated
20 energy farm. And looking at it, for example
21 dairies could put, have PV, could generate twice
22 the biogas roughly if they had true access to the
23 market. So an under-utilized resource that
24 through policy and technology integration can
25 really mushroom into much larger scale energy

1 production in my mind.
2 So again I mentioned I see us moving
3 forward in a poly-fuel future. The technologies
4 are going to compete and these workshops help
5 inform us all in terms of developing the best
6 policy and way to move forward. So thank you.
7 MR. McKINNEY: Great. Thank you very
8 much, Steve. Commissioners, did you have any
9 questions for Steve Shaffer?
10 PRESIDING MEMBER BOYD: No. Thanks,
11 Steve.
12 MR. McKINNEY: Our next, our next
13 speaker is professor Steve Shaffer at the
14 University of California at Davis.
15 MR. SHAFFER: Steve Kaffka.
16 MR. McKINNEY: Steve Kaffka, I'm sorry.
17 That's right, Steve Shaffer already spoke.
18 Professor Kaffka, professor of agronomy
19 at UC Davis department of plant sciences, I think
20 current co-director of the bioenergy working
21 group. A long-time participant in helping the
22 Energy Commission and other state entities
23 understand the issues associated with agriculture,
24 bioenergy crops and biomass issues.
25 And I just want to say personally as

1 somebody who is heading up the sustainability
2 efforts for AB 118, Steve has really helped inform
3 my thinking. He is very thoughtful and always has
4 a good perspective to bear on pretty complex
5 issues. So with that, Steve.
6 DR. KAFFKA: Thanks, Jim. Somehow my
7 title slide didn't get here. I want to
8 acknowledge Bryan Jenkins who had substantial
9 input to this as well as some of our board members
10 and members of the California Biomass
11 Collaborative, Brian Williams, Bruce Goines, Doug
12 Wickizer, who are board members, and others who I
13 will mention as we go along.
14 I just wanted to put in just a brief
15 plug and a description of the California Biomass
16 Collaborative. A lot of the data, all of the data
17 that you are going to see, comes from the efforts
18 of the California Biomass Collaborative, which is
19 funded by the PIER program through the Energy
20 Commission and has been around since 2003.
21 It is an integrative organization that
22 bridges we hope the entire sector of people,
23 groups and interest groups that are interested in
24 biomass energy. Basically it is a statewide
25 coordinating group.

1 The data that we will be hearing or
2 seeing today really comes in part from the
3 California Biomass facilities Reporting System and
4 from other database issues that are there. And
5 you can go to the California Biomass website and
6 get access to that data. That's one of its main
7 goals.
8 It has also produced a roadmap to guide
9 the development of sustainable biomass development
10 in California and we are obviously active on the,
11 as Steve kindly mentioned, on sustainability
12 standards and with Commissioner Boyd's Interagency
13 Working Group.
14 The biomass roadmap provides some
15 guidance in developing recommendations on how to
16 develop and use resources. It is for all users in
17 the state. And currently the Collaborative is
18 very much involved in trying to develop
19 implementation plans in various ways for the
20 roadmap.
21 I am just going to skip that.
22 Ken, in organizing this meeting sent us
23 several questions and these are the questions that
24 are there that he suggested that we at least think
25 about. And I have tried to have these questions

1 inform the presentation that I am going to make.
2 I won't tile talk very much about the Western
3 Governors' Association task force. The speaker
4 following me, Jim Schroeder, is going to talk
5 about that. But I will try to touch on at least
6 some aspects of these issues in the remaining time
7 that I have.
8 Well you have seen this slide before.
9 This comes from the database assembled by the
10 Biomass Collaborative. This is the most recent
11 set of data. We will be doing this again if we
12 get funded in the next round for 2008 data and it
13 shows both potentially, technically available and
14 gross biomass estimates across the sectors. Other
15 people have shown the slide as well.
16 One estimate that has now been submitted
17 to the Energy Commission for their review shows
18 one potential set of estimates for cellulosic
19 residues in California. And they range from about
20 2.3 tons for residues from field and seed crops,
21 orchard/vine prunings and so on. Landfills: mixed
22 paper, landfills: wood and green waste with gas
23 production, and then forest thinning. And I
24 highlighted forest thinning because I knew there
25 would be some additional interest in that. There

is a substantial ethanol production in terms of million gallons per year and in terms of million gallons of gasoline equivalence per year that come from these potential instruments.

Now the point is this is, these are not estimate of economically recoverable or even sustainably recoverable biomass but these are estimates of what is potentially out there.

Now some of our estimates that we currently have in fact still involve the idea of using agricultural crops for at least part of the biomass. And so one projection for the potential for corn production then, sugar beet production which is an excellent ethanol source, are these under E5.7, E10 and E20 blend scenario.

Now the ones that I have highlighted in pink, just looking at sugar beets, the 222,000 acres that are estimated, was the long-term average production in the history of the California sugar beet industry. Right now currently there's 20,000 acres of sugar beets in California. So some of these numbers are not terribly realistic.

And the same is true for corn ethanol. The 750,000 acres is almost all the corn produced

in California, including to feed all those 1.2 million dairy cows. So those numbers aren't particularly -- These need further refinement.

For oil seeds it's a little bit better. Under a B2 scenario, a biodiesel two percent biofuels, 180,000 acres of oil seeds is a realistic number in California, at least historically in agriculture. The other two numbers are potentially feasible but probably only as cover crops or secondary crops. Oil seeds being used as winter cover crops and other things.

But anyway, these are some of the numbers that are going into some of our long-term projections subject to revision.

Now this is a multi-feedstock scenario that has been developed for 2010 for the E10 and B2 scenarios. And it estimates that if you use ten percent of current starch and sugar crops for ethanol a third of the lignocellulosic residues, that includes from forest wastes. We'll talk about that in a minute. And perhaps as much as 200,000 acres of dedicated energy crops which could include grasses and it could include sugar cane ethanol, for example.

You could get to a fairly substantial

1 ethanol total in terms of greenhouse gas gallons
2 of gasoline equivalent and it would be
3 approximately sufficient to meet the 2010 E10 and
4 B2 scenario goals. So there is some potential for
5 this but we have to refine some of these
6 extractable or achievable numbers.
7 Now what I am going to talk about for
8 the majority of this presentation is recent work
9 that has been submitted to the Energy Commission
10 in a report that estimates the economically
11 available biomass resource in California. It is a
12 very interesting project. It was done by graduate
13 students at UC Davis under Bryan Jenkins'
14 supervision. Peter Tittmann, Nathan Parker and
15 others.
16 And basically they are trying to do two
17 things. They are trying to geographically map
18 where in California biomass can be found and try
19 to integrate that with the state's transportation
20 and potential refining infrastructure. So it's
21 another filter on the potential, recoverable
22 biomass map.
23 And so this is basically just a picture
24 schematic of the potential of the pathways that
25 are analyzed in the biomass utilization and supply

chain. Obviously it started back here with wastes and from fields and forests and through transportation and refining to end users.

These are the materials that were considered. This is a modeling exercise. It integrates modeling using GIS methods with linear programming. It is basically a classical operations research transportation problem which is optimizing where you produce it and where you refine it and where you use it.

And these are the various sources that are considered in the various conversion technologies that are employed in doing the analysis. And these are the best guesses for the kinds of efficiencies associated with these conversion technologies for the year 2015. That is where the focus is.

This is what that bioenergy network diagram looks like. I know that we can't really study or analyze these diagrams in the presentation because it is too complicated and we don't have enough time for it. But they are up on the web and you can contact the Collaborative, Dr. Jenkins and myself, and we can go into that detail if you have further questions.

1 So this is one of the outcomes of that
2 modeling. It provides the overview of the
3 transportation network showing where there might
4 be hubs in the transportation facilities. How
5 material might be moved to various locations. So
6 the green are the feedstock locations. You can
7 see potential locations as well for manufacturing
8 and then also some more substantial terminal
9 locations.
10 These are -- This is breaking down the
11 state in terms of transportation hubs or where you
12 have blending facilities, existing blending
13 facilities, and what the kind of fuelsheds that
14 Steve just talked about might look like around the
15 state, based on the modeling outcomes.
16 I wanted to talk a little bit about
17 forest thinning because it's come up a little
18 earlier. We met with some of our board members
19 who -- California Collaborative board members who
20 come from the forest industry or from the public
21 agencies associated with forestry management.
22 And this is a draft partly developed by
23 the Air Board based on data from the Biomass
24 Collaborative and the Energy Commission and from
25 the California Department of Forestry and Fire

1 Protection.
2 So it indicates what might be available
3 in terms of technically available from slash and
4 thinnings from forests, from mill wastes, from
5 shrubs, meaning chaparral and shrub materials,
6 adding up to a total from both private, federal
7 and state sources.
8 Now the asterisks on the federal source
9 is that those numbers are only calculated after
10 all the federal parks, all the restricted and
11 preserved areas, any area of federal public forest
12 land that has any special consideration. The
13 restriction is already removed and so this leaves,
14 this is the extraction, potential extraction from
15 the rest. And you can see that there's a number
16 of roughly 14 million bone dry tons that's
17 estimated when you do all these calculations.
18 Now some of the assumptions are that
19 there's about 40 million acres of forest lands in
20 California where about 46 percent is national
21 forest, 12 percent is other public forests and 42
22 percent are private lands.
23 What do we mean by logging slash? Tops,
24 branches and bark.
25 Thinnings are non-merchantable materials

extracted during stand improvement and for fuel reduction. This is for forest health management. And to reduce the threat of catastrophic wildfire.

The mill residues are things like bark, sawdust, shavings and trim ends.

And then shrubs and chaparral, that would be primarily for biomass.

Now both -- Oh you can't see that, I'm sorry, the background didn't come out. It's supposed to be black. But it says, both nationally and in California we are seeing a demonstrable increase of forest land burning each year. And we are also seeing an increase in the intensity of forest fires.

Now why is that? Well, the forest biomass, particularly in conifer forests, is increasing at rates greater than the harvest and the removal other than from fire. And that rate of increase greater than removal ranges from about 1.5 perhaps on private lands to as high as 15 to one. Now these numbers are not act in stone and they vary by location and area.

But when we build up so much fuel in our fires through caring for them so carefully, catastrophic fire becomes an outcome. And what

1 happens with catastrophic fires is that they
2 fundamentally all end up undoing all the concerns
3 that we might have for preserving the ecological
4 values of our systems.
5 So these are some forest numbers and
6 other biomass numbers that have come out of the
7 modeling exercise by Tittmann and all. And what
8 you see here is the annual potential production of
9 biomass at a certain biomass procurement cost.
10 And at above $20 a ton, at $15 to $20 a ton forest
11 biomass starts to become fairly substantial. As
12 well as municipal solid waste.
13 This is taking into account feedstock
14 production, distribution to refining terminals and
15 then distribution to end users. So this is a
16 higher level filter, if you will, about
17 economically recoverable biomass.
18 And at higher biomass prices above
19 about, according to this modeling exercise $40 to
20 $50 a ton, a substantial amount of forest biomass
21 becomes available. And at around $100 a ton
22 procurement cost you see the limit of forest
23 biomass.
24 As discussed earlier, subject to all the
25 constraints that currently exist on limiting

1 forest harvest, which includes policies to take
2 into account the public trust doctrine and the
3 preservation of ecological values in terms of
4 forest stewardship.
5 So what happens? At less than $1.50 per
6 gallon of gasoline equivalent the biopower
7 provides market for about 14 percent of the
8 biomass. We are looking at -- California has gone
9 back up again but we were touching that again just
10 recently. So you don't get much biofuel
11 development around that. But above about $1.50 to
12 especially $2 you see a rapid increase in the
13 utilization of feedstocks in this model with costs
14 centered around $20 to $35, $35 to $35 a dry ton.
15 Corn ethanol economically without
16 subsidy enters at about $2.50 a gallon as does
17 forest biomass. It doesn't say that in here. And
18 by $5 a gallon gasoline equivalent you actually
19 start to convert using a Fischer-Tropsch process,
20 very low quality municipal solid waste into fuels.
21 So there are economic thresholds that seem
22 actually within sight. We could see perhaps $4 or
23 $5 gasoline in our lifetimes again someday.
24 So if you take a look at these various
25 sources as the price of biofuel in terms of

1 dollars per gallon gasoline equivalent increases
2 you start to see some of these resources start to
3 come into being and to use. So here is the forest
4 residues. And somewhere between 1.75 and
5 certainly 2.50 you see a substantial potential for
6 the conversion of removable forest residues from
7 -- and used for biomass. Provided you can figure
8 a good lignocellulosic fermentation conversion.
9 But these are the assumed costs of conversion that
10 we can currently estimate.
11 Well this is very useful. This is
12 useful just simply to show you that different
13 types of materials, dry mill corn ethanol for
14 example, has a much higher procurement cost than a
15 conversion or distribution cost. Whereas
16 electricity has a much higher -- If you are going
17 to make electricity out of biomass it has a much
18 higher conversion cost than feedstock procurement.
19 Fatty Acid Methyl Ester biodiesel and
20 second generation biodiesel again have very large
21 procurement costs relative to conversion. The
22 Fischer-Tropsch diesel has a very high conversion
23 cost with a very low procurement cost. So there's
24 tradeoffs in all of these types of materials based
25 on current technology assumptions.

1 So conclusions from this model are that
2 depending on the market scenario the total
3 economic biomass resource in the state varies
4 between about 18 and 25 million dry tons at the
5 price ranges of about $2.20 to $4. Now that's a
6 lower number. You have been 30 to 40 million tons
7 in some earlier assessments. But this is using
8 the filter of actual looking at transportation and
9 distribution costs and location.
10 However, this is the first cut at this,
11 at this analysis. And to really know this on the
12 ground, have a much better concrete estimate, we
13 still do need to really do a better idea of the,
14 of the mapping of the actual resources, a look at
15 the sustainability issues associated with recovery
16 and so on.
17 And we are going to need to do an analysis of
18 the natural forest and carbon dynamics and
19 wildfire frequency, which will change some of the,
20 potentially change some of the assumptions around
21 price and availability.
22 Land use policies are going to have a
23 significant impact on the availability of
24 feedstock. We heard earlier from the Air Board
25 that they are not that interested in seeing

1 agricultural lands used for feedstocks. That's
2 one policy, for example, that might reduce or
3 change these availabilities.
4 We believe that land policies should
5 enable the expansion of crops on marginal lands.
6 I have talked about that at the Energy Commission
7 previously and you can see references to that in
8 some of the other locations on the Energy
9 Commission website.
10 And we have the capacity to better
11 analyze potential greenhouse gas reductions and so
12 on through purpose-grown or dedicated energy crops
13 and we think that those should be more thoroughly
14 analyzed. So this is just a beginning and a start
15 for this kind of work.
16 Now just briefly I want to talk about
17 one of the last of Jim's questions is whether
18 there's a potential for biofuels from purpose-
19 grown crops in California.
20 Funded partially by the Energy
21 Commission and also by the Air Board through the
22 STEPS program we are conducting a much more
23 detailed agro-ecological and economic assessment
24 of the actual potential of biofuel and residue
25 production across California's farming regions.

1 And I have listed a number of them there.
2 Steve Shaffer mentioned earlier that
3 each region has separate sets of opportunities and
4 constraints. So if you were to do a simple
5 statewide calculation, which is what we have
6 tended to do in the past, you are going to both
7 over- and underestimate biomass production.
8 And these models, which we have already
9 started to create, can be used for a number of
10 purposes. In fact we are doing it in cooperation
11 with the Bren School with another Energy
12 Commission project as well.
13 These are roughly some of the areas that
14 are being analyzed, both as areas, as regions as a
15 whole but also within subregions of those, of
16 those large areas.
17 We are taking a look at the most likely
18 crops, which are the ones that we know how to grow
19 right away, but also some perennial forest grasses
20 and perhaps some other new species that might be
21 introduced.
22 And this just gives you a snapshot of
23 just some of the numbers. These numbers come from
24 interviews with individual farmers. The farmers
25 have chosen -- the people in the Cooperative

1 Extension who know their farmer client base and
2 who suggested that these would be the best people
3 to interview in this area. So we are going around
4 the state and interviewing them.
5 And if you just take a look at alfalfa
6 across the stop you see cost and return estimates
7 for the San Joaquin Valley for 2008 for the cost
8 of production of alfalfa but you can see the
9 estimates of the individual farmers based on the
10 records that they gave us. You can see that it
11 varies quite a bit. And in parentheses is the
12 percentage of the cost due to water allocation.
13 And that's interesting to because look at Farmer
14 6. His water cost is way lower than Farmer number
15 7 and Farmer number 4, even 5.
16 So even within regions, this is just
17 Western San Joaquin Valley, there are these quite
18 distinctive differences for both opportunities and
19 constraints for production.
20 Basically -- I'll skip that. That's a
21 model and the simple way it functions.
22 This shows you for Farmer number 5, our
23 estimates of his costs and returns for different
24 crops. And you can see in the first one canola,
25 which is a new energy, potential energy crop,

1 starts to replace both a little bit of tomato-
2 processing and pima cotton at a fairly high price
3 of $20 a hundredweight. That's higher than we are
4 likely to see for biodiesel so that doesn't seem
5 too promising.
6 But sweet sorghum looks actually quite
7 reasonable at the price of around $18. At $17,
8 $18 a ton for biomass it starts to replace some
9 alfalfa hay production in that case on that farm
10 and some processing tomatoes. And certainly pima
11 cotton.
12 This is where we have the interviews
13 conducted so far, we have got another 10 to 15 to
14 do. And you can see the entry point into the crop
15 rotation for canola. You can see how that price
16 varies by different farmers. And you can see how
17 the price varies as well for sweet sorghum. In
18 some cases by almost three-fold. So this gives
19 you an idea of the kind of information that is
20 coming out of this work.
21 This same kind of information needs to
22 be done for the assessment of forest biomass
23 resources and their availability. And it is part
24 of the next phase of the Collaborative's projects
25 should it be funded.

1 Just lastly I want to mention, just
2 point out that there is potential, and it is not
3 in the model that I just showed you yet, for the
4 use of crops for phyto-remediation or
5 bioremediation of problems like selenium. And I
6 have talked about this at other presentations at
7 the Energy Commission so I won't cover it in any
8 detail here. But this represents a way of using
9 bioenergy to try to manage other environmental
10 problems. In other words, fund, provide economic
11 resources to do environmental management of
12 something like selenium on the western side of the
13 San Joaquin Valley.
14 So I probably went too long I'm sure but
15 that's it.
16 MR. McKINNEY: Thanks very much, Steve,
17 and I want to acknowledge that I actually asked
18 him to cover a few additional items so I'll take
19 the responsibility for him running a little long.
20 Commissioners, did you have any questions for
21 Professor Kaffka?
22 PRESIDING MEMBER BOYD: I don't know if
23 it's a question or a reaction. Maybe it's a
24 question. I was frankly surprised by the amount
25 of stover referenced in your chart, if I take that

as a California fuel base. And that gets back to an earlier comment you made about the amount of corn in California. A little bit more than I am used to recalling.

DR. KAFFKA: Well we tend to think of corn in two ways, one is corn grain and one is corn silage. And the great majority of corn produced in California is grown to feed dairy cows. It's like seven to eight to one is the ratio.

Stover is available in straw. There's quite a bit of wheat produced and quite a bit of wheat straw, barley straw and so on. That is also part of what you would call stover.

PRESIDING MEMBER BOYD: That's my mistake, I'm only thinking of corn stover.

DR. KAFFKA: If there isn't any, if there is a severe water limitation then what happens is this. You see corn stover baled up to feed the dairy cows because there is not enough water at a minimum baseline to provide enough feed. So there's a bunch of public policy issues that interact with all of these numbers.

MR. McKINNEY: Any other questions from the Commissioners?

1 Before I introduce the next speaker --
2 And thanks again, Professor Kaffka. Before I
3 introduce the next speaker, I was made aware of a
4 program change. So Alan Weber, stand by and be
5 prepared to make your presentation after Alex.
6 Our next speaker is Alex Schroeder.
7 Alex is the program director for the
8 transportation fuels and radioactive waste
9 transportation with the Western Governors'
10 Association. And he has been in the Denver office
11 for four years. So welcome Alex.
12 MR. SCHROEDER: Thank you, Jim. I would
13 also like to thank the Commission for inviting the
14 Western Governors' Association and allowing us to
15 attend and participate in this workshop.
16 I realize that I may be the last speaker
17 standing between everyone here and lunch so I will
18 try to be efficient here.
19 A little bit about WGA. We represent
20 the 19 western United States and three US Pacific
21 flagged islands. You can see our territory there.
22 It's a good deal of the country. Currently right
23 now our Chair is Governor Huntsman of Utah and our
24 Vice Chair is Governor Schweitzer of Montana. The
25 chairmanship rotates every year and our chair also

1 hosts our annual meeting, which will be this year
2 in Park City, Utah.
3 WGA was really established by the
4 Governors as a regional forum to work in issues
5 that have a regional underpinning. A lot of those
6 have come up and energy is an obvious one.
7 Natural resources, forest health.
8 And it is really an opportunity for the
9 governors to get together to come up with a common
10 western voice. There are definitely some unique
11 western concerns that the Governors feel need to
12 be addressed, both within the states and in
13 Washington. And we work to provide that forum.
14 I guess a little background on how we
15 work and how we get our direction. The Governors
16 establish policy resolutions, typically every year
17 at their annual meeting. The policy resolutions
18 are driven by the Governors. They are typically
19 reached by consensus and it is really what gives
20 staff direction on our work plans.
21 I am really here to talk about two
22 specific programs. One is the Transportation
23 Fuels for the Future initiative, one which
24 Commissioner Boys is very intimately familiar with
25 as one of our co-chairs. The other is a Western

1 Strategic Bioenergy Assessment, which is really
2 kind of an expansion of the program Steve talked
3 about. Looking at the whole supply chain for
4 biofuels across the entire West.
5 I would also note the quote at the top,
6 which comes from a recent letter from the
7 Governors to President-elect Obama. And it
8 really, this post-dates both of these reports and
9 I think underscores the Governors' commitment to
10 working together and working with Washington to
11 kind of work through some of our energy issues.
12 So the Transportation Fuels for the
13 Future resolution was passed in 2006 and added on
14 the establishment of a regional task force. The
15 regional task force was charged with coming up
16 with policy recommendations to increase the recent
17 supply -- excuse me -- the capacity of alternative
18 fuels, develop an adequate infrastructure to
19 support that, and position the Western States as
20 key producers in the alternative fuels economy.
21 Just kind of to jump ahead. Some of the
22 cost-cutting recommendations that came out of the
23 report were leadership, environmental stewardship,
24 financial and economic support, infrastructure,
25 feedstock development and workforce development.

1 Just to get into a couple of these
2 specifically. I think the Advisory Committee
3 which wrote this report really realized that the
4 states have the leadership role to play here.
5 There's a lot that the Governors can be doing, the
6 states can be doing, state agencies, et cetera, to
7 kind of advance the region's alternative fuels
8 agenda, whether it be fleets, et cetera.
9 Environmental stewardship is obviously a
10 chief concern of the Governors and working
11 together regionally to solve some of these issues
12 I think was an important point the Advisory
13 Committee stressed.
14 Our infrastructure challenges are
15 obvious and there is certainly a need for regional
16 cooperation there. And I think as we will hear in
17 the afternoon as we have heard this morning, there
18 are certainly challenges in getting both feedstock
19 development technologies, conversion technologies
20 and also the workforce to support that.
21 Specifically advising the Advisory
22 Committee was a biofuels task force which I think
23 was referred to earlier. And it was really, it
24 was a broad stakeholder group and they made
25 recommendations to the Advisory Committee, which

1 then went forward to the Governors. And I will
2 just talk briefly I guess about some of their
3 priority recommendations.
4 One of them which I think was
5 accomplished -- And we'll also note that this
6 report was published before the Renewable Fuels
7 Standard. So the first one which is really a
8 priority recommendation was creating a demand for
9 biofuels. I think we can check the box. There
10 are certainly some things that probably, some ways
11 to tweak that but really the basic policy is in
12 place.
13 Another was coordination between state
14 and federal agencies on research, development and
15 deployment and really kind of making sure that
16 state and federal incentives and programs were
17 working with each other and not against each
18 other.
19 Another thing that has been talked about
20 several times today is ensuring that the next
21 generation of biofuels is developed, whether it's
22 developing feedstocks, dedicated energy crops and
23 also the conversion technologies so we can move to
24 the next generation of biofuels development.
25 And lastly development of infrastructure

to support higher blends of biofuels. And there are different ways that the different states are looking at this. In the Mid-West blending pumps are extremely popular and there are certainly regulatory considerations there. But there was just a general recognition that regionally we need to be working together on some of these infrastructure challenges. Which again is pointed out below.

I think it was mentioned before, coordinating fuel standards. Air quality standards across state lines are going to be essential. As Bob pointed out in the Low-Carbon Fuel Standard, it's really important that state policies really move past the borders because a lot of the economic implications don't have borders. So it is really important that we, we work together as a region.

And the same goes with environmental impacts. Emissions, water, et cetera don't necessarily have state borders.

So in conclusion of this effort the Governors passed a resolution in 2008 vowing to work together on the recommendations.

And they also formed a Transportation

1 Fuels Council which really has been given that
2 task, and they are going to be reporting back to
3 the Governors this year at their 2009 annual
4 meeting on some of the progress that the Western
5 States made.
6 It is also an opportunity for the states
7 to get together to kind of share experiences,
8 coordinate with the federal government and have
9 kind of a regional forum to share what's going on
10 in each irrespective states in regard to
11 alternative fuels.
12 So moving on to the Western Strategic
13 Bioenergy Assessment, which as I said is really
14 kind of our expansion of the work that UC Davis
15 did. And we would like to acknowledge and thank
16 UC Davis, they have been a great partner to WGA.
17 Bryan Jenkins has probably actually been working
18 with WGA a little longer than I have.
19 And really there were four parts to this
20 assessment, which Steve kind of alluded to. And
21 the main goal is really to get an idea of the
22 entire biofuel supply chain so we have an idea of
23 what is economically feasible. The first part is
24 really looking at the western resources. Coming
25 up with an inventory of our biomass resources.

1 The second is modeling the conversion
2 technologies. And the part where UC Davis really
3 helped out was plugging that into a model with the
4 transportation infrastructure that could really
5 come up with a delivered cost of fuel.
6 And the fourth piece was kind of an
7 analysis that we used to inform the biofuels task
8 force and also the Advisory Committee report which
9 was looking at what different policies could be
10 put in place and could have a positive effect on
11 the outcome here.
12 So this is just a brief overview of the
13 results. These are potential growth projections
14 to 2015. I will note that this is modeled at a
15 $2.40 gallon of gasoline equivalent price, which
16 at the time was very reasonable, six months later
17 it was not and is now high. So it's definitely a
18 moving target.
19 But the main conclusion was that 11
20 billion gallons of biodiesel and biofuels are
21 possible per year by 2015. You can kind of see
22 the breakout of feedstocks on the right. This
23 obviously assumes a big increase in production
24 with cellulosic biofuels, particularly from
25 herbaceous energy crops.

1 And this translates to roughly $18
2 billion in economic development in rural
3 communities and a $23 billion investment in
4 technology and infrastructure.
5 So the next step, and this is what we're
6 currently working on right now, is taking this
7 Western model and making it a national model. The
8 fuels market is really something that doesn't have
9 any boundaries, unlike electricity where there are
10 street grids. It's really a national market.
11 Feedstocks certainly cross borders.
12 So the US Department of Energy
13 approached us on taking our model, expanding it
14 nationally and really using it to provide a key
15 input into their update on the Billion Ton Study.
16 So we are working with them right now. We are
17 revising a lot of our western data on feedstocks.
18 Kind of looking at the conversion technologies,
19 reevaluating those, seeing what else is possible.
20 And I think a big piece that we are
21 looking at here is a more detailed look at
22 environmental impacts. And what those, going back
23 to the western assessment, what does 11 billion
24 gallons of biofuels mean for greenhouse gas
25 emissions, for water consumption. And really

1 trying to come up with some of the secondary or
2 maybe even primary impacts of ramping up for
3 biofuels production.
4 We are also looking at modeling
5 different national policies and infrastructure
6 scenarios. One would be a more distributed
7 infrastructure where you do have blending pumps
8 instead of centralized distribution facilities.
9 Also potentially looking at the effects of a cap
10 and trade program price on carbon, et cetera.
11 And of course as I mentioned before, the
12 price of gasoline is certainly a moving target.
13 We hope to update some of our economic assumptions
14 on that.
15 And finally, I think we are looking to
16 make this information available in a manner that
17 is easily accessible to everyone. So that it is
18 useful to the consumer, it is useful to
19 businesses. But just kind of getting that
20 information out there and making this work
21 publicly available.
22 So I will just briefly go over some of
23 the things that WGA plans on working on in the
24 coming years. I just mentioned our National
25 Bioenergy Assessment. We hope to have it wrapped

1 up by the end of this year.
2 We are also hosting regional biofuels
3 workshops, really as an opportunity to kind of get
4 states together to evaluate their biofuels policy
5 and also bring in federal agencies and start a
6 dialogue there.
7 WGA is also a member of the National
8 Biomass Partnership and we work with the other
9 Governors' organization in the country to just
10 kind of make people aware of what is going on in
11 biofuels in Washington and kind of create a
12 national network there.
13 As I already mentioned before the WGS
14 Transportation Fuels Council will be presenting
15 their progress report to the Governors at their
16 2009 annual meeting.
17 I think I briefly mentioned in our third
18 slide the Governors are following up with
19 President-elect Obama, the Administration and
20 Congress on a letter that they sent in November
21 which really emphasizes the need for a
22 comprehensive, national energy policy.
23 And as I said, this is something that
24 WGA has really been pushing for quite a few years.
25 I think there is a sense that it is really

reaching ahead and a sense of urgency. So the Governors are exploring ways to implement that. They met with the transition team in November, provided testimony in Congress, and we are really looking at ways to kind of make sure that the western states are at the table.

I think that's about it so are there any questions?

PRESIDING MEMBER BOYD: Thank you, Alex.

MR. McKINNEY: Our next and final speaker for this panel is going to be Alan Weber. And Alan is with the National Biodiesel Board. And I'm sorry, Alan, I didn't get a chance to talk to you before so I am going to ask you to introduce yourself. Are you with us here?

MR. WEBER: Yes I am.

MR. McKINNEY: Can you work the controls okay?

MR. WEBER: I believe so.

MR. McKINNEY: Great. Okay, have at it.

MR. WEBER: Very good. I seem to be having a delay on advancing the slides.

MR. NGUYEN: Just click your mouse on the slides. Maximize it, please. The red arrow at the bottom, the left hand corner. Thank you.

1 MR. WEBER: Then to advance do I click
2 on it?
3 MR. NGUYEN: Yes.
4 MR. WEBER: I'm not having a response.
5 MR. NGUYEN: The up and down arrows.
6 Click your mouse on the slide and then the up and
7 down arrows.
8 MR. WEBER: Nothing.
9 MR. McKINNEY: Alan, Jim McKinney. I'll
10 tell you what, why don't you make your
11 presentation. And then when you want a new slide
12 say, next slide please, and Darren will operate it
13 from here.
14 MR. WEBER: Very good, that will work
15 from this end. And thank you Jim and thanks for
16 working with me in terms of getting technology to
17 work. I do, I do appreciate the chance so
18 Commissioners Boyd, Douglas and the rest of the
19 Committee, I appreciate the opportunity to be able
20 to be with you via the web today to present before
21 the Committee.
22 For the record my name is Alan Weber. I
23 am a partner with MARC-IV Consulting and also
24 serve as a senior advisor to the National
25 Biodiesel Board. What I hope to accomplish today

1 is to provide you with an overview in terms of
2 sources which are available to utilize for
3 biodiesel production in the United States. Next
4 slide, please.
5 I am representing the National Biodiesel
6 Board. Some of you may already be familiar with
7 this organization. In case you are not, the
8 Biodiesel Board is an industry trade association.
9 It is very diverse in terms of membership,
10 representing most every biodiesel producer that is
11 in the United States, also fuel marketers and
12 technology firms as well as feedstock
13 organizations. So offices, our headquarters in
14 Jefferson City, Missouri and also offices in
15 Washington DC. Is it possible to get the slide
16 advanced?
17 MR. McKINNEY: Bear with us, Alan, we
18 are still figuring this out.
19 MR. WEBER: I'll just go ahead and move
20 forward. I know the Committee is aware of a lot
21 of advances in biofuel as well as biodiesel. We
22 have seen some significant industry growth moving
23 from a mere two million gallons in the calendar
24 year 2000 to the most recent year in which we will
25 see about 700 million gallons of biodiesel which

1 is being produced by US producers.
2 And I think it is important from the
3 context of looking at this growth in terms of some
4 policy which is has been set at the federal level
5 or whether we are looking at it from a California-
6 specific standpoint in terms of this growth and
7 some of the milestones which have been set.
8 And when we start talking about policy
9 and milestones which have been set there's a
10 couple of questions which come to the forefront.
11 A lot of times the first question is, will there
12 be sufficient investment in terms of plant
13 capacity? And then with biodiesel specifically
14 the next question usually comes to be, you know,
15 will there be sufficient feedstocks to be able to
16 meet these goals or these milestones?
17 And what I wanted to do in the
18 presentation today was to address both of those
19 questions. I set a benchmark of 2012, primarily
20 because some of the federal legislation which you
21 heard speak about earlier, the RFS 2, and the fact
22 that that 2012 date is a milestone date.
23 Whenever the slides get to it there is a
24 slide in terms of production locations in terms of
25 plants that are in the United States. Valentino

1 earlier provided an overview of California and so
2 from a US perspective as of September of last year
3 there was around 175 plants with an annual plant
4 capacity of around 2.5 billion gallons.
5 And for those of you that might have had
6 an interest, the average plant capacity is around
7 50 million gallons currently. And 42 of those 175
8 plants are a 20 million gallon per year plant or
9 greater. And in addition to those plants, which I
10 might mention kind of stretch across the West
11 Coast north to south, there's a number of firms
12 that still have plans for expansion or for new
13 construction. And when those plants are taken
14 into consideration you would have an additional
15 850 million gallons worth of capacity which could
16 be brought on-line if all of those plants
17 materialized.
18 More from a state perspective. Texas
19 and Iowa lead the way in terms of states that have
20 invested in plant capacity. Texas has 450 million
21 gallons of annual plant capacity. Iowa follows
22 with greater than 300 million gallons of plant
23 capacity. And when you take a look at the West
24 Coast and look at California, Oregon and
25 Washington, around 160 gallons worth of plant

capacity. The numbers matched up fairly well actually with what was presented earlier.

Kind of shifting gears. From my perspective I don't necessarily believe that a certain plant capacity represents a constraint for federal policy or for state policy as far as that goes as well. But I do want to shift gears then into looking at some of the feedstock supplies.

And I think that whenever think about feedstock supplies it is important to be able to divide our thoughts up from a timing perspective. So I wanted to speak first of all in terms of the near-term landscape. Where we might see opportunities for feedstock supplies in the three or four years. And then look to the horizon about other opportunities which I believe are out there.

Whenever we think about raw material supplies, and I'm speaking for the US as a whole. We have gone from California-specific to the western region and now we are looking at the nation as a whole. We will be relying, in my estimation, on some of our near-term technologies. Some things that you are probably familiar with. Things such as yellow grease, animal fats, canola, Nebraska (indiscernible), soybean production.

1 And there's some things which you may or
2 may not be familiar with, things such as Camelina
3 production possibly in the Pacific Northwest, or
4 utilizing corn oil in ethanol plants in the US.
5 So using 2012 as a benchmark I am going
6 to go through some of these opportunities and try
7 to give you my estimate of where I think raw
8 material sources will be in the year 2012.
9 So kicking things off I am actually
10 going to start with the ethanol industry. It is
11 important in my mind to feel the leverage
12 opportunities wherever they exist. And as Paul
13 had indicated earlier, with the RFS 2 goal of
14 having 5 billion gallons of starch-based ethanol
15 by the year 2015 -- realize we are talking, give
16 or take, around five billion of corn, which would
17 then be converted into ethanol.
18 And although the amount of fat that
19 exists in a kernel of corn is low on a percentage
20 basis, when you think about the volume of bushels
21 we are actually talking about a very significant
22 amount of potential vegetable oil.
23 To be able to extract that oil we are
24 really looking at two pathways. The first pathway
25 would be on the front end of the ethanol plant

1 looking at fractionation technology. The other
2 would be to actually go through the fermentation
3 process and then to de-oil one of the co-products,
4 the dry composed grain from solubles, to pull that
5 vegetable oil out.
6 And we termed the adoption of these
7 technologies with the current capital markets the
8 way that they exist today as well as the amount of
9 capital which is required to be able to, you know,
10 look at fractionation technologies. It is my
11 opinion that most ethanol plants that will be
12 looking at adopting a pathway will be looking at a
13 de-oiling technology. Which has the capability,
14 most likely, of removing about a third of the
15 potential oil.
16 So when you think of it from that
17 perspective of removing about a third of the oil
18 of five billion bushels of corn, it is around 400
19 million gallons worth of biodiesel potentially if
20 vegetable oils could move into the marketplace.
21 I think it is also important to note, to
22 highlight that the current vegetable oil content
23 of corn is between three and three and a half
24 percent. And technology already exists in terms
25 of genetics to be able to almost double that up to

1 close to seven percent for some Iowa corn.
2 On my screen, to Jim or to Darren, I'm
3 still seeing the initial slide. Is the rest of
4 the Committee seeing other slides?
5 MR. McKINNEY: Yes. The WebEx is not
6 working for your presentation and we really
7 apologize for that, Alan. We are trying to page
8 through the slides here at the Energy Commission.
9 MR. WEBER: Okay.
10 MR. McKINNEY: But there seems to be a
11 bit of a glitch there. So the one I have got up
12 here is Near Term Raw Material Sources.
13 MR. WEBER: Okay, you can go ahead and
14 move two more past that.
15 MR. McKINNEY: Dry Grind Ethanol Plans?
16 MR. WEBER: A-ha, and then move to the
17 next one.
18 MR. McKINNEY: Camelina?
19 MR. WEBER: Yes sir.
20 MR. McKINNEY: Bingo.
21 MR. WEBER: And so we just basically
22 looked at the potential for pulling vegetable oil
23 or feedstock supplies in ethanol plants.
24 And I wanted to switch gears and talk
25 about some of the higher oil content oil feeds.

1 Let's start with Camelina which is a crop which I
2 think more people are becoming familiar with.
3 It's a relatively input crop and concentrated
4 right now in Montana and other parts of the
5 Pacific Northwest.
6 If you take a look at an eight state
7 region in that area there's around 22 million
8 acres worth of wheat grown. So it is realistic to
9 think that maybe we would be able to plant on ten
10 percent of those acres, or around two million
11 acres, camelina. And if successful that would
12 represent about 116 million gallons worth of
13 additional feedstock supply.
14 Keeping in mind that one of the benefits
15 of camelina is that it can be grown on acreage
16 which maybe doesn't have the potential to raise a
17 good canola or a good wheat crop. So I think that
18 two million acre target is realistic, timing of
19 course with the issue there as to when the two
20 million acres would be realized. Introducing a
21 new crop is not easy. I have had one in a decade
22 of experience of introducing new oil feeds and
23 material green crops.
24 The challenges in this case are several.
25 Risk management options for farmers, things like

1 getting crop insurance. Grower education about
2 how to move it into the rotation. And most
3 importantly, just the fact that it would have to
4 compete with crops that might be in a rotation
5 from an economic standpoint. So in this case that
6 would be wheat. But nevertheless, it was realized
7 in the Pacific Northwest where you are looking at
8 more than 100 million gallons of additional
9 feedstock supply.
10 So moving to the next slide in terms of
11 winter canola. And most of the canola acreage
12 which is grown in the United States currently is
13 raised in the upper Midwest, primarily North
14 Dakota. About a million acres in that region,
15 almost all of it in spring canola.
16 There's a lot of opportunities in being
17 able to look at planting winter canola in new
18 regions. That would be the Great Plains, the Mid-
19 South or Southeast and then also the Pacific
20 Northwest.
21 The US Canola Association has a goal, a
22 stated goal of increased acreage to two million
23 acres by 2010. Again, some of the same challenges
24 persist in terms of increasing acreage. Things
25 such as risk management strategies, having access

1 to crop insurance. And again, that crop must
2 compete competitively. But if we added two
3 million acres of canola it represents about 100
4 million gallons worth of additional vegetable oil
5 supply.
6 I do think it is important to note that
7 even though we do have plants in the United States
8 which are currently operating on canola feedstocks
9 it is a premium priced feedstock and therefore
10 most likely would move into the edible oil market.
11 But still benefiting the biodiesel industry from
12 the standpoint of increasing vegetable oil supply.
13 In the next slide I wanted to highlight
14 some of the opportunities for animal fats and
15 yellow grease. And although these feedstocks
16 don't necessarily have a supply response, we don't
17 necessarily eat more french fries to generate more
18 recycled cooking oil, I do believe that they will
19 have a significant contribution in terms of raw
20 materials by 2012.
21 So basically some information on work
22 that was done and commissioned by the National
23 Renewable Energy Laboratory which estimated the
24 per capita generation of recycled cooking oil at
25 about 9.4 pounds per capita. In a total sense in

1 the US we could probably generate around 300
2 million gallons worth of yellow grease.
3 Now it is not realistic necessarily to
4 assume that all of that would be diverted into
5 biodiesel production. There's a lot of other uses
6 currently, primarily in terms of feed
7 manufacturing for yellow grease.
8 I do have, however, think that as you
9 look at the import/export data that we realize
10 that about half of our inedible fats are currently
11 exported that we could assume we could probably
12 divert up to half of our yellow grease generation
13 into biodiesel production. So, you know,
14 representing a little bit more than 150 million
15 gallons worth of potential.
16 Switching over to the animal fat side,
17 to the edible/inedible tallows, the
18 (indiscernible) greases, poultry fat. Using the
19 US census information there's around 964 million
20 gallons worth of potential in the form of animal
21 fats that are currently being rendered.
22 Now again these feedstocks currently
23 have uses and so (indiscernible) be able to put
24 them into biodiesel production. So some industry
25 analysts have felt that moving up to 25 percent of

1 existing animal fats into biodiesel production
2 would be reasonable, thus representing around 250
3 to 260 million gallons of potential production.
4 And then kind of finishing up here in
5 terms of the near-term opportunities looking at
6 soybean oil supplies on the next slide. Just to
7 kind of benchmark for you: In 2007 and 2008 around
8 400 million gallons worth of soybean oil were
9 utilized in biodiesel production. The '08 crop
10 this past year was around 2.92, 2.96 billion so a
11 fairly healthy crop.
12 And I think the most notable thing that
13 would be of interest to this Committee is the fact
14 that companies such as Pioneer and DuPont Company
15 and Monsanto have been investing significant
16 resources to be able to improve today. And with
17 limited introduction in '09 and full introduction
18 in 2010, we will see genetics that will have a
19 stepwise change in yields of ten percent.
20 And when we think about the fact that
21 farmers have demonstrated the willingness to adopt
22 technology or genetics, which will have unit
23 improvements or cost reductions. So if 90 percent
24 of reductions, say 60 million acres were converted
25 to the next technologies and new genetics, that

1 could actually add around 250 million bushels or
2 close to 380 million gallons of additional oil
3 supply on the soybean side.
4 If we move to the next slide it kind of
5 provides a summary that whenever I look at
6 feedstock supplies for biodiesel production in the
7 next three to four years, so by 2012, we are
8 looking at a possibility of around 1.8 billion
9 gallons worth of potential.
10 Now I think some important things to
11 note here. The first one is that these are all
12 known technologies. So all the things which I
13 discussed, currently -- the technology currently
14 exists to process it.
15 But any new crops, in terms of
16 introductions, does have its challenges, which I
17 tried to note. I also highlighted the fact that
18 we would have yield enhancing technology on the
19 soybean side. But I want you to remember that we
20 can have production of additional bushels but we
21 would have to be able to expand our processing
22 capacity at the same time to be able to utilize
23 the oil.
24 And to be able to fully benefit from the
25 potential corn oil coming from an ethanol dry

1 grind facility we have to also assume that the
2 capital markets are there to be able to have those
3 investments. So there are some blocks out there
4 but I think from a near-term perspective we can
5 see up to 1.8 billion gallons worth of fats and
6 oils.
7 The thing which I didn't cover but I
8 just wanted to highlight is when you start
9 thinking about soybean oil exports, the export of
10 raw soybeans, the potential for import of other
11 feedstocks, whether it be things such as palm or
12 whether it be other vegetable oil supplies coming
13 from other countries. It could have a significant
14 but it's highly variable depending upon the global
15 economic conditions as well as policy. And
16 heavily dependant upon expansion of processing
17 facilities here in the United States.
18 So what is on the horizon? Trying to
19 look at it more from a perspective of looking at
20 California and crops which could potentially be
21 grown in California. If we move two slides
22 forward, please.
23 You currently, when we take a look at
24 raw material supplies in the US there has been a
25 lot of competition for feedstock by the biodiesel

1 facilities, margin is a bit thin. But the silver
2 lining from my perspective, and then from the fact
3 that there has been a lot of investment is in
4 feedstocks and looking at ways to deal with
5 increased feedstock supply. So we will be
6 speaking about a lot of things that include
7 halophytes such as Pickleweed and Seashore Mallow,
8 crops such as Jatropha, Pennycress in the Midwest,
9 Low Ricin Castor. All of these have potential.
10 But I did want to more concentrate on things which
11 may have potential to California.
12 So if we could move to the next slide.
13 Algae is a technology which probably has some of
14 the most significant potential in terms of yields
15 per acre. I think that it could realistically --
16 researchers and companies which are working right
17 now are estimating a two to five thousand gallons
18 per acre range in their discussion, with a lot of
19 research going into ways to be able to increase
20 that significantly.
21 You know, I was at a (indiscernible)
22 exercise for algae last month. And a note that I
23 thought was interesting was that in terms of
24 venture capital investment in the first and second
25 quarter of 2008, around $280 million was invested

in biofuels and of that, 84 was specifically for algae. So algae is garnering a lot of attention from an investment perspective.

In speaking with companies that are working on the development side, they said it is probably reasonable to assume that we would be able to see commercial fuel production in the next five years.

Brown grease. The only thing I wanted to add from a brown grease perspective. Again, the potential. You're looking at close to a half a million gallons potential based upon the work that was done for an NREL report in the late 1990s.

And the last thing I wanted to say from a brown grease perspective is just the fact that even though I have it on the longer term horizon, I did so full well knowing that California's codes are already firm which are actually plugging brown grease conversion into biodiesel. So it has the possibility of having a greater capacity in a shorter time frame.

The last two slides I just want to briefly mention due to the time constraints. Jatropha is a crop which can be grown on less-than

1 optimum acreage. It grows in various low rainfall
2 areas. Up to 40 percent oil, typically 35
3 percent. This is a crop that hasn't had a lot of
4 research into it necessarily. It currently cannot
5 be mechanically harvested. And it does do better,
6 obviously, with better ground. Primarily being
7 grown in Asia but some acreage being planted in
8 Central America as well as Africa.
9 And the last crop to highlight that has
10 potentials in my mind for the state of California
11 would be halophyte production. Which is a crop
12 that can thrive in high-salt content environments,
13 whether it's brackish wells, wherever you have
14 salt water intrusion. These would be crops such
15 as Salicornia and Seashore Mallow. But the main
16 thing I would emphasize here is that all of these
17 crops need a lot of work, a lot of investment on
18 the user side. Everything from genetics all the
19 way through to the processing.
20 So in summary. Thank you for staying
21 with me through the presentation here.
22 When I think about plant capacity I
23 think about feedstock potential, keeping in mind
24 the 2012 benchmark which I outlined. I don't
25 believe that plant capacity nor feedstock supply,

1 from a US level, represents constraints to be able
2 to meet a federal policy such as RFS 2, and also
3 the state policies such as being considered in
4 California as well.
5 So Jim and the Commissioners and the
6 Committee present, thank you again for the
7 opportunity to be able to present to you. And
8 with that I will conclude.
9 MR. McKINNEY: Thank you very much,
10 Alan. And I also want to say thank you very much
11 to Darren for helping us get across the
12 technological thin ice there on the presentations,
13 thanks.
14 Commissioners, any questions for
15 Mr. Weber?
16 PRESIDING MEMBER BOYD: None, thank you.
17 MR. McKINNEY: I think in terms of
18 moving to the next step. I know we are trying to
19 maintain our schedule. I suggest to the Committee
20 that we get a show of hands to get a sense for how
21 many people want to speak or ask questions on the
22 four panelists who have already presented this
23 morning. I don't see any.
24 Darren, are there any people on the
25 WebEx who want to pose questions?

1 Does anybody on the phone want to pose a
2 question to our panelists?
3 MR. SHIPLEY: Yes, I would like to pose
4 a question for Mr. Weber.
5 MR. McKINNEY: Will you identify
6 yourself, please.
7 MR. SHIPLEY: This is Greg Shipley
8 calling. I'd like to ask Mr. Weber to repeat some
9 of the statistics on the algae and what the
10 production yield was.
11 MR. WEBER: Yes, Mr. Shipley, this is
12 Alan Weber. From an algae perspective there is --
13 If you were to attend an algae conference where
14 there were five firms and they were speaking about
15 their technology there would be a very wide range
16 in terms of projections of production per acre.
17 I think that a number of individuals,
18 when you think about what is doable today,
19 (indiscernible), that in the range of two to five
20 thousand gallons per acre would be something that
21 would be achievable in the next few years.
22 I realize that there are number of
23 research programs looking at things such as
24 frequency shifting of light, heterotrophic boosts
25 in terms of growing the algae in the evenings and

1 increasing the CO2 fixation rates that could
2 double and triple that potential.
3 I guess throughout my presentation, as
4 you can see, even with the animal fats and yellow
5 greases, I am not assuming that we can take all of
6 the production into biodiesel. I am trying to be
7 realistic and to be conservative. So that is why
8 I gave the two to five thousand gallons per acre.
9 MR. McKINNEY: Thanks Alan. Any other
10 questions from the WebEx audience?
11 MR. RAIN: Yes, my name is Rain. I was
12 wondering if there has been an looking into
13 doubling algae production with water treatment?
14 MR. WEBER: Yes, this is Alan Weber.
15 And Rain, I guess a lot of individuals would
16 definitely point to water treatment abilities as a
17 very likely first impact into the marketplace.
18 And I think in that particular case where you have
19 got the nutrient loading that what it does is
20 really help from an economic perspective in terms
21 of the amount of nitrogen and phosphorous or other
22 nutrients which would be required (indiscernible).
23 MR. RAIN: Absolutely. Thank you.
24 MR. McKINNEY: Rain, we are really glad
25 that you are joining us today. And I just wanted

to ask, have you composed any songs about the wonders of algae as a biofuel?

MR. RAIN: No, actually I have not.

MR. McKINNEY: When you do please send us a copy, okay.

MR. RAIN: I appreciate that, thank you.

MR. McKINNEY: Any other questions from the WebEx audience?

I think with that, Commissioners and Ken, I'll turn it back over to you and let you decide how long you want to break for lunch.

PRESIDING MEMBER BOYD: Well, okay, a quick announcement then we'll break for lunch.

Item number six on our agenda for this afternoon is titled Company Presentations. What we would like all of you to think about when you come back from lunch is to fill out one of these blue cards that's on the table out there in the lobby. This is a request to speak.

As you heard at the beginning, we are limiting folks to five minutes, no slides. But please do sign up if you want to make a presentation and put in the upper right hand corner where there's no space but up in the right hand corner that it is a company presentation so

it can be correlated back to the agenda.

With that I think we will break for no more than one hour for lunch. We are going to start right on time so I ask you to hustle quick. Come back and we'll have to move smartly. This is really interesting and I hate to move things along but we are going to run out of day here. Thank you all.

(Whereupon, the lunch recess was taken.)

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1 AFTERNOON SESSION

2 DR. TIANGCO: Good afternoon. Welcome
3 to this afternoon's biofuels technology workshop.
4 We have a daunting task. This afternoon's
5 session is on the conversion technology.
6 The transformational breakthrough in
7 basic, including applied and demonstration of
8 technologies that will be necessary to make plants
9 for biomass, for biofuels to be economically
10 viable.
11 For example, one of the key barriers,
12 one of the key barriers is the recalcitrant or
13 resistance of plant fiber to break down into
14 sugar, intermediate. The scientific and
15 technological challenges here are formidable.
16 Significant work is needed to better understand
17 the science for -- including plant cellulose,
18 plant fiber, for converting lignocellulosic
19 biomass to ethanol.
20 Likewise another key barrier to
21 understand how plant material breaks down
22 thermochemically or thermally, there is a
23 potential for new progress in chemical,
24 thermochemical conversion processes to include
25 catalysts. In short, we need technological

1 breakthroughs in order to help meet the biofuel
2 targets that we have here in the state.
3 This morning I alluded to the current
4 biofuel production. If you look on our current
5 biofuel production, by 2010 we will be able to
6 meet the 20 percent biofuel production in the
7 state. Before the idle power plants will operate
8 on-line by the end of this year or early next year
9 we will be able to meet the goal of .3 billion
10 gallons capacity equivalent of diesel biofuel.
11 This afternoon's session on biofuel
12 production technology. We have six speakers, we
13 have six distinguished speakers here. The first
14 two speakers will be doing it on-line by WebEx.
15 We have Dr. Don Stevens who will share to us the
16 up-to-date information on biochemical conversion
17 processes.
18 We have Dr. John Scahill from Denver,
19 Colorado who will be doing it on-line also on
20 thermochemical conversion processes. Dr. Bryan
21 Jenkins will share the Chevron - UC Davis
22 Research. And Harvey Blanch from Joint BioEnergy
23 Institute will share their progress on what to
24 date has been done in JBEI research. Together
25 with Susan Jenkins who will be showing to us the

1 Energy Biosciences Institute research being funded
2 by BP. And last but not least Tom Jacob will say
3 something on the biobutanols and all the other
4 lignocellulosic biomass projects, what they have
5 been doing to this point.
6 Without too much ado I would like to
7 give the floor to Don Stevens from the Pacific
8 Northwest National Lab. Don, are you on-line?
9 DR. STEVENS: Yes, I'm here. Can you
10 hear me now?
11 DR. TIANGCO: Yes, loud and clear.
12 DR. STEVENS: Good. I appreciate the
13 offer to be part of your conference. I appreciate
14 the offer to do this by WebEx. The global CO2
15 imprint attributable to this conference is less
16 because I don't have to be on a jet coming down so
17 I appreciate that.
18 I'd like to talk just a little bit today
19 about the biochemical conversion work. And I have
20 here as well Dr. John Magnusson from PNNL. If
21 there's questions that one of us can't answer the
22 other one hopefully can.
23 Just as a way of benchmarking where we
24 are right now, essentially all of the biofuels
25 which are being produced, the vast majority of it

at least in terms of volume, is ethanol and that's produced from corn. There's of course biodiesel as well, it's a smaller amount. But nationally we are producing the vast majority of our biofuel and ethanol from corn.

And with the plants that are currently available and the ones that are either under construction or being planned, we will rapidly be getting up to the 15 to 16 billion gallons nationally of biofuels. That brings us to the energy impact of the -- what the Energy Security Act's guidelines for corn ethanol. So ethanol as a fuel in this country has grown dramatically. That's not news to anybody.

Going to the next slide though. If we are going to move ahead we are probably going to get away from corn and go into the lignocellulosic feedstocks.

If you look at the national resource base you can kind of project out that various amounts of biofuels could be made from the various kinds of crops there, the various kinds of feedstocks. And that corn will still continue to be part of that but the majority in the future will shift away from just corn to include a

variety of biomass feedstocks. And those of course include things that California as well as Washington here has, ag residues, forest residues, municipal waste derived from feedstocks, et cetera, et cetera.

And one of the things that we did at the lab here at a few years ago was look at feedstocks. And if you get out of the Midwest where there's lot and lots of corn stover and go to the West where there isn't lots and lots of corn stover, what you find is that you are going to have to use a lot of different feedstocks. You are going to have to use things from a lot of little different piles.

In Washington it's everywhere from food processing waste to grape pomace to this and that and the next thing. And California if it wants to have its fuels come from indigenous resources as well is going to have to look at that vast variety and diversity of feedstocks.

If you look at all those feedstocks and think about how you do it of course there's a couple of different pathways. John Scahill is going to talk about the thermoconversion in a minute. I am talking about the bioconversion

here.

And for the most part bioconversion requires that you recover the sugars from the plant material and you let the organisms convert them into something interesting. Ethanol certainly, maybe other things as well, we'll get to that in a minute. And in doing that you have to somehow take advantage of the lignin that is there if you don't want a whole bunch of lignins just sitting on the ground wasting away.

There's also the whole issue of lipid oils, particularly from algae, whether we consider that bioconversion or feedstock. We'll talk about that in a minute.

A biological conversion route typically looks somewhat like this. Where you get the biomass, you do some sizing and pre-processing. But then you have got to get the sugars out and the sugars reside in the long chains of cellulose and hemicellulose. So you have got to do some kind of a hydrolysis.

There's lots of hydrolysis processes out there that can be used. There's strong and weak acid hydrolysis processes, there's enzymatic ones, steam explosion, ammonia explosion, quite a few

1 different approaches can be used. And it is not
2 my purpose here to pick one today because it would
3 depend on the industry and the situation, the
4 feedstock, as to which one is going to work in
5 that situation.
6 But once you have done the hydrolysis to
7 get the sugars from the biomass, then you want to
8 ferment those. Then unlike a corn situation where
9 you are using cellulosic biomass you have not only
10 the six carbon glucose-based sugars, the --
11 anyway, you have five carbon sugars as well as the
12 Xylose, the cellulose-based six carbon sugars and
13 the Xylose-based five carbon sugars. You have got
14 to be able to ferment both of those to get a
15 decent fuel yield.
16 And the organisms that do those
17 fermentations are less well-developed than the
18 organisms that just do six carbon sugars. They
19 have got some additional things there. In product
20 recovery you have got a dilute stream of ethanol
21 or other, or other products. And that is going to
22 be more -- the sugars coming out of your
23 cellulosic biomass process are more dilute than
24 the sugars from a corn-based biorefinery and
25 that's one of them.

1 So the ethanol is going to be more
2 dilute from a cellulosic biorefinery. So hence
3 you are going to have to do a little extra work in
4 the product recovery as well. The whole thing
5 depends on what it says down there at the bottom.
6 You have to do good hydrolysis and good
7 fermentation of the five and six carbon sugars to
8 have some opportunity for economic success.
9 So what's happened? Well, people have
10 been doing research on lignocellulosic biomass,
11 particularly ethanol, for about 30 years. I have
12 been involved with the biomass program through the
13 Department of Energy for a good part of that. And
14 a lot of work has been done and a lot of progress
15 has ben made. Better hydrolysis, better
16 fermentation organisms, reduced enzyme costs. All
17 those have been achieved in various, in various
18 ways.
19 And the RD&E is still continuing at the
20 federal level in a lot of ways. Certainly -- I
21 think you are all familiar with the big bioenergy
22 centers doing basic research. And one of those is
23 located, of course in California. The Department
24 of Energy continues to fund research on enzyme
25 improvements, on ethanologen improvements and

1 others. And as a result of all that research that
2 has gone on the projected prices for producing
3 ethanol, at least from cellulosic biomass, has
4 tracked down as well.
5 Now this is some, this is a graph from
6 the Department of Energy which shows some modeled
7 costs, just modeling done by the National
8 Renewable Energy Lab. And of course any set of
9 analyses depends on the assumptions that these are
10 for an nth (phonetic) plant. And nobody has made
11 the first one yet, let alone the nth one. And
12 they are based on laboratory results being able to
13 be achieved at those nth plants.
14 So there's certainly some uncertainty in
15 these numbers. But the trend here is what's
16 important more than the absolute numbers. So
17 please don't beat me up at the absolute numbers.
18 The trend is though that the projected costs of
19 producing ethanol from lignocellulosic biomass has
20 gone down over the last several years. It's gone
21 down quite dramatically and it is getting to the
22 range now where it is looking more and more
23 interesting on a commercial basis.
24 And as a result of that commercial
25 interest several large-scale demos have been

1 started by industry. Part of that was through the
2 EPAct legislation for the 932 demonstration scale,
3 the large demonstration scale facilities. Part of
4 the additional work which Congress requested the
5 Department of Energy fund on a ten percent scale.
6 And there's solicitation plans (indiscernible) on
7 a smaller scale advanced biofuels. The Department
8 of Energy has that out now. If after this phone
9 call people want information on that look at
10 grants.gov or give me a call or an e-mail and I'll
11 help you find that.
12 Just a quick summary of some of those
13 things that have happened in those large-scale
14 solicitations. The large, commercial scale 932s.
15 One of those, BlueFire in California, looking at
16 using biomass collected from municipal waste
17 systems. This is highly sorted waste. But the
18 biomass sorted from municipal waste into ethanol.
19 They have a demonstration plant there in
20 California. Three of the four here are
21 biological-based processes; one is a gasification.
22 Similarly, the so-called ten percent
23 scale facilities were slightly more advanced
24 ideas. I believe there's nine here and I believe
25 seven of those nine are biological-based.

1 So the take-home message here is simply
2 that biological conversion systems are nearing
3 commercial production. Right now there is no
4 ethanol produced commercially from them. However,
5 they are at the point where they are nearing
6 commercial production or nearing the point where
7 they can get to commercial production.
8 I have been talking largely about
9 ethanol and I want to mention some other things in
10 passing here because they could be important.
11 One, you don't have to make ethanol if you are
12 doing biological conversion. There's other
13 processes that you can do.
14 You can use the same source of
15 hydrolysis, processes to get sugars and then use
16 different organisms to make biobutanol.
17 Biobutanol has different characteristics. It is
18 more energy dense and in many ways might make
19 better transportation fuel. Unfortunately right
20 now it isn't authorized for motor fuel use that I
21 could find.
22 And there's other things besides ethanol
23 or butanol you can conceivably make. You can
24 conceivably make hydrocarbons using biological
25 conversion processes and various things. So if I

1 missed your particular favorite process I'm sorry.
2 It is no my intention to leave it out. But in a
3 short ten minutes or so you can't include each and
4 every thing that might be interesting.
5 There's mixed processes where you use a
6 combination of thermal and biological processes.
7 For instance you can gasify biomass and then use
8 fermentative processes to convert this into
9 syngas, CO and hydrogen to ethanol or perhaps
10 other products.
11 And whether we call algae a biological
12 conversion process or whether we call it merely a
13 feedstock growth process, of course algae is one
14 of those things that has quite a bit of potential
15 at least to make lots of biomass or lots of
16 biofuels. You can make lots of biomass and
17 convert it to something else or you can make lipid
18 oils as part of your algae growth.
19 In that case, in either case the process
20 of the algae technology development would be
21 around how do you grow this stuff so you have got
22 either the algae or the oil from the algae. You
23 really don't have to do very much. The focus
24 would be on using biology to make it more than it
25 is on conversion.

1 And of course, like I said, there may be
2 other processes that I missed today. But in ten
3 minutes you don't have time to think of
4 everything.
5 As we look at California. I'm sitting
6 here in Washington looking at California. I just
7 want to iterate a couple of things. Number one,
8 like I said at first, you are going to have a lot
9 of different feedstocks. You don't have one big
10 pile of just one feedstock like you might have in
11 the Midwest where you have one big pile of corn
12 stover.
13 You are going to have to have
14 technologies to deal with the variability of the
15 feedstock you might have. Not only lots of little
16 piles but they are going to vary by season, by
17 location and a lot of other things. So your
18 technologies have to face that.
19 As a result you are going to have
20 things, for instance, a strong acid hydrolysis
21 like BlueFire uses is very appropriate for the
22 kind of feedstocks they are using. They have a
23 highly variable feedstock. The problem with that
24 is they probably have to put up with a little more
25 yields than might theoretically be possible

because the enzymatic hydrolysis gives you higher fuel for sugars but is less robust if you have a variety of feedstocks coming in on a day-in and day-out basis. Something to think about.

Secondly, if I look at the goals that were set out in the paper, you have to think in addition to ethanol you might well be wanting other fuels as well. If you are thinking about only ethanol you are limited at this point in time by national laws to either a maximum of E10 or E85. E20 is not an allowable fuel at this point in time because it doesn't meet EPA requirements.

Hence before very long you could rapidly get to the point where you are producing enough ethanol that you reach the ten percent maximum for all the fuel in California. You can't put any more in because after E85 you might or might not have the vehicles to accommodate that. So there's a sort of ten percent blend wall where you get too much ethanol. You can't have more. So you have got to be careful about that.

And even if you reach the ten percent or more, and even if the laws change, there's distribution, infrastructure, pump fuel requirements, fuel vehicle requirements, that will

1 require differences from what we have now. Things
2 to think about. So thinking about infrastructure-
3 compatible fuels is probably useful, particularly
4 for California and the feedstocks you have.
5 One last slide here. So these would be
6 Don Stevens's suggestions for California going
7 forward. Number one: Make absolutely, positively
8 certain that your resource situation is clearly
9 understood. They did the exercise here in
10 Washington a few, a couple of years ago. And from
11 the 70,000 foot level it looked like there's a lot
12 of biomass. The closer to the biomass you get the
13 more elusive it seems. Because things that seemed
14 to be there may not genuinely be available.
15 In our case wheat straw. A lot of it
16 has to be plowed back into the ground to maintain
17 the soil moisture, the soil moisture and the soil
18 carbon contents in the very dry areas that we have
19 around here.
20 The second problem is they may be
21 available but at a cost you can't afford. So
22 understand your resource base really well.
23 If California had additional funding, if
24 you want to do things fast, you have got to put
25 steel in the ground fast, we'll facilitate that

through legislative effort that will help that.

And if you have some money for RD&D there's quite a few things that might conceivably be done. Leveraging the DOE programs is useful I think because nobody has enough money to do everything themselves.

Utilize the expertise at the universities. And that's particularly useful in positioning yourself for 2050, or 2020 and 2050, down the road a few years. By identifying and advancing the next generation of biofuels you lay the groundwork for being able to do that effectively a year or so from now.

Algae might be part of that.

But the last bullet is really critical. Understand and do this within the land and water use sustainability context. It is easy to think about large volumes of biomass. It is harder to think about how to grow it sustainably and don't lose sight of that.

With that I can take any questions for my portion.

DR. TIANGCO: Thanks, Don. Thanks for that short yet comprehensive -- and also for providing some suggestions for California.

1 Any questions from the Commissioners?
2 PRESIDING MEMBER BOYD: No questions.
3 ASSOCIATE MEMBER DOUGLAS: No questions.
4 DR. TIANGCO: Okay, our next speaker
5 will also be doing this on-line and it will be
6 John Scahill. He will be sharing the presentation
7 on the thermochemical conversion pathway.
8 MR. SCAHILL: Okay. Can you hear me,
9 Val?
10 DR. TIANGCO: Yes John.
11 MR. SCAHILL: Okay. We are at the end
12 of my presentation. Do I have control?
13 DR. TIANGCO: Our webmaster is doing it
14 right now. You have control now, you can go back
15 to the beginning.
16 MR. SCAHILL: It's not, it's not moving
17 on my screen.
18 DR. TIANGCO: Okay. We had this problem
19 this morning we we'll try to --
20 MR. SCAHILL: Okay. Okay, now I have
21 movement. All right, now we are back to the
22 front. Okay. The other thing I was going to ask,
23 is my pointer showing up on your screen, the
24 cursor pointer?
25 DR. TIANGCO: Okay.

1 MR. SCAHILL: Okay, I think that lost
2 control. What I'm showing now is my --
3 MR. NGUYEN: Click on the slide and then
4 you should be able to move with the up and down
5 arrows.
6 MR. SCAHILL: Okay, I don't see it, I
7 don't see it moving. I don't see the up and down
8 arrows on my screen.
9 MR. NGUYEN: No, it's on the keyboard.
10 MR. SCAHILL: Okay, even on my keyboard.
11 Oh there I go. Now it's working. Okay, I'll go
12 ahead and get started in the interest of time.
13 As Val pointed out my name is John
14 Scahill and I am with the Office of Biomass
15 Programs within the Department of Energy in the
16 Office of Energy Efficiency and Renewable Energy.
17 And I am going to talk to you about the other
18 approach to converting biomass into fuels and that
19 is using heat or thermochemical conversion.
20 Okay. Our program is actually driven by
21 a lot of different taskmasters. And this is a
22 busy slide but the only purpose of it is to show
23 you where we get our direction from. And that
24 comes from the Executive branch; edicts coming
25 from the President. Also from Congress through

1 different energy policy acts. And also internally
2 within DOE we have our own internal direction.
3 All of those things funnel down into what is
4 characterized as our Office of Biomass Program
5 vision or mission or performance goals.
6 And today that primarily means
7 converting biomass into liquid transportation
8 fuels. And this is a chart from the recently
9 passed Energy Independence Security Act. And what
10 our direction is, basically from that previous
11 slide, is to fill in the blue, green and red
12 components of these bar graphs.
13 And as Don pointed out in his
14 presentation, corn ethanol is taking up all of the
15 volume in the bottom that's in yellow.
16 So how do we do that? The approach is
17 looking at a biorefinery concept. And Don showed
18 the same slide only in a different format. But
19 basically we feed biomass into this refinery in
20 two primary platforms or approaches. One is the
21 breaking down of the sub-states with enzymes and
22 acids. And what I am going to talk to you about
23 is this thermochemical approach using heat to
24 break down that sub-state.
25 And if we look at the substrate.

1 Biomass contains lignin, hemicellulose and
2 cellulose. The cellulose and hemicellulose
3 components of this biomass are what Don just
4 mentioned to you. And you can see from a
5 chemist's kind of interpretation of what biomass
6 looks like, it's primarily made up of hydrogen,
7 carbon and oxygen. You can see those elements
8 making up most of the material you see on the
9 screen here.
10 So our task is to break that solid
11 material down into smaller components. Basically
12 go from a solid to a liquid or a gas and then take
13 those intermediates on to the final fuel product.
14 So the way we do that in the
15 thermochemical platform is we apply heat and
16 potentially a residence time to the material. And
17 this thermoconversion pathway always essentially
18 starts with pyrolysis. As we look to the right
19 and the temperature is driven up in the residence
20 time it is also increased -- pyrolysis is the
21 first thing that occurs. And I am going to talk
22 about that in a few minutes.
23 But as that process continues basically
24 what happens is the, the initial fragments that
25 break down from that substrate are essentially

exposed to higher temperature and longer residence time. That material then breaks down into what you see here as carbon monoxide, hydrogen and small amounts of methane.

There are also contaminants that go along for the ride and those are things like tars, also smaller amounts of sulfur compounds that may be present in different feedstocks. So the real focus from an R&D standpoint in the thermochemical platform is in this gas clean-up and conditioning step. Basically the removal of those contaminants. So I am going to talk about that initially in the gasification and then I am going to go back to the pyrolysis component.

Biomass gasification has a relatively long history. There's a lot of work that has been done over the years, both in the United States and internationally, mostly in Europe. And these are just examples of some of the recent, more recent gasification projects that have been underway. But as you can see here, most of these are in the 50 to almost 200 tons per day through-put capacity. So these types of systems don't generally lend themselves to certainly remove areas. And particularly in the Western United

1 States and parts of California where you have a
2 lot of federal, federal land.
3 Back to the clean-up issue. There are
4 cost-effective clean-up technologies that are
5 currently in use. These are primarily applied in
6 large coal gasification plants where they use
7 technologies called Rectisol or Selexol. These,
8 like I said, do work at the larger scales but the
9 biomass plants don't lend themselves to that
10 economies of scale. A typical coal gasification
11 plant can consume upwards of 30,000 tons per day,
12 where we will be very lucky to get biomass plant
13 capacities up to the 3,000 tons per day. So it's
14 kind of a order of magnitude smaller.
15 So what the office of Biomass Program is
16 doing is looking at technology development that
17 will be just as effective as the Rectisol or
18 Selexol but at a much smaller scale. And in 2004
19 and 2007 we put out solicitations specifically
20 directed towards this gas clean-up issue. And
21 there's also ongoing work at the National Lab
22 directed towards this issue as well.
23 And again another busy slide. But the
24 only important take-away message from this slide,
25 if you look on the left hand column there are a

number of different types of products. Fischer-Tropsch synthesis can make gasoline or diesel-type hydrocarbons. And then of course methanol synthesis has been around for decades, commercially produced syngas made from natural gas. But the point of this slide is if you look at the level of contaminants that the catalysts use for converting that synthesis gas these levels are extremely low. They are in the parts per billion or very low parts per million range. And that's what presents the huge challenge.

This is an example of work that is ongoing at the National Renewable Energy Lab and other places, other parts of the world. But nickel-type catalysts have been show to be very effective in eliminating or reforming these compounds that you see on the stream here, benzene, toluene, phenol.

The problem is that after a period of time the catalyst becomes fouled or poisoned and the activity then starts to decline. The goal there is to figure out how to make more robust catalysts and/or develop processes that will be able to regenerate these catalysts.

Another project funded by DOE is with

the Gas Technology Institute in looking at engineered catalysts. Things like nickel-impregnated-olivine. These have also been shown to be very effective in destructing or reforming. In this case naphthalene is a monocompound that is meant to simulate the tars. But we can essentially get rid of 100 percent of it under the right conditions.

Another exciting catalyst development is in the glass ceramic materials also containing nickel oxide. These are essentially materials similar to your Corningware glass. They get creative in how they incorporate metal within the matrix of the glass.

And this is another example of nickel-magnesium-silicate-impregnated ceramic catalysts. And the key thing here is that it shows the ability to also reform that methane. And that is an important consideration in improving the overall conversion efficiency. That methane cannot be catalytically converted to alcohols or other fuels through the catalytic process so we need to either get rid of it or the best thing is to reform it into additional carbon monoxide and hydrogen.

1 This also looked at also spiking the gas
2 stream with low levels of hydrogen sulfide as a
3 poisoning agent just to see what would happen with
4 the catalyst. And it seems to hold up fairly well
5 against this.
6 Another thing that we have done in
7 trying to advance this clean-up area. Last year,
8 actually in late 2007 we ran a solicitation
9 looking at requesting proposals for people to do
10 clean-up and validation. And these are
11 essentially integrated projects where they take
12 syngas that is generated from actual biomass and
13 gasifier and do the clean-up and validate that
14 they can indeed achieve those very low parts per
15 million or parts per billion levels. We had a
16 total of five projects that were selected and
17 these are now just getting underway.
18 Okay, now I am going to move into the
19 area of pyrolysis. Which if you recall in that
20 earlier slide I showed you that this is the first
21 stage of thermochemical processing.
22 And basically what we want to do here is
23 expose the biomass to very high heat fluxes and
24 very short resident time. When we do this we can
25 generate as much as 71 percent of that biomass can

be converted into that liquid that you see on the right hand side of the column. The other products that are made are gases that have a relatively high heating value. And those gases can be used to drive the process itself. And char is the other co-product that is made.

The exciting thing about this technology is that these bio-oils can be looked at as essentially a refinery feedstock. And what you see on this slide are two existing petroleum refinery, what we call unit operations, hydrotreating and hydrocracking.

And these operations basically reject that oxygen that I pointed out to you earlier in that slide that had the molecular structure of biomass. All of that oxygen that was present there needs to be removed. And that same oxygen is also present in the bio-oil.

So with these two processes we essentially inject hydrogen and the hydrogen then displaces the oxygen on those molecules. And it is rejected in the form of CO2 and water. So the products then resulting from this are basically hydrocarbons, that oil into gasoline, diesel point range. And the real advantage here is that we can

1 leverage the existing investments that have been
2 made in petroleum refineries.
3 This is an example of what those
4 products look like. On the left hand side the
5 paraffin, iso-paraffin. These are nomenclature
6 for types of hydrocarbons that are typically
7 present in gasoline and diesel. And the gasoline
8 components, these are the ranges that we see from
9 this hydrotreating, hydrocracking process. And
10 they are compared against what we see in a typical
11 gasoline in today's marketplace.
12 The other exciting thing about this.
13 The numbers that are presented here actually came
14 from a cooperative research and development
15 agreement that DOE has allowed two of the National
16 Labs to enter into with a major technology
17 provider to the petroleum industry.
18 So they took the yield data resulting
19 from some of that work and put it into their
20 economic model. And these are the way the numbers
21 were spit out. So the production costs of these
22 hydrocarbons is roughly around between $2.50 and
23 close to $2.80 a gallon. And while today these
24 may not look that favorable, but you compare these
25 against what people were paying just this past

1 summer, these are close to being in the ballpark
2 of being economically competitive.
3 So the technology kind of hurdle or one
4 of the things that we need to get around is
5 instability of these oils. And this instability
6 is caused essentially by chemical reactions
7 between some of the compounds that are present in
8 the oil. And these reactions essentially increase
9 the viscosity, case phase separation, formation of
10 gums and deposits and stuff.
11 Research in the past has shown that
12 these are tied to the acidity of the oil. The
13 acidity comes from acetic and formic acids that
14 are produced as part of that pyrolysis process.
15 It is also tied to the char fines that sometimes
16 get carried over into the condensed oil. And also
17 the amount of oxygen that is originally in the
18 bio-oil itself. And just this past year our
19 office released another solicitation requesting
20 proposals directed at these particular issues.
21 This is a chart that I wanted to expose
22 people to, to introduce them to this concept
23 called Terra Preta. And this is something
24 recently observed in parts of the Amazon where
25 ancient Amazonian Indians had buried charcoal in

1 the soil. And the result was it dramatically
2 improved the productivity of the soil. There's
3 been some research in the last ten years looking
4 at this phenomenon and they think that this is
5 tied to the fact that the presence of carbon
6 improves the essentially soil nutrients, the water
7 retention and the microbial and fungus habitat,
8 which are important for healthy soil.
9 So this may offer a potential for
10 significant carbon sequestration as a result.
11 Even though there have been some early positive
12 effects in this; some of the studies have been
13 inconclusive. We don't know if this works, you
14 know, well in acid and basic soils or in different
15 latitudes so there still needs to be some work
16 done. But nonetheless it is a promising
17 potential, particularly in light of the ability to
18 also produce liquid fuels from biomass.
19 Don mentioned some of these in his talk
20 so I am not going to go into these in any great
21 detail. I'll just point out that there are
22 commercial scale biorefineries that are currently
23 in the process of being put in the ground.
24 The picture you see here is actually of
25 the Range Fuels site in Soperton, Georgia. They

have started construction on this and some of the large pieces of the processing equipment have been ordered. They expect to start commissioning of this plant in early 2010. So about a year from now. However, the collapse of the financial markets are probably going to slow the progress of these projects as a result of the inability to get adequate capital to keep building them out.

The other thing that I was going to talk about a little bit. This was one of the questions that people asked the presenters to look into and that was the use of water in fuel production. These numbers have come from a recent paper published by Argonne National Lab. And it shows, and I put these all on the same graph as a comparison to look at the water usage of gallons of water per gallon of ethanol.

And this is corn ethanol and it is compared to lignocellulosic bioconversion, lignocellulosic thermoconversion, lignocellulosic hybrid. This is the one Don alluded to earlier which is fermenting syngas into ethanol. And it is also compared to producing gasoline from petroleum.

So my last slide, just some conclusions.

1 Biomass actually is the only renewable that offers
2 the opportunity to displace petroleum-based liquid
3 transportation fuels.
4 Some of these technologies look
5 commercially viable within the next five to ten
6 years.
7 CO2 sequestration or CO2 neutral is one
8 of the key attributes of biomass into liquid fuel.
9 And the other aspect of producing
10 domestic jobs in rural economies is another plus
11 to this technology.
12 So with that I will take questions.
13 DR. TIANGCO: Thanks John. Any
14 questions from our Commissioners?
15 PRESIDING MEMBER BOYD: I have one quick
16 question. John, this is Jim Boyd, thanks.
17 Your reference to Selexol and Rectisol
18 only for coal gasification stimulated my ancient
19 memory. I thought that I had seen that in Sweden
20 they use this technology and they use these
21 approaches for their processing of biomass to
22 energy. Do you have any information on that?
23 MR. SCAHILL: It is indeed quite
24 possible to do that. The problem is that it is
25 more expensive so it adds more cost to the bottom

1 line. Now in Sweden they are currently paying
2 about $8 or $9 a gallon for their regular
3 transportation fuel.
4 PRESIDING MEMBER BOYD: And I think this
5 is strictly for conversion to biogas as well.
6 MR. SCAHILL: Okay. Well, in the biogas
7 are you referring to synthesis gas?
8 PRESIDING MEMBER BOYD: No, actually
9 biomethane eventually.
10 MR. SCAHILL: Well that's a different
11 process. That's anaerobic digestion. And it does
12 make mostly methane but there are some sulfur and
13 other contaminants that are also present there.
14 But I think that they can use conventional
15 scrubbing, water scrubbing to remove those from
16 the anaerobic digestion, biogas component.
17 But if you are doing gasification. And
18 the Swedes have indeed been doing gasification for
19 quite a long time. As a matter of fact some of
20 the early nickel-based catalysis work came out of
21 not Sweden but Finland. So, you know, folks from
22 the Scandinavian countries have large, biomass
23 resources. They have been looking at this for
24 quite some time.
25 But if it is the syngas clean-up and the

1 tars and other sulfur-containing compounds, they
2 could indeed be using the Selexol. They will be
3 paying, like I said, a higher cost for doing that
4 at that scale.
5 PRESIDING MEMBER BOYD: Okay. I have a
6 suspicion they do as they clean up the first or
7 second stages of biogas to biomethane in order to
8 get it to be a fairly high percentage of
9 biomethane and to treat all the other ingredients.
10 I could be wrong but I will have to look it up
11 again. But of course Sweden is very deficient in
12 terms of any form of natural gas so they are
13 probably willing to pay the price.
14 MR. SCAHILL: Yes, correct.
15 PRESIDING MEMBER BOYD: That's all.
16 ASSOCIATE MEMBER DOUGLAS: No questions.
17 DR. TIANGCO: Okay, thank you, John, for
18 that great presentation and great overview on
19 where we are on the thermochemical conversion
20 pathway for biofuel production from biomass. I
21 remember Ray Cutchen, whom we called guru of
22 lignocellulosic biomass to ethanol, always said,
23 biomass to ethanol, or lignocellulosic biomass to
24 ethanol has always been a bridesmaid, never been a
25 bride. So with these things that are going on

through DOE and through other forefront including private funding maybe next year we'll see the first thermochemical oven and also biochemical conversion pathway of biomass to biofuel.

Our next presenter is Dr. Bryan Jenkins who will be sharing the UC Davis-Chevron Biofuels research. Bryan.

DR. B. JENKINS: Thanks Val. Commissioners, a pleasure to be here. I am going to share a little bit about the UC Davis-Chevron Joint Research Agreement in biofuels, mostly from the UC Davis side. I won't actually be able to give you a whole lot of detail about the Chevron side because, well, we have a certain agreement with Chevron. There wasn't quite time in the two days I had to prepare this since I was asked to do this to get a review of it done. So I'll give you a little bit of information about it. If you want more information there's some contact information at the end. But I'll give you the basic perspective on this.

So this is a program which is administered through the new UC Davis Energy Institute. And I'll tell you a little bit about this because it is perhaps important in some of

1 the way we administer this program and try to
2 cooperate with various others outside the
3 university in the program.
4 But I have had the pleasure of serving
5 as the director of this Energy Institute since the
6 fall of 2007. I was supposed to be interim, we
7 had a director search underway, but it was
8 suspended two months ago, a month and a half ago
9 actually, because of the financial crisis of the
10 university. So I am with it right now. You'll
11 see me around for a little bit more I guess.
12 Anyway, this Institute provides
13 coordination across the campus for both research
14 and education on energy. We have a post-graduate
15 group, for example, that grant MS and PhD degrees
16 in Energy Science and Technology and Energy Policy
17 and Management. So we have been working on that.
18 But the Chevron program serves as part
19 of this and the Institute also administers a
20 number of other centers and programs, including
21 the Energy Efficiency Center which you probably
22 heard a lot about recently. In fact I just
23 earlier at noon, actually 11 o'clock, was up at
24 the Sutter Club up the street where the
25 announcement was made for an endowed chair in the

1 Efficiency Center from Chevron actually for the
2 director of that Center. So there is quite a bit
3 going on in the way of public/private partnerships
4 in these various energy areas. So anyway, that's
5 what the Institute is doing.
6 In terms of the Chevron program. In
7 2006 the University wrote an agreement with
8 Chevron to conduct research in the biofuels area.
9 The agreement itself is actually on-line if you
10 wish to inspect the agreement and the terms of the
11 agreement. There are a few numbers that have been
12 redacted in the public version, I am not quite
13 sure why, but anyway, the terms of the agreement
14 are public and you can inspect those on the
15 website which I will show you in a bit for the
16 Energy Institute. Basically if you go to
17 energy.ucdavis.edu you'll find a link to that
18 agreement.
19 Basically what it did was set out an
20 agreement between Chevron Technology Ventures and
21 the University to conduct a program in biofuels
22 research over a five year period with a total of
23 $25 million. And we are in the third year of the
24 program at present. We have 41 funded projects
25 through three solicitations, three annual

1 solicitations. Or about $15 million invested to
2 date or incurred to date in the research area with
3 another million or so in equipment grants that
4 have gone to support the research across the
5 University in what you might call a distributed
6 laboratory, a biofuels laboratory at the
7 University for this type of research.
8 I can't give you the details on the
9 projects themselves because of this agreement that
10 we have but I can give you a little bit about the
11 nature of the research. It is really intended to
12 address the issue of scale and magnitude when it
13 comes to biofuels.
14 Scale. Of course Chevron as a petroleum
15 refining, mostly petroleum refining company is
16 used to very large scales. They need to supply us
17 with the fuel that we demand, or some part of that
18 in their case. So they are used to facilities
19 that operate at say in the 100,000 barrels per day
20 capacity range.
21 We know that biomass as a solar resource
22 is a distributed resource. And to try to amass
23 the amount of biomass into centralized facilities
24 that would support that kind of development is a
25 fairly horrendous undertaking as far as logistical

support and it is fairly expensive. So we are not likely to operate at those scales although we may get there eventually.

So we are looking at ways in which we can address the difference in scale between what Chevron as an oil company might be used to versus what the biomass industry might be able to develop and what research might be able to support in the way of scale for biomass facilities. You know, the type we have just seen in the last few presentations as well as some other types of facilities that might develop over time.

And of course integrated facilities that produce not only biofuels but also fuels or energy, electricity, heat. That are integrated in the way we saw in some of the slides but also bioproducts, various high-value bioproducts. And also the bioplant. So this is all of interest and concern in this research program.

There are various modeling aspects in addition to direct laboratory or experimental work as part of this program. Some of the modeling went to support some of the efforts that I think Steve Kaffka talked about in his presentation. Unfortunately I couldn't hear that so there are

also modeling efforts underway with this.

This is really leveraged off a lot of the work that has existed at UC Davis and continues at UC Davis. Funded not only by Chevron but by many others as well, including the California Energy Commission, the Department of Energy and USDA, EPA, the National Science Foundation and many others.

So we have sort of a long history in research in biomass and many different areas. Chemical research, that's my own research field for the most part. Biochemical and biofuels production and processing with biodiesels as well as other hydrocarbons and vegetable oils. Bioproducts of various types.

Logistics, optimization of the biomass systems. Environmental and social impacts, lifecycle assessment. And this is all very much interdisciplinary across campus. There are people sitting in this room who have not had a chance to speak today who also participate in this activity.

As part of the answer we have an Energy Initiative across campus which has also resulted in building capacity of the sort which I heard mentioned this morning in some of the talks about

how do we build the support we are going to need out to 2050. And a lot of that has to do with the students that we train now, the other training that we do and the faculty that are hired now. So we have been in the process of hiring 15 faculty in the energy area. We have seven faculty hired at present and another eight searches underway while this was going on.

Also of course the Collaborative as administered through UC Davis. Steve Kaffka serves as the director and you heard him speak earlier. I think you even saw this slide before. So a lot of this is leveraged off the collaborative work.

And also we have other programs through, for example, the Institute of Transportation Studies, John Muir Institute of the Environment, the California Institute of Food and Agricultural Research. I know Sharon Shoemaker is here in the audience. And there are many other programs across campus that support this kind of effort.

So I am going to leave it at that to indicate that we have, we are administering the Chevron agreement for biofuels, looking at the scale issues as well as a number of other basis

research issues.

And if you look at this list of committees that we have, that exist within the Bioenergy Research Group, which also was started just prior to writing the Chevron agreement. These are largely the areas that are addressed by not only the research across campus but also from the Chevron agreement and other agreements that we have.

As you can see they range from the very basic level in molecular and cellular chemistry and biology, genetics, genomics and the like all the way through to the engineering, conversion systems, production systems as well as the resource management issues, environmental quality and the production of the biomass itself.

So if you want some more information about this I am happy to provide what information I can. Otherwise you can contact me, the information is here. Or you can also talk to the Executive Director of the Institute, Billy Sanders. Carol Kruger is our coordinator for the Chevron program. She is happy to supply any basic information about the program but she won't be able to give you a whole lot more information than

1 what I have given you here today.
2 So anyway that is where we stand on
3 that. Any questions? I'm not sure that with the
4 information I gave you you would be able to ask
5 any questions.
6 PRESIDING MEMBER BOYD: I don't really
7 have a question, Bryan. I'm going to pick on you
8 because we're good friends. But both the $500
9 million grant to UC Berkeley and this grant to UC
10 Davis. I don't want to say they give me heartburn
11 but the fact that we can't talk enough about it.
12 I appreciate if they weren't spending that money
13 the research wouldn't be going on. It's just it's
14 tough to not be able to know more about it
15 sometimes, as we try to decide how to invest
16 public monies like through our 118 program. As we
17 try to get a reading today as to where are we in
18 this whole arena. But that's just a philosophical
19 comment.
20 DR. B. JENKINS: Well I'll comment on
21 your philosophical comment.
22 PRESIDING MEMBER BOYD: Okay.
23 DR. B. JENKINS: Because your comment,
24 you are not alone in this opinion. There are
25 others who share some interest in being apprised

1 of that information in greater detail. I think
2 this will come eventually. I think we are trying
3 to find our way under a lot of these public/
4 private partnerships.
5 And of course there was a lot of
6 concern, contention about the EBI grant and
7 concern about the Chevron grant. I think we need
8 to find some way through this process so that we
9 can be working in these public private
10 partnerships effectively and I think we'll get
11 there. I don't think -- It's like these minor
12 details of not being able to say something
13 specific about this. We need to work through this
14 somehow.
15 PRESIDING MEMBER BOYD: I'm a big
16 proponent of public/private partnerships, having
17 been through this experience for the first time in
18 my years at the Air Board, which turned out to be
19 a very satisfying experience. But they were 100
20 percent in the sunlight and everything was
21 discussed in, you know, kind of public forums, et
22 cetera, et cetera. In any event, hopefully you'll
23 wrestle your way through that.
24 DR. B. JENKINS: I'll also comment that
25 the issue of transparency was important to us when

we wrote the agreement. Now I didn't sign the agreement but I wound up somehow in a position where I am going to try to provide coordination across campus for this agreement.

There is, in fact, no specific limitation on publication so the results of all these activities will be forthcoming. It's just that there is a review part of the agreement, which there is an inspection for intellectual property. Chevron wants to make sure, of course, that it gets the benefit of the business development opportunities coming out of the research that they are funding. Whether you agree with this approach or not I'll leave to you. But the publications will be coming eventually. There is no essential limitation on that in the agreement.

PRESIDING MEMBER BOYD: Thanks.

DR. B. JENKINS: Thank you.

DR. TIANGCO: Thanks Bryan.

As a response to the Energy Independence and Security Act of 2007 the Office of Bioenergy Science -- Basic Energy Sciences, Department of Energy, called for two centers. Three centers were funded and we are fortunate enough we got one

of the centers located here in-state. Dr. Harvey Blanch will be sharing the Joint BioEnergy Institute and some of the things that are going on at the moment. Harvey.

DR. BLANCH: Thanks very much for the opportunity to tell you a little bit about the research activities at the Joint BioEnergy Institute. It is one of the three BioEnergy Centers that was supported by Department of Energy the Basic Energy Sciences Division.

Originally the call was for two proposals in here and three were funded. The funding for each center was initially 125 and later became 134 million over five years. So roughly -- Initially it was 25 million per year for five years.

The JBEI institute that we put together is actually a consortium of three national laboratories, two universities and the Carnegie Institute. The lead laboratory is Lawrence Berkeley National Lab. Sandia National Lab represents the second largest component of the consortium in terms of staffing. Lawrence Livermore, UC Berkeley, UC Davis and the Carnegie Institute.

1 So we are located in Emeryville. All of
2 the staff works in one location in Emeryville. We
3 have currently about 125 researchers. That should
4 grow to about 150 by mid-year this year. And
5 everyone is working together so we avoid many of
6 the issues that typically we find on campus with
7 programs that are in various locations. So
8 everyone comes to JBEI and interacts strongly. We
9 believe that is very important in this kind of
10 research program.
11 We have adopted a start-up company
12 approach which is rather unusual also for a
13 national lab and university consortium. The idea
14 being we want to be very nimble, able to change
15 direction and reallocate resources very
16 efficiently as a result of changing the research
17 directions and programs.
18 We have four science divisions:
19 Feedstocks related to plant biology;
20 deconstruction, which is the decomposition of the
21 biomass into its constituents; fuel synthesis,
22 which is the conversion of sugars into fuels. And
23 this is supported by a cross-cutting technologies
24 division.
25 We also have an industry partnership

1 program where we interface with industry. They
2 contribute to part of the research programs. The
3 idea is to provide a route for us to better
4 understand the issues involved in biofuels
5 production and for them to get a very close look
6 at the technology we are developing. So this
7 addresses one of the needs that DOE had, which was
8 to translate technology rapidly into industry.
9 The previous speakers have very nicely
10 mentioned the problems in converting
11 lignocellulosic biomass into fuels. And I will
12 just very briefly share our perspective on this
13 with you. Ultimately what we are looking at is
14 developing bioenergy crops where the cell wall
15 material serves a the constituent for conversion
16 into a fuel. These may be crops such as
17 miscanthus, switchgrass, maybe things like
18 municipal solid wastes.
19 These are broken down into their
20 constituents, the cellulosic and hemicellulosic
21 components which are sugar containing, and the
22 lignin, which is sort of the glue that holds the
23 biomass together and prevents pathogen and insect
24 attack. It presents an opportunity for production
25 of a byproduct.

1 These are broken down into constituent
2 monomers. A number of routes for doing this have
3 been presented earlier, either acids, bases or
4 enzymatically. We are focused on an enzymatic
5 route because any of the other processes involve a
6 loss of the raw materials in converting the
7 lignocellulose into a sugar. The sugar components
8 are then converted microbially into fuels.
9 I just put ethanol there but in fact we
10 are not working on production of ethanol at all.
11 That's rather a well-understood process. We are
12 looking at production of non-ethanol fuels.
13 So let me just go over the technology
14 challenges that we see. In the feedstocks area we
15 are looking at developing specific bioenergy
16 crops. One of the difficulties in breaking down
17 plant material is the hemicellulose and cellulose
18 are occluded by lignin. It sort of acts as the
19 glue holding the whole thing together. And that
20 is very difficult to break this apart. So we are
21 trying to develop crops where we can have lignin
22 which is much more readily broken apart.
23 These would be genetically modified
24 crops. Specific crops for bioenergy that are much
25 easier to deconstruct. As a result we also want

1 to understand how the cell wall in plants is
2 synthesized, with the objective of making more
3 cellulose and getting higher yields.
4 The hemicellulose component is attached
5 to the lignin through linkages which when broken
6 down make inhibitors that carry through the rest
7 of the process and reduce the overall yields and
8 the formation of product, so we want to reduce
9 those.
10 The second area is in the breaking down
11 of the lignocellulosic material. And the
12 challenges here are related to the fact that the
13 lignin is a difficult challenge to solubilize in a
14 sense and break down the crystalline amorphous
15 regions of cellulose and hemicellulose.
16 Many of the pretreatment methods form
17 these inhibitory byproducts. So that's the focus
18 there. We are doing this enzymatically because,
19 as I mentioned, acids or bases result in a loss of
20 the raw material and this is a commodity product
21 where the raw material costs dominate. So it is
22 very important that we retain all the raw
23 material.
24 Finally converting the sugar to fuel.
25 We are talking the position that the conversion of

1 sugar to ethanol is rather well-understood. The
2 yields are around about 95 percent of theoretical.
3 There is not much upside there. The upside is for
4 us looking at other fuels. These may be things
5 such as butanol. But we are really focused on
6 making fuels which are directly mixable with
7 gasoline. So these are more fuels such as octane
8 and C12, C14, C15. Hydrocarbons that can be
9 directly blended with gasoline.
10 This gets around some of the problems.
11 Here we have the challenges. That not all of the
12 organisms that we use are able to use all of the
13 sugar components. We need to be able to develop
14 the organisms to do that and to get around these
15 problems of inhibition.
16 So our approach is to have these three
17 divisions focused in each of these areas and
18 supporting technologies group.
19 I just want to sort of reiterate the
20 importance of raw material costs because we have
21 heard a lot of potential raw materials being
22 discussed this morning. And these are only viable
23 depending on their costs.
24 So I'll illustrate why we are interested
25 in lignocellulosic materials. If you look at the

1 left hand side here you will see a Biomass Source.
2 Miscanthus, which is a grass. Switchgrass would
3 be similar with yields of say up to 25 tons per
4 acre. And the cost of the sugar that we would get
5 from lignocellulosic-based biomass is around five
6 cents a pound.
7 Poplar woods that would be grown as
8 energy crops yield prices of sugar, glucose
9 equivalence, a little bit higher but still much
10 lower than corn, which has fluctuated as we know
11 quite wildly recently, but has been as much as 30
12 cents a pound. So in this range of 20 to 30 cents
13 a pound.
14 Sugar cane, sucrose. The world price is
15 about 11 cents a pound for the raw material, the
16 US price is about double that.
17 If we then look at converting this into
18 a fuel products. These are minimum theoretical
19 amounts in the middle column of how many pounds of
20 the glucose material we need to make one gallon of
21 fuel. You can see we need nearly 13 pounds of
22 glucose to make a gallon of ethanol. Which
23 translates at 25 cents a pound for glucose to a
24 raw material cost only of a little over $3 a
25 gallon. Comparable numbers for butanol and octane

1 and so on.

2 In the chemical business a rough rule of

3 thumb might be, if we double the raw material cost

4 that will be approximately the selling price of

5 your finished product. So we look at doubling

6 these numbers to get an effective cost of any of

7 these alternative fuels based on 25 cent a pound

8 glucose produced from corn.

9 The objective then is to look at

10 miscanthus, from which we might be able to produce

11 sugar for about five cents a pound, a factor of

12 five less, and therefore a very attractive raw

13 material for production of fuels.

14 So our objectives are, in short, to

15 develop fuels that are miscible with the existing

16 gasoline infrastructure. And these are going to

17 be of common numbers of 8 to 15 roughly but could

18 also be used for jet fuels and diesel.

19 They will have a higher energy content

20 than ethanol.

21 And they won't require changes to the

22 existing automobiles.

23 We want to develop feedstocks that are

24 specific bioenergy crops that could be planted in

25 marginal lands. And these crops are not starch-

1 based and don't compete with the feed or food
2 applications.
3 To date we have developed fermentations
4 to produce these fuels. We are currently
5 optimizing them. These are C12 to C15 alkanes.
6 They have the advantage that they are not miscible
7 with water. They freely separate in the
8 fermentation and so we don't need the expensive
9 energy-requiring distillation, as is the case with
10 ethanol. They simply freely separate into two, a
11 water and a fuel phase.
12 We have developed approaches using new
13 solvents to solubilize biomass directly and
14 produce sugars in high yields.
15 And the crops are being developed as
16 bioenergy crops. This is a much longer term
17 proposal, probably five to ten years at a minimum,
18 for developing any new bioenergy crops using
19 current genetic tools.
20 We were asked to provide just a few
21 recommendations. One would be that certainly
22 cellulosic-based biofuels are going to have lower
23 raw material costs and will not compete with the
24 food/feed crops otherwise.
25 There seem to be considerable amounts

available, on agricultural residues particularly, that can provide this kind of biomass in the short run.

Later on bioenergy crops can be grown on marginal lands.

And there is a potential use of municipal solid waste-type materials and wood residues that could be converted with these kinds of technologies.

So it is my hope that standards will not be written using ethanol as the sole biofuel alternative. Other fuels which will be directly miscible certainly we hope will be available. Several companies today are producing them in pilot scale facilities from sugars.

The scale of biofuels use in California I think is going to translate into what kinds of feedstocks we can actually consider.

And the timelines we think might be kind of parallel to those of the current S-06-06. So thank you.

PRESIDING MEMBER BOYD: A quick question. Your references to MSW conversion to biofuels requires further research and the previous slide had a comment about the possibility

of getting cellulose out of MSW.

It is my understanding there is a rather significant amount of green waste that finds its way to landfills, which I may be mistakenly classify as basically cellulose. And an incredible amount, at least in California, of urban wood waste that finds its way. And other than us being able to get our hands on it to use it, what additional further research do you think is needed in that arena?

DR. BLANCH: I think you put your finger on exactly the kind of research. How do you actually classify, separate these materials and find associated costs. Beyond that I think they will serve as excellent feedstocks.

PRESIDING MEMBER BOYD: Thank you.

DR. TIANGCO: Thank you, Harvey. The next presenter is Dr. Susan Jenkins who will present the BP Petroleum-funded research through the Energy Biosciences Institute. Thank you.

DR. S. JENKINS: Actually I think we prefer to say the EBI research funded by BP Petroleum.

I would like to thank you for providing the opportunity to come share the goals, the

research agenda and the progress to date, the potential contributions the Energy Biosciences Institute might be able to make to help the state realize its biofuel goals for 2050.

For those of you who don't know the EBI was formed in 2007, the fall of 2007, as a partnership between UC Berkeley, LBNL and the University of Illinois at Urbana-Champaign and BP as a partner.

BP committed funding of $500 million over ten years. About $35 million a year actually flows directly into the academic research programs at the three partners, the three academic partners, UC Berkeley, UIUC and LBNL.

The goals include total system solutions to the production of biofuels that are cost-effective and sustainable, the development of approved biotechnologies for energy applications, not just biofuels but other bioenergy applications as well, and the education of scientists and engineers across relevant disciplines in this area.

In summary the EBI is an academic research institute that is going to perform basic, fundamental research in the area of bioenergy with

1 an initial focus on biofuels. And the initial
2 focus on ethanol as well but, as others have said,
3 ethanol might not be the ultimate end product for
4 biofuel.
5 To determine if the biofuels that we are
6 looking at are environmentally, socially and
7 economically feasible and sustainable.
8 And I should also mention that BP is a
9 global energy company and so their vision in this
10 is a global solution. So much of the research we
11 do is aimed at that vision but I think it will
12 translate into other levels as well, the state and
13 domestic, the level of the country.
14 This slide illustrates in general how
15 our research topics are organized within the EBI.
16 We are looking at all aspects of biofuels as are
17 some other institutes. And we are doing so by
18 spending a significant part of our research
19 funding, almost 25 percent in the first year,
20 upwards of $5 million alone, on what we call our
21 ESC Dimensions. It's our environmental, social
22 and economic dimensions.
23 We are studying many aspects in this
24 area but probably two of the most important are
25 the complete lifecycle assessment of biofuels as

well as the environmental concerns.

In addition we also look, in the blue circle there, at the basic chemistry and molecular biology involved in the process of lignocellulosic biofuel production. Research that mostly takes place in a lab setting as well as agricultural aspects shown in the orange circle there, much of which is fuel-based research.

Most importantly we continue to tie all of this research back to the LCA and the environmental and social studies covered in ESC programs to ensure that we are on the right track as we move forward.

We are, at least until perhaps recently we were unique in that we are one of the few institutes of our size that truly integrates a large number of researchers from a wide array of disciplines to address the field of bioenergy from every angle, as illustrated on this slide. And I think you will have an even better appreciation as I go through some of our projects.

We have 53, I think, currently funded programs and projects in our institute. All of our projects have a two to three page project description on our website. So if you are

1 interested in learning anything about what the EBI
2 is doing you can go to the EBI website and those
3 are readily accessible.
4 Again like the Davis-Chevron deal we do
5 have a small time frame, 30 days, of review period
6 if we are going to publish any of the research.
7 But I can say in our case the review periods have
8 been much less than the 30 days and we do have
9 several publications that have been submitted and
10 I believe are patents as well. And as soon as the
11 patent is available we can, that will be publicly
12 available.
13 The benefits of the institute, obviously
14 besides the $35 million is that as an academic
15 research institute we don't always have the
16 capacity for scale-up. And so what we do in our
17 academic setting is proof of concept. And so we
18 will rely on BP to make, to translate that into
19 commercial applications as we move forward.
20 Okay our main, four of our main areas
21 that we started in are agronomy and feedstocks,
22 pretreatment and depolymerization, biofuels
23 production, and then as I said, the environmental,
24 social and economic dimensions.
25 And as you can imagine there's

1 significant overlap in several of these areas with
2 the research going on at JBEI and the other talks
3 you have already heard this morning so I am not
4 going to go into the details of what the
5 challenges are because those challenges exist in
6 all of those research institutes.
7 What I will try and highlight are to
8 provide a brief overview of our specific research
9 programs and projects in areas that may prove
10 useful in the future for assessing and
11 implementing the 2050 vision for California
12 biofuels.
13 I'll start with -- The first area one
14 is, this is one where there's actually very little
15 or no overlap with JBEI but maybe some significant
16 overlap with the programs at UC Davis. In the
17 area of agronomy and feedstocks our studies focus
18 on the development of dedicated energy crops.
19 At UIUC we have established a 320 acre
20 energy farm that allows us to address feedstock
21 issues in a very controlled way.
22 In addition to the obtainable biomass
23 studies we also have experts in woody species,
24 salt-tolerant species, pest and pathogen research
25 in the areas listed there.

1 In genetic diversity investigations we
2 have researchers looking into breeding barriers,
3 which is self-incompatibility in miscanthus. And
4 grass transformation technologies to increase
5 efficiencies.
6 In addition we have a group that is
7 dedicated to addressing transportation, harvesting
8 and storage. And although the EBI research is
9 focusing mostly on the perennial grass miscanthus
10 as a potential energy crop, the models that we
11 develop in these areas should be applicable to
12 other crops in biomass streams as well.
13 Okay, now leaving agronomy and
14 feedstocks behind we move into pretreatment and
15 depolymerization. The next three slides I am
16 going to show you will demonstrate our
17 significant, ongoing efforts to address the
18 challenges that, as I said, Harvey already covered
19 in the pretreatment and depolymerization.
20 So on this slide just to summarize, we
21 are developing tools for visualizing cell walls at
22 a nano level as well as novel tree treatment
23 approaches using ionic liquids, delignification
24 and hemicellulose solubilization and
25 identification of inhibitory products. Again,

already addressed earlier.

Again, pretreatment and depoloymerization from the cellulose angle. We have researchers delving into the obvious areas covering enzyme engineering, discovery of new relevant enzymes from various sources including the popular choices of cow rumen and grass-feeding termites.

And the last slide on pretreatment and depoloymerization. We have more than half a dozen researchers investigating, on the top section there, lignin depoloymerization using biological approaches and chemical approaches to lignin and cellulose depoloymerization as well. And you can read the areas there. And all of these are listed on our website and explained in greater detail.

Okay. Our work in biofuels production currently covers ethanol and to a lesser extent some work on biodiesel. We have very talented researchers in this area between the three institutes and so we are taking advantage of their interest in this area and their willingness to work with us.

Here we are developing -- Well, outside the biodiesel, novel membranes for dehydration of

1 ethanol.
2 In the area of biodiesel, assessment
3 study on algal biodiesel production. And I'll
4 mention that this Thursday and Friday we are
5 holding a workshop on campus that is listed on our
6 website that is open for anyone interested in this
7 area. We'll probably have about several dozen
8 experts. And the report from that will be
9 available within several months and again
10 available on our website.
11 The three other areas under biodiesel:
12 Non-thermal chemical conversion, microbes for
13 bioconversion of biodiesel, chemical conversion of
14 biomass to diesel-compatible fuels.
15 And then again back into bioconversion
16 of biomass. The bottom there again addressing
17 product toxicity.
18 So also in biofuels production we have a
19 group taking the systems biology approach to
20 optimize the production as well as additional
21 projects in the other two sections covering sugar
22 utilization in yeast and bacteria. And you have
23 already heard about the five- and six-carbon issue
24 between cellulose and hemicellulose.
25 So now I'll switch to the environmental,

1 social and economic dimensions. This is the final
2 area that I'll cover. In the top section there
3 under our environmental research we have
4 greenhouse gas studies for various feed crops.
5 Water issues, which will always be a significant
6 factor when looking at these technologies for
7 producing biofuels. We are studying biodiversity
8 impacts and nitrogen utilization. And again, a
9 lot of this is happening at the energy farm at
10 UIUC.
11 And as we do this, all of this research.
12 In every aspect it always ties back to the
13 lifecycle assessment area and the work, the models
14 developed. They are refined and tested by our
15 lifecycle assessment team. And they are applying
16 their expertise to biomass production, biofuels
17 production, transport and storage, air emissions
18 and air quality, health and ecosystems impacts and
19 the environmental analysis. In all the areas they
20 collaborate not only within their own group but
21 with all of the other groups researching these
22 areas as well.
23 We have several programs that
24 collaborate in indirect land use issues including
25 modeling and mapping to define what to plant and

where to plant it. And this is on a US scale as well as a global scale. And we also have very productive work identifying marginal and abandoned agricultural lands suitable for biocrops around the world and also within the US. In particular we have been looking at Brazil.

In the area of food and fuel market impacts we have very interesting and important work going on in assessing competitiveness with Brazil and potential trade impacts, impacts of biofuels on food and energy. Modeling global oil prices in response to transitioning to a biofuels economy, assessing and modeling carbon and greenhouse gas emission costs, and developing trade scenarios for corn and cellulosic ethanol using CGE models.

And then finally we have also in our ESC Dimensions research on societal and policy aspects. And again from both a global and perspective, keeping in line with BP's goals for this research. Again, very important, interesting and relevant to the big picture. I don't think that you can move forward in this area without really looking at all of these topics.

And again just to highlight the

diversity. Intellectual property rights, food security, global conflicts in the shift toward biofuels, et cetera. They're there and again they are on our website.

And I'll end -- We just have a couple more slides. We have been funding a lot of activities this past 18 months, many in -- We have funded a lot of workshops in various areas and have contributed significantly to conferences covering biofuels and there's a list of them here. Many of these have, reports were generated and are available. So our goal here is to bring together the key stakeholders in these areas. And under various disciplines so that they can understand what the other groups are doing as well.

And then in addition to our basic research. All of the partners, UCB, UIUC and LBL are very much dedicated to developing and implementing education outreach programs. Certain aspects are already in place. Here we are interested in opening up our facilities and our research and the intellectual resources to visiting scholars.

We want to develop programs to education really the next generation of what we need of

1 energy scientists at the post-doctoral level, PhD
2 and undergraduate level.
3 Educating the public. This is I think
4 really key, as many of us who are biologists
5 learned in the GMO efforts that probably weren't
6 handled as best they could have been a decade or
7 so ago.
8 And it will be particularly important,
9 especially in educating the public again to ensure
10 that the individuals that are called upon later to
11 make key decisions regarding bioenergy and
12 biofuels can do so with adequate information and
13 make informed choices. I think that that's where
14 the mistakes have been made in the past.
15 And I'll end with some contact
16 information. Our website,
17 energybiosciencesinstitute.org, or you can send
18 requests for any material to ebi@berkeley.edu.
19 It's also, I would just like to say that
20 our partnership with BP focuses on bioenergy and
21 biofuels. Again, as viewed by the global lens but
22 the models, the assessments and the research we
23 publish hopefully will be applicable to US and
24 state biofuels efforts as well. Thank you.
25 DR. TIANGCO: Thank you. Any questions

1 from the Commissioners?
2 PRESIDING MEMBER BOYD: No. I just want
3 to thank you. And I am particularly interested
4 in, well I'm interested in practically everything
5 you said but the modeling oil cost thing. You are
6 liable to hear from us more about how much you can
7 talk to us about that issue. Nobody anywhere
8 seems to be able to accurately predict energy
9 costs.
10 DR. S. JENKINS: Well another
11 interesting area there is transitioning. As the
12 economy transitions and looking at past experience
13 in the oil markets from private oil companies to
14 nationalization and what lessons were learned
15 there and what we need to sort of be prepared for
16 as our energy sources shift here in the United
17 States.
18 ADVISOR BROWN: Could you speak into the
19 microphone, please.
20 DR. S. JENKINS: Sorry. Do I have to --
21 I don't know if it's on.
22 PRESIDING MEMBER BOYD: Do you have a
23 green light on?
24 DR. S. JENKINS: Now it's on.
25 PRESIDING MEMBER BOYD: Now you do.

1 DR. S. JENKINS: I would also like to
2 say that almost everything under our social,
3 economic and environmental program received an
4 exemption from BP for the 30 day preview period.
5 So that is information that there isn't a lot of
6 IP attached to it so we are perfectly happy to
7 make that available on an ongoing basis.
8 PRESIDING MEMBER BOYD: Thank you.
9 DR. TIANGCO: Our last speaker for this
10 panel is Tom Jacob from DuPont. And he will be
11 sharing the things that are going on at DuPont
12 with regards to biofuels research. Thanks, Tom.
13 MR. JACOB: Thank you very much. I
14 appreciate the opportunity to share with you some
15 of what DuPont is doing in the biofuels area. We
16 have a very strong belief in this area and its
17 import going forward into the century. We expect
18 to be a significant player in that. Let me
19 provide one caveat in advance. I am not embedded
20 in the technical side of this so there are limits
21 to how deeply I can get into it in the event of
22 questions. Let's get going.
23 We have a mission that we have
24 incorporated into DuPont of increasing shareholder
25 value and societal value while reducing our

1 environmental footprint. Not only within the
2 company but along the value chains in which we
3 operate.
4 And with respect to that footprint we
5 have certain parameters around that. But what
6 this reflects in a real sense is a very dramatic
7 transition that our company has been in the midst
8 of for the past 15 years or so from one of the
9 largest chemical companies on the plant to a
10 company that is very, very deeply embedded at the
11 interface of biology and chemistry.
12 And very deliberately so. We believe
13 that that's where a lot of the solutions come
14 from, not only in the energy area but in areas
15 related to food and agriculture, industrial
16 production, biological production, industrial
17 chemicals. We are involved in a number of
18 different aspects of energy, solar, wind, fuel
19 cells. And of course the topic that we are about
20 today, biofuels.
21 We do believe that biology will help
22 reduce the global reliance on fossil fuels.
23 We believe that we can deliver solutions
24 that are sustainable, renewable and that match
25 real-world needs. That will integrate modern

1 biological tools into world-renowned chemistry and
2 engineering, as well as delivering renewable-
3 sourced chemicals and fuels.
4 We in essence are following a three part
5 strategy here. First, to improve existing ethanol
6 production via differentiated agricultural seed
7 products and crop protection. Then to develop and
8 supply the next generation of biofuels with
9 improved performance. and also, of course, to
10 develop and supply new technologies to allow
11 conversion of cellulose to ethanol. We believe
12 that all of these are integral to making progress
13 and delivering it as rapidly as possible.
14 With respect to the improvement in
15 ethanol yield. We think this is important. We
16 own, one of our companies is Pioneer Hi-Bred,
17 which is perhaps the leading corn and soybean seed
18 production company in the world. Specifically
19 delivering into the marketplace today over 170
20 branded ethanol -- branded hybrids specifically
21 developed to yield maximum levels of ethanol.
22 We are also actively involved in
23 improving corn grain composition to increase
24 ethanol yield, offering at the same time more
25 valuable food and feed co-products.

1 And because we are so intimately
2 involved across the spectrum of these we are also
3 very attentive and very involved with improving
4 supply chain efficiencies to better link farmers
5 and ethanol producers.
6 And a derivative of our historic
7 business in the crop protection area we are also
8 focusing particularly on the protection of biofuel
9 crops to maximize yield.
10 We do have a partnership of some note
11 with BP for the production of biobutanol.
12 Biobutanol formulations we believe deliver good
13 fuel characteristics, high energy density,
14 controlled volatility, sufficient octane to really
15 deliver what the market requires, low levels of
16 impurities.
17 The performance benefits of biobutanol
18 we believe are several. Energy content closer to
19 gasoline.
20 The opportunities to add more biofuels
21 to gasoline.
22 It can easily be used with the existing
23 infrastructure. It doesn't require a separate
24 infrastructure. Gasoline blended with butanol is
25 less susceptible to separation than ethanol-

1 gasoline blends.
2 And it is compatible with current
3 vehicle and engine technologies.
4 We believe all of these represent
5 enhancements that will enable the fuel to really
6 deliver value versus ethanol.
7 Our partnership began in 2006. It is
8 based on the foundation of green-based ethanol.
9 We do have our biobutanol in pilot scale scheduled
10 for 2010 and we expect commercial scale production
11 of it in 2012. We are already involved with such
12 things as testing of the fuel. Most of the
13 development work is occurring in Europe.
14 But we believe there are other benefits
15 as well. The greenhouse gas benefits are at least
16 as good as ethanol. Low vapor pressure is lower
17 VOC problems.
18 It does have synergy with ethanol.
19 Existing ethanol capacity can be retrofitted to
20 butanol production as was alluded to earlier.
21 The same agricultural feedstocks as are
22 used to produce ethanol can be used.
23 The reduced vapor pressure actually
24 offers opportunities for co-blending with
25 gasoline/ethanol blends to a favorable advantage

1 and also from an octane standpoint.
2 One of the questions that we think is
3 relevant, it has been alluded to several times, it
4 relates both to the temporary ethanol production
5 and potentially the production of biobutanol from
6 similar crops, is the question of food, fiber and
7 fuel competition. That has become a particularly
8 key question this year. We think it's a relevant
9 question but we think that the focus needs to be
10 broadened a bit.
11 Some have suggested that agriculture
12 cannot supply all of these needs. That
13 governments need to be more actively involved in
14 the choices between them. We think though that
15 you have got to take a look at not just some of
16 these emerging questions but the larger issues
17 around productivity and yield and the benefits
18 that are accruing in that.
19 Over the past decade we have seen a 13
20 percent growth in global population, a 36 percent
21 growth in income. Well that could be 18 percent
22 now.
23 (Laughter)
24 MR. JACOB: A 21 percent growth in meat
25 consumption, 34 percent in corn consumption, 52 in

1 soybean consumption. But that growth has been
2 supplied off only a six percent increase in crop
3 area delivering those products.
4 The benefits from the yield in this
5 regard are very significant. In the last 25 years
6 improved corn yields from existing acres in the US
7 have resulted in corn production that would have
8 required an additional 150 million planted acres
9 had yields not improved. In essence a virtual 150
10 million virtual acres had been created as a result
11 of this increase in yield.
12 And we think this is an aspect of the
13 food/fuel issue that needs to be taken into
14 account as we try to parse through some of the
15 questions that are occurring in the area of
16 biofuels. We don't think that this is an
17 either/or debate. We think that policies need to
18 focus on greater agricultural productivity.
19 Especially, we would add, in the developing world.
20 We think that expanded agricultural production
21 will expand health, stability and economic
22 opportunity.
23 Finally let me get into our work in the
24 cellulosic area, which we find very exciting. We
25 have just this year, or just last year actually,

1 entered into a $140 million joint venture with the
2 Genencor division of the Danish company Danisco.
3 That is aimed at commercializing a
4 leading technology for non-food-based cellulosic
5 ethanol production.
6 The intent is to license the technology
7 package, the leading edge technology package
8 directly to ethanol producers.
9 Establishing regional cellulosic ethanol
10 affiliates in the process to help deliver some of
11 this technology in other regions of the world.
12 The technology package that we are
13 developing can be used as a bolt-on to existing
14 ethanol plants to expand capacity in accepting
15 cellulosic feedstocks.
16 The technology package can be a design-
17 basis for a stand-alone cellulosic ethanol
18 facility.
19 We have broken ground. We will be
20 operational on a pilot scale this year, focusing
21 on corncobs and switchgrass.
22 And we anticipate commercial scale
23 production by 2012. A lot of the work and
24 background on this has been enabled as a result of
25 DOE Renewable Energy Laboratory research grants.

1 The partnership will deliver significant
2 pretreatment to separate the lignin from the plant
3 cellulose.
4 The Genencor contribution will be
5 enzymatic hydrolysis to convert the cellulose.
6 Importantly, the enzyme complexes that they have
7 developed we believe will yield about a 30-fold
8 cost reduction for the enzymes, which will be very
9 important in developing and advancing this to
10 commercial sustainability.
11 And we also have novel technology to
12 offer to ferment the sugars and make a very high
13 concentration of cellulosic ethanol. In this case
14 utilizing a proprietary biocatalyst based on
15 (inaudible) that we have advanced quite
16 considerably.
17 We believe that this will produce from
18 corn stover at a pilot scale this year with
19 commercial production in 2012.
20 As I indicated we think that this as a
21 bolt-on can in essence expand the productivity of
22 existing acreage and biorefineries by a third. A
23 significant improvement.
24 The biofuels benefits could be in the
25 range of 25 to 40 cents a gallon.

1 And significantly this is also yielding
2 biomaterials like Sorona and Cerenol to reduce oil
3 demand by sourcing those materials from non-
4 petroleum resources.
5 So what we have is an advance on a very
6 broad front here in the area of biofuels by our
7 company and others. And for the purposes of
8 California I think the take-away is simply that we
9 have a strong belief that this is where the future
10 needs to take us. And we have a strong belief
11 that it would be to our advantage and hopefully to
12 the advantage of everyone if we were right there
13 at the front of the line. I'd be happy to answer
14 any questions.
15 PRESIDING MEMBER BOYD: Thanks, Tom. I
16 don't have any questions. I'd just comment for
17 audience benefit that you were the individual in
18 your company who introduced this agency to
19 biobutanol quite a long time ago. We're glad to
20 see you back here today.
21 MR. JACOB: Thank you very much.
22 DR. TIANGCO: Thanks so much, Tom. I
23 think we can open up the panel for questions. But
24 before that let's give a warm applause for these
25 distinguished speakers for this panel.

1 (Applause)
2 DR. TIANGCO: What I would like to do
3 for the questions is take questions first now and
4 then we'll do the on-line chat and also open up
5 the phone for questions. Any questions? Ken.
6 MR. KOYAMA: Hi, Ken Koyama with the
7 Energy Commission. A question for Bryan, Harvey
8 and Susan. You mentioned a number of research
9 areas that you are going to be working on but what
10 about the time frame? When can we expect some
11 results, for example?
12 DR. B. JENKINS: You want me to start?
13 DR. S. JENKINS: Bryan is used to these
14 questions.
15 DR. B. JENKINS: Well, being good
16 academics we have already accomplished some things
17 and have some results. So it depends on what you
18 want.
19 MR. KOYAMA: We have got very aggressive
20 goals to meet.
21 DR. B. JENKINS: In terms of trying to
22 satisfy the goals within the Bioenergy Action
23 Plan, AB 32 and 118 and others. You know, I am
24 not going to make any great predictions about when
25 we are going to see large-scale production of

1 biofuels to meet these demands.
2 I think we are all hopeful that we will
3 make some progress on these but I think it is
4 going to take some time to get facilities built at
5 the scale that we think that they can be economic
6 so it will be perhaps some years before we see
7 this. But I think if we don't, if we don't take
8 some risk, I think -- we have been pretty risk-
9 averse in this area. We have been very cautious
10 in the way we have proceeded. Not just in the
11 biofuels area but the renewable area in general we
12 have been very cautious.
13 And I think we don't need to be so
14 cautious. I think there are some things that we
15 can do in the way of proceeding to provide some,
16 some compensation for the risk perhaps that will
17 allow us to fail better than we have been able to
18 do so far.
19 So I think we will see some move
20 forward, particularly coming out of these DOE
21 programs as well as the in-state programs. Where
22 we will see certainly some more development within
23 the fairly near future. I'll just say that.
24 DR. BLANCH: We sort or established a
25 five year time frame. We established a five year

time frame that was part of the DOE support. We are pretty much on track to have the technology developed, we feel, within that time frame.

The translation of the technology into pilot and then commercial facilities is obviously going to take much, much longer. But we hope by partnering with industry early on that will shorten that time frame.

DR. S. JENKINS: I think I just have to echo Harvey's time frame. In partnering with BP, they are already establishing some of the infrastructure to test what we will be developing over the next -- I think they were looking at a three to five window, a three to five year window for something substantial.

DR. TIANGCO: Any more questions? Steve. Please identify your name.

DR. KAFFKA: This is Steve Kaffka. I'd just like to make a comment about that question, Ken, because I think it's a good one.

My own view is that in the short- to mid-term, the way that California can develop liquid transportation fuels is primarily from agricultural-based sources and possibly also forestry-based sources. But if we create

1 regulations that effectively prohibit the
2 development of some of those opportunities we
3 won't have those fuels.
4 DR. TIANGCO: Sharon Shoemaker.
5 DR. SHOEMAKER: Thank you very much,
6 Val. I appreciate this opportunity to be here
7 today and commend the group that's giving
8 presentations. And the part of this that is near
9 and dear to my heart is in the biochemical
10 approach to this area.
11 But first I have to just say, what a day
12 to do this. This is the day that one of our
13 Californians is perhaps being confirmed as the
14 Secretary of Energy nationally so I think this is
15 quite a day to have this meeting.
16 Then moving on, especially to the group
17 at Berkeley. To ask one area. This is not
18 addressing the question of near-term and reaching
19 the goals as much but in the broader sense to
20 capture, if you will, the power of biology. In
21 this one area one approach wasn't mentioned and I
22 wondered if you were working in this area. I know
23 some other campuses are.
24 And that is in the area of direct
25 biological conversion, that is from CO2. So not

1 using plants. In this case not using land acreage
2 but using, if you will, fermentation like the
3 pharmaceutical industry but in some new reactor
4 design to take CO2 to products other than ethanol
5 typically.
6 And this is work that is going on at
7 UCLA, at one place, James Leal. Gevo, a company.
8 It's a start-up that has started but it's kind of
9 -- I think it is very interesting in doing
10 metabolic engineering. That's the fancy word of
11 how to redesign microorganisms.
12 And we really know so little about our
13 microbial work today that therefore there is a lot
14 of potential to really harness this. And now with
15 the tools that we have we could, I think, really
16 develop this further. Are you -- I mean, that
17 wasn't mentioned and we're talking about plants,
18 crops in this and some of the inherent
19 complexities. If you'd comment.
20 DR. BLANCH: There is some activity in
21 this area at Lawrence Berkeley National Lab but
22 none other I am aware of of the sort, apart from
23 fixing CO2 using micro-algae on campus.
24 MR. SHAFFER: Steve Shaffer, a couple of
25 questions. One for Susan. And again it gets back

1 to the timeline. We are all anxious on results
2 from research and what have you. But especially
3 in terms of the effort on the socioeconomic
4 issues. Anything to anticipate coming out on
5 indirect land use effects that might be timely for
6 the discussion that is going on at CARB?
7 DR. S. JENKINS: Yes, actually. There
8 is a draft review of write-up from a meeting that
9 was held just before the winter break. It was a
10 meeting with Michael O'Hare and representatives
11 from CARB on discussing the -- the name escapes
12 me. I have it on me, I'd have to look it up.
13 Somebody from Purdue. On the lifecycle assessment
14 of the greenhouse gas issues on corn versus other
15 products.
16 MR. SHAFFER: Good, thank you.
17 And my question for Harvey was more of a
18 technical one. The table you had. It's the
19 bottom slide on page six of your handout.
20 Comparing the cost of sugars from different
21 sources. And sugar cane you seemed to use
22 different parameters that aren't directly
23 analogous to how you compare them to the other
24 feedstocks, you just used the world price for
25 sugar. It looks like presumably you are just

1 looking at the available sugar in the juice and
2 not counting the biomass as well so the cellulose
3 and hemicellulose -- Any comment on that?
4 DR. BLANCH: Yes. In Brazil typically
5 those components are used. They are combusted to
6 provide energy for the distillation of the
7 ethanol. So yes, I just used the world sugar
8 price. The US one because of the tariff is a
9 little misleading. It roughly doubles to a little
10 over 20 cents a pound.
11 MR. SHAFFER: Sure, if it is just direct
12 refined sugar.
13 DR. BLANCH: Yes.
14 MR. SHAFFER: But if you are looking at
15 sugar cane as a cellulosic biomass feedstock for
16 second generation fuels it would see that that
17 might come down to similar to miscanthus or
18 poplar.
19 DR. BLANCH: Potentially, yes.
20 MR. SHAFFER: Okay, thank you.
21 DR. TIANGCO: Jim McKinney.
22 MR. McKINNEY: Jim McKinney, Energy
23 Commission staff. I had a question for
24 Dr. Jenkins. I was quite intrigued by the social
25 and environmental research component you described

there. And is your institute doing any work on sustainability standards per se? So specific sustainability protocols or best management practices, say akin to the round table on sustainable biofuels. Say practices or certification procedures that can be applied at the global scale.

DR. S. JENKINS: Oh boy. I would say very likely touching on aspects of that. I can't, nothing specifically comes to mind. I don't know. I mean, my knowledge of all the programs and projects isn't as deep in all of the areas. But it's certainly something that I could put you in touch with the groups or we could talk about it afterwards.

MR. McKINNEY: Okay. I'd appreciate that, thank you.

MR. JACOB: I'd like to just, if I could chime in on a couple of these points. Because I think these issues around the indirect impacts are clearly, you know, very current, not only here but globally. And they are also very, very complicated. And I think we are all going to have to do a lot of focused thinking to get, to get through them.

1 But our view is that there's a lot of
2 factors that influence these land use decisions,
3 particularly when you are considering this on a
4 global scale. Population growth, changes in
5 living standards, standards for agriculture,
6 traditional subsistence farming, demand for
7 minerals and the like.
8 One of our concerns here and one of the
9 reasons why we think we need to make sure we
10 somehow put this in the context of the larger
11 enhancements in yield and crop productivity, if we
12 are going to make rational choices here, is that
13 we are concerned that we not kind of drift in the
14 direction of a default penalty for agriculture-
15 based biofuels.
16 We have got to sort this out in a way
17 that enables the most rational path forward that
18 integrates not only the interest in replacing or
19 displacing significant amounts of petroleum but
20 recognizes the opportunities to enhance
21 agricultural productivity. The necessity of doing
22 that really in many parts of the world.
23 And if you look at comparisons of
24 agricultural yield across the world you find that
25 there's enormous opportunities for enhancing

1 agricultural productivity in many of these places
2 where we are expressing concerns over these
3 indirect land use impacts. It raises lots of
4 questions about whether we are delivering as much
5 as we can in the way of increasing productivity on
6 the ground, in the agriculture that's already in
7 place in these countries. If we are not then
8 that's affecting more pressures. Why is that?
9 These are not simple questions. They
10 are very, very important questions though and they
11 have significant implications for the growth and
12 development of biofuels in our view.
13 And we also had some discussion and
14 questions about timing. And one of the reasons --
15 Well there are several reasons why we are heavily
16 involved with corn, not least of which is we know
17 a hell of a lot about it. Not just us as a
18 company but certainly us as a company, but
19 nationally. And that knowledge can be very
20 enabling. So can the existence of the supply
21 chains and the systems that are already in place
22 around corn production, harvest, storage. As well
23 as the utilization of corn in ethanol production.
24 So in terms of enabling the maximum
25 progress in terms of this transition. And really

that is what this is all about is the beginnings of the transition toward a more sustainable fuel culture. We think that that's one of the reasons why we should continue to try to leverage what we have already accomplished in the area of some of the significant commodity production crops and get the most we can out of them. Because we think we can deliver much more rapidly there because of the knowledge base we are building off of, as well as the infrastructure and supply chain issues associated with that.

DR. S. JENKINS: I would also like to make just a comment. About the EBI in general and our direction. I think the leadership of the EBI has discussed this, all of these aspects, all these topics many times. And I think that what our position is is that we are not about lignocellulosic biofuels or bust. We are about biofuels if they can be done right.

So yes we are positive or we are forward-thinking about it. We feel that there is room. That things will progress as they need to progress. But I think that's the importance of doing all of the research together so that if somewhere along the way a flag goes up you, you

1 see that flag. And then you step back and you
2 look at the issues and examine them.
3 So we are not, you know, advocating
4 that, you know, that it has to be biofuels for
5 transportation fuels. It could be biofuels for
6 alternative energy production. But we are only a
7 year into our program pretty much. Our
8 researchers really started receiving funding
9 within the last six to eight months. So we have a
10 significant amount of work to do also.
11 DR. TIANGCO: I have a question for John
12 Scahill or Don Stevens. Are you on-line?
13 DR. STEVENS: Don is still on-line.
14 DR. TIANGCO: This is with regards to
15 Section 932 commercial scale biorefineries.
16 I thought IUGen (phonetic) is ahead of
17 the game and I don't know what happened, why IUGen
18 is out of the commercial scale biorefinery
19 support.
20 DR. STEVENS: IUGen withdrew itself and
21 I am not entirely sure of the reasons. You have
22 to ask IUGen to be certain about that. They
23 formally withdrew from the competition.
24 DR. TIANGCO: Thank you. Any questions
25 from the audience?

1 I think we can entertain questions on-
2 line. Okay, the first question for all speakers.
3 Based on the growth rate and ease of growing algae
4 it should be our main focus for economic and
5 sustainable alternative. How is it that it is
6 competitive at a cost of $3.22 a gallon? With a
7 20 percent profit margin I think you will be
8 selling it at $4.50.
9 DR. B. JENKINS: Can you repeat the
10 exact question.
11 DR. TIANGCO: Based on the growth rate
12 and ease or growing algae -- I'm reading it. It
13 should be our main focus for economic and
14 sustainable alternative development. How is it
15 that it is competitive at a cost of $3.22 a
16 gallon?
17 DR. BLANCH: Algae has been examined for
18 the past 40 years. There are only two commercial
19 algae facilities making products in the US,
20 Syanotech and Aquasearch were. One of the big
21 issues is dewatering the algae because of the
22 their small size.
23 And the second is simply the amount of
24 water that must be used in growing algae. For
25 example, a modest algae biorefinery, say making

10,000 barrels per day of oil, will process approximately ten billion gallons of water per day. The largest wastewater treatment facility in the US is one billion gallons per day.

So the current productivities, which are actual productivities measured in the field, not in the lab, would suggest that algae will not be a suitable organism for making biofuels.

DR. TIANGCO: We will unmute the phone. Whoever asked this question you can do the follow-up question. Are you on-line?

MR. RAIN: Yes I am.

DR. TIANGCO: Okay. Can you speak up and raise your follow-up question.

MR. RAIN: Yes, sorry about that. Okay, so you are saying it would take so many gallons in order to create -- And certainly that is an excellent point. That's the reason this should be doubled as a water-treatment facility for even just California in general needing so much water.

I mean, we are not talking like we have to really make the water -- We have so much bad water out there. There's oceans of it. Can it still be possible?

DR. BLANCH: One of the issues with

algae is their size. They are very small. Most of the algae you would like to use for producing biofuels are around five microns. The only way you can separate them from water effectively is centrifugally, which requires processing these huge volumes of water.

MR. RAIN: Okay.

DR. BLANCH: You can't filter them effectively. It has to be done at a very high-cost process. So regardless of the quality of the water, the amount of water to be processed is simply so high it has precluded always the commercial production of algae.

MR. RAIN: Is that electrical costs?

DR. BLANCH: Yes, electrical costs.

MR. RAIN: Okay. Okay, thank you. I appreciate that.

DR. B. JENKINS: I want to just comment on this algae harvesting question that there are some other techniques. For example there was a technique developed by David Brune which uses fish to harvest the algae and then harvest the fish. I don't know if we can use fish as a biofuel feedstock but that's potentially one way to do it.

MR. RAIN: Okay, thank you.

1 DR. TIANGCO: The other comment is from
2 Shirley Johnson. Again with regards to algae. I
3 will read: The algae conference in Seattle was
4 showing a cost of around $50 per gallon to produce
5 the closed system. Open pans are currently
6 operational but are climate-prohibited. That's
7 why we shouldn't use pans. Vertically built
8 bioreactors are much more practical. I guess
9 that's a comment rather than a question.
10 Are you on-line Shirley?
11 Any more questions from the audience? I
12 guess that's it. I'll give the floor to Ken for
13 the company presentations unless the Commissioners
14 have comments or questions.
15 PRESIDING MEMBER BOYD: No, no
16 questions. I just ended up with the blue cards,
17 of which there are two.
18 MR. KOYAMA: You can do it.
19 PRESIDING MEMBER BOYD: There's a third
20 coming from behind you. I'm going to pass them
21 down to you and I'll let you do it.
22 MR. KOYAMA: So again, the ground rules
23 are about a five minute presentation per company,
24 please. The first one is Jeff McElvaney, director
25 of marketing for Proterra Bio.

1 MR. McELVANEY: Good afternoon. Thank
2 you very much for the opportunity to speak to you
3 all, the Committee and the Commissioners. I
4 appreciate the opportunity to share a little bit
5 of information about our company. Again, I'm Jeff
6 McElvaney, I'm with Proterra Bio. And basically
7 we are an advanced form of anaerobic digestion.
8 The technology is not brand new. It's
9 been in commercial operation for a total of about
10 15 years starting back in Hawaii. The technology
11 was developed back in 1984 in a prototype plant on
12 Waiamau, Hawaii, Oahu. And it was funded
13 originally by I think it was Washington Energy
14 back then. And they explored the technology and
15 implemented it in a horizontal tank format. And
16 after a period of years the technology person took
17 his technology and went to another investor.
18 And at that point it took on a second
19 generation form on Maui, on the slopes of Maui.
20 And that was to demonstrate the commercial
21 scalability of the technology.
22 Basically the advanced anaerobic
23 digestion, if I can just sort of paraphrase since
24 I am not scientific, I'm just marketing. The
25 process is we are able to accelerate the

1 processing rate of digestion. And it is not in a
2 typical stand-alone sitting tank like you see in a
3 typical, classic anaerobic digestion form.
4 The processing rate is increased to
5 approximately double, basically cutting your costs
6 in almost 50 percent. And what happens is it
7 leads to a smaller project site. It also leads to
8 economies of scale in taking it to market.
9 Basically we can take any multiple
10 organic waste feed input, any kind of biomass, and
11 process that. We can turn out any kind of
12 flexible fuel, butanol, ethanol. Hydrogen even is
13 what we are exploring as well.
14 And just to back up, the technology has
15 existed in commercial operation for about 15
16 years. The most recent experience that the
17 technology person had with the technology
18 implementing in commercial operation was in Los
19 Angeles, California back in 2004 when the
20 technology was awarded the first renewable
21 contract with the LA Department of the Water and
22 Power. And at that point it was scheduled to go
23 in in Lancaster, California and to provide 40
24 megawatts of renewable energy to LA by the year
25 2008.

1 Unfortunately due to some business
2 operation issues the contract went null and void
3 and so the technology is now getting into a sort
4 of dormant stage and we are coming out with a
5 third generation system now and we are ready to
6 go.
7 So not to over-tout but our position but
8 the commercial scalability of the project is
9 viable today. The technology is ready to go now.
10 And we can start off with one fuel and adjust the
11 process and produce a secondary fuel or a third
12 type of fuel as the market changes. And so we are
13 very interested in pursuing interest in
14 California. We are going to be developing more
15 projects in California and we are available to
16 speak to the Commission if it seems necessary.
17 We are very open to questions. I'd
18 prefer to put you in touch directly with our
19 technology person since he will be able to explain
20 a little bit better. But he has been the source
21 of the technology and received the patent on the
22 technology. So again, thank you very much and I'm
23 from Proterra Bio, thanks.
24 PRESIDING MEMBER BOYD: Thank you.
25 MR. KOYAMA: Any questions from the

1 Commissioners?
2 PRESIDING MEMBER BOYD: No but I have a
3 feeling some staff will be contacting you with
4 questions later.
5 MR. McELVANEY: You've met Jim
6 McElvaney, I believe. A couple of years ago I
7 think.
8 PRESIDING MEMBER BOYD: Yes. I just was
9 mentioning to Susan, these folks were here quite a
10 while ago.
11 MR. KOYAMA: Okay, our next company is
12 Dave Rubenstein, chief operating officer for
13 California Ethanol and Power, LLC.
14 MR. RUBENSTEIN: Good afternoon. I want
15 to thank the Commission for allowing me to spend a
16 few moments with you. We are doing a sugar cane
17 to ethanol facility down in the El Centro area.
18 We have been moving along pretty good for the past
19 two years. We are in the permit process now.
20 We recently just changed our engineer/
21 constructor to Fagan who has built 50 to 60
22 percent of the corn ethanol plants within the
23 United States. They became an investor in our
24 company as well.
25 Our model is pretty much the same was as

1 Brazil has been doing it to the effect that we are
2 going to squeeze the juice out of the cane, make
3 ethanol out of it and then use the bagasse as a
4 fuel source for our co-gen facility. That's about
5 where it ends as far as the Brazilian technology
6 goes.
7 There's, you know, quite a bit more
8 environmental aspects that we need to look at and
9 we are actually pretty excited about it. We are
10 looking to build multiple plants. The first one
11 should produce about 60 million gallons of
12 advanced biofuel and about 50 megawatts of
13 electricity, half of which would be provided back
14 to the grid as green electricity.
15 We are working with SCPPA right now to
16 do the off-take of that as well as IID. Excuse
17 me. I don't get in front of crowds too often.
18 One of the other things that happens in
19 Brazil is they take the vinasse and they just
20 simply put it back in the fields. Well we found
21 that we can't do that and we found actually
22 opportunities for that.
23 We think we could recycle a considerable
24 amount of the water from that application and use
25 it within the plant. Our goal is to get water-

1 neutral if at all possible within the plant.
2 We will also produce some organic and
3 inorganics and we will produce some fertilizer.
4 And we think we will also have an anaerobic
5 digestion system on there that will either get us
6 some biomethane or -- we're talking with Air
7 Products in terms of putting a fuel cell
8 technology on it and possibly having a hydrogen
9 off-take.
10 In Brazil they typically burn the crop
11 and the field trimmings are gone. We are going to
12 collect the field trimmings and we think they
13 could go both as cattle feed as well as there's
14 other biomass power facilities in the Valley that
15 are interested in taking that as a fuel source for
16 their facilities.
17 We are also looking at a CO2 offtake.
18 We think there is a potential to capture the CO2
19 that's coming off the fermentation process. And
20 we are working with a few companies right now to
21 see if they want the industrial CO2 for industrial
22 applications.
23 And then there's algae. We were talking
24 to numerous people that approached us to see if
25 they will take the CO2 for algae production. So

1 open book on that.
2 On the agricultural aspect we are pretty
3 excited about it. We are working with a group of
4 five farmers who have formed an alliance who are
5 extremely excited about this program. It is going
6 to double the amount of rent they get per acre.
7 It is going to reduce their labor in the fields.
8 They don't need to go and cut alfalfa nine, ten,
9 twelve times a year. So they're really excited
10 about it. It is going to bring a sustainable and
11 predictable crop to the Valley for them.
12 We are looking at about -- Each plant
13 should produce about 300 to 350 direct jobs. Most
14 of those jobs would be well-paid operators. They
15 will be working both in the ethanol plant as well
16 as the power plant. So it is not going to be, you
17 know, $8 an hour jobs. It's going to be pretty
18 well-paid for folks.
19 One of the big issues we have to talk
20 about is water and we have addressed that. As
21 mentioned we think we can recycle a substantial
22 amount of the water out of the cane that comes
23 into the plant and use that in the plant. And our
24 goal is to be water neutral.
25 As far as the cane growing in the field,

1 we are excited that it is not using much more
2 water than the alfalfa or Sudan grass that is
3 currently growing there.
4 We are excited about AB 118. We think
5 that one of the proposals that we presented to the
6 Commission was one that we would be looking for a
7 possibility of a low-interest loan to get us
8 through the development stage. Pay that back to
9 the state with interest at financial close. And
10 then possibly later a loan guarantee along with
11 other federal loan guarantees to see if we could
12 get this thing built, bring these jobs to the
13 state and bring some renewable fuel in as well.
14 And I think that's pretty much it from
15 my scribble notes. And again, sorry for the
16 choking up. But if anybody has any questions I'll
17 be happy to answer them.
18 PRESIDING MEMBER BOYD: You did fine so
19 you can come before bodies any time. I have no
20 questions, just a comment that having been at this
21 for a lot of years I have been -- You sound
22 promising. I have been hearing about Imperial
23 Valley ethanol from sugar for more than ten years.
24 I wish you luck.
25 MR. KOYAMA: Our final company

1 presentation is from Matthew Frome from Solazyme,
2 Incorporated.
3 MR. FROME: I'm Matthew Frome, I'm with
4 Solazyme. Thank you for giving me the opportunity
5 to speak.
6 Solazyme is a renewable oil production
7 company. We are also the leader in algal
8 synthetic biology. We were founded in 2003,
9 making us I think probably the oldest algal
10 biofuel company in the world. We are a
11 California-based company. We are located in South
12 San Francisco.
13 And we are energized by the programs
14 that the CEC is moving forward with and we look
15 forward to moving our commercialization here in
16 California.
17 Solazyme has a unique microbial
18 conversion technology process allowing algae to
19 produce oil in standard industrial facilities
20 quickly, efficiently and at large scale.
21 To be clear, we do not grow our algae
22 photosynthetically, at least for energy purposes.
23 We do for some other products. But grow in
24 standard, industrial fermentation facilities. I
25 think we are the only advanced biofuels company

1 producing oil at scale in this way.
2 Using algae as a platform we have
3 actually demonstrated feedstock flexibility,
4 including cellulosic feedstocks such as corn
5 stover and switchgrass as well as industrial waste
6 streams.
7 In terms of fuels, Soladiesel I think is
8 the first demonstrated fuel ever to be run at 100
9 percent, 100 percent algae fuel in any road test
10 whatsoever. Soladiesel is a -- This particular
11 one in my hand is a Fatty Acid Methyl Ester. It
12 meets all of the specifications for ASTM D6751.
13 And it has all the benefits of biodiesel but also
14 includes a cloud of -7C, the lowest available.
15 We are also the first company ever to
16 make a hydro-treated renewable diesel from algae.
17 It also meets all the specifications for D975.
18 And so both of these fuels, although
19 they do have slight differences in their use, both
20 can be used in the current vehicle infrastructure.
21 Lastly I just wanted to mention that I
22 actually drove up to this meeting in an algae
23 Jeep, one with algae biofuel, so it is real. We
24 will be taking part in the Target 2030 Conference,
25 Transportation and Energy Future tomorrow and the

next day. We're part of the Ride and Drive. So if anybody is interested in driving in I think the only algae-powered vehicle in the world please let me know. Thank you.

(Laughter)

PRESIDING MEMBER BOYD: Is there a unique odor we should be looking for?

MR. FROME: There's none.

PRESIDING MEMBER BOYD: Okay, thank you.

MR. FROME: The oil actually can also -- we have actually some food applications. It actually tastes great. I've made brownies and all sorts of great things with it.

(Laughter)

MR. KOYAMA: Okay, do we have any on-line that want, any companies on-line that want to speak? No? Okay.

MR. SHIPLEY: Hello.

MR. KOYAMA: Okay, go ahead. Please identify yourself.

MR. SHIPLEY: Yes. My name is Greg Shipley with Bioenergy Development.

We have a -- We are a private company that has an agreement with the USDA ARS Lab in Albany, which is right next to Berkeley. And we

are presently in the process of building a four-conversion technology integrated pilot plant there on campus.

And one of the, one of the things that we are doing is using algae for, the co-production of algae from the fermentation process of a way of not really sequestering CO2 but absorbing CO2 as a byproduct from the fermentation process. This is the kind of closed look thinking that we believe an integrated biorefinery should have.

The other processes that we are incorporating are biological, biochemical and thermochemical. We believe that not one technology is a silver bullet for conversion of biomass into biofuels and biochemicals.

The one point that I wanted to make is that the pilot plant and our cooperative arrangements with the lab, presented today by JBEI and the BEI along with UC Davis and Cal Berkeley, is that we would like to share our power plant facilities with other groups. And also to share our data with state agencies like the Energy Commission and the Integrated Waste Management Board and CARB on air emissions and that sort of thing. We'll have a power plant facility where

1 regulators, whether it's from a commercial site
2 application or from a state policy, you can come
3 down and kick some tires. I think that about
4 wraps it up.
5 MR. KOYAMA: Okay, thank you. Is there
6 anyone else? Okay, I think we are ready for your
7 concluding remarks.
8 PRESIDING MEMBER BOYD: Thank you. Well
9 first my first sincere concluding remark is to
10 thank all of our participants today for their
11 participation, for their contributions to the
12 ever-growing body of knowledge on the subject.
13 And I find days like this quite enjoyable,
14 fascinating and educational.
15 Thanks to the stakeholders who added
16 both their questions and additional comments.
17 And I want to thank Ken in particular
18 but all of the staff who worked on this. It was a
19 lot of work to seduce many of you to this table to
20 talk about these various topics and we very much
21 appreciate it.
22 For those of us who have been at this
23 for a long, long time, you know, we get anxious
24 about wanting to move this along. But by the same
25 token I appreciate the caveats today about, we

need more time. I really wanted to ask those who said, three to five more years, or just to comment, but I have been hearing that for three to five years. I didn't say it.

(Laughter)

PRESIDING MEMBER BOYD: But nonetheless I recognize that this is complex, it takes a lot of effort. We try to convey that there are very strong policies in place in California that hopefully provide some kind of drivers or forcing functions from folks or to convey to their, to their leaders that there is an extreme interest in this.

We have kind of today almost ignored the financial world that we suddenly are living in and trying to hope that maybe that will go away real quick and we can keep on going. I know it won't but at least -- There were a few references and a few comments about what's happened already.

The good news so far, I'm almost afraid to say this publicly for fear that it will bite me, but the good news so far is that the 118 program has not been adversely impacted by California's financial dilemma. And we hope to at least do our part as government to participate in

consenting, encouraging -- development and demonstration is almost priority one for us. But research and development is a necessity as well.

Aside from the 118 program our Public Interest Energy Research activity here at this agency has for years and will continue to invest pure R&D to the extent it can and leverage its funds in some of these same activities. A lot of the things you hard about today have had our involvement in the past.

I do think that we need to step it up. And it is hard to say in the face of the financial situation. I too am encouraged if not downright giddy over the fact that Steven Chu is going to be our Energy Secretary. We have great familiarity with him as we do with the whole University of California system, particularly the University of California, Berkeley. And he knows our state, he knows what's going on and hopefully it will be reflected in some of what we need to do.

I mean, I feel very strongly. We need to divest ourselves along multiple bioenergy and other alternative energy paths. We concentrated today on biofuels but bioenergy in general is of extreme interest and a very strong need for us in

1 the state if we are going to barely remain the
2 golden nation-state of California. And therefore
3 anything we can do to encourage, incent within
4 reason, we will be doing as an agency.
5 I must admit there is no question
6 climate change is the biggest driver we have seen.
7 It has brought with it lots of issues about
8 indirect effects of things and the carbon
9 footprint question and so on and so forth. And
10 this agency along with the Air Board, the staff's
11 have been wrestling together and independently
12 with this issue.
13 We have been driven very -- The Air
14 Board I know is driven very hard by the Low-Carbon
15 Fuel Standard. We have been driven even harder
16 because we have got to get this AB 118 program
17 launched. The legislation required regulations,
18 it required an Investment Plan that was to be
19 prepared with help from an Advisory Committee, and
20 it very specifically cited sustainability and all
21 that that entails.
22 I see Tom Jacob has -- There he is.
23 Your almost closing comments there a few minutes
24 ago. I almost made a comment and I didn't and I
25 am going to make it now. In that I took to heart

1 what you had to say and you said it in an
2 exquisitely diplomatic way, far better than I
3 might be able to, with regard to the issue of food
4 versus fuel.
5 You know, a lot of us have reacted to
6 that fairly negatively, some even more so.
7 There's been a lot of knee-jerk reactions. Thou
8 shalt not. You won't spend any money at all on
9 energy crops with any of the money you have. And
10 yet you heard today you can, you know, there's way
11 to salvage land with some kinds of crops, et
12 cetera, et cetera so don't totally slam the door
13 on it. And I heard you say that research in this
14 arena might actually bring some net positive
15 rather than net benefit. So hopefully everybody
16 is open-minded enough to know.
17 I mean, I looked very deep into the
18 issue early on of folks in Mexico paying more for
19 their tortillas as a result of the early -- And
20 you know that's white corn, we produce yellow
21 corn. There was a market reaction. And it's hard
22 to control markets. But it wasn't a direct, you
23 know, withdrawing food from people's mouths kind
24 of an issue.
25 Now I am not much of a proponent, if any

1 proponent of corn to ethanol because I have much
2 higher priorities personally associated with using
3 the California, quote, wastestream. But I also
4 like to think that I am very open-minded and that
5 this agency is very open-minded. It takes a
6 little grief once in a while from folks when we're
7 trying to be open-minded.
8 But in any event to me this contributed
9 to the knowledge we have. And I wish you all well
10 in the work that you have underway and I just hope
11 we all can move the issue forward.
12 Pardon me for that long closing remark
13 but that's where I'm coming from. Commissioner
14 Douglas.
15 ASSOCIATE MEMBER DOUGLAS: Thank you. I
16 will balance your closing remarks with a very
17 brief closing remark of my own. I'd like to join
18 Commissioner Boyd in thanking the participants and
19 the stakeholders who were here today with us.
20 I also see biofuels as an important part
21 of California's future transportation fuel mix and
22 we are working hard here at the Energy Commission
23 in a number of ways to understand better how that
24 change can take place and how we can help
25 facilitate it.

1 I would also like to -- It was very
2 helpful to hear from folks here, particularly the
3 private sector about what you are actually doing
4 to advance biofuels research, and particularly
5 cellulosic and other forms of biofuels.
6 I would like to encourage everybody to
7 think about how to identify and to some extent
8 quantify some of the environmental benefits that
9 can be achieved through at least certain kinds of
10 biofuel production. And also to do as we are
11 doing and as the AB 118 directs us to do, to deal
12 with sustainability issues and concerns up front.
13 And think about criteria and think about
14 goals and think about, you know, depending on the
15 environmental footprint -- I'll just say, the
16 environmental footprint of a fuel that is produced
17 probably does and will impact the extent to which
18 it can be widely deployed. So it is going to be a
19 fundamental part of our considerations and
20 hopefully will be of everybody's considerations as
21 we move forward looking at biofuels and other
22 transportation fuel options.
23 So again, thank you very much. I was
24 pleased to be able to hear from so many people on
25 such a wide range of issues.

1 PRESIDING MEMBER BOYD: I'll leave it to
2 you to conclude the session, Mr. Koyama.
3 MR. KOYAMA: Okay, thank you.
4 With that, that concludes today's
5 workshop. I appreciate everyone's participation
6 in this. As Commissioner Boyd said, some of you
7 were contacted at the very, very, very last minute
8 and graciously decided that you could make it so
9 thank you all very much.
10 (Whereupon, at 4:36 p.m., the Committee
11 Workshop was adjourned.)
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CERTIFICATE OF REPORTER

I, RAMONA COTA, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission Joint Committee 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 26th day of January, 2009.