UNIVERSITY OF CALIFORNIA

BIOLOGICAL AND AGRICULTURAL ENGINEERING

CALIFORNIA BIOMASS COLLABORATIVE

FOURTH ANNUAL FORUM

VOLUME I

CALIFORNIA EPA BUILDING

BYRON SHER AUDITORIUM

1001 I STREET

SACRAMENTO, CALIFORNIA

TUESDAY, MARCH 27, 2007

8:41 a.m.

Reported by:
Peter Petty

APPEARANCES

Bryan Jenkins
California Biomass Collaborative

James Boyd, Vice Chairperson, Commissioner
California Energy Commission

Nathan Dietrich
Representative Matsui's Office

John Shears, Moderator
Center for Energy Efficiency and Renewable Technologies

Steve Shaffer
California Department of Food and Agriculture

Amy Luers
Union of Concerned Scientists

Sven Sommer
University of Aarhus, Denmark

Hal LaFlash
Pacific Gas and Electric Company

Ken Krich, Moderator
California Institute for Energy and Environment
University of California Office of President

Val Tiangco
California Energy Commission

Tim Olson
California Energy Commission

Marc Melaina
Institute of Transportation Studies
University of California Davis

Jim Pena
United States Forest Service

Martha Gildart
California Biomass Collaborative

Rich Zalesky
Chevron

APPEARANCES

Mary Beth Stanek
General Motors Corporation

Judith Ikle
California Public Utilities Commission

Raphael Lotilla, Secretary
Philippines Department of Energy

Eric Larson
Princeton University

David Dayton
National Renewable Energy Laboratory

John Ferrell
United States Department of Energy

Amar Anumakonda
Universal Oil Products, Honeywell

Dan Noble
Association of Compost Producers

Gregory Andert
Alpha Laval Biokinetics

Reed Benet
Sierra Research

Zack Norwood
University of California Berkeley

Andy Guerra
Central Valley Biofuels

Krishna Nand
City of Vernon

Kent Hoekman
Desert Research Institute

Lisa Morgenthaler-Jones
LiveFuels, Inc.

Paul Gamble
Norcal Waste

APPEARANCES

Tom Miles
TRMiles Technical Consultants

Hans Henning Judak
Energy Visions, Inc.

Frank Mazanec
LNG Energy

Bin Yang
University of California Riverside

Rizaldo Aldas
University of California Davis

Michael Theroux
Theroux Environmental

I N D E X

I N D E X

I N D E X

P R O C E E D I N G S

8:41 a.m.

DR. JENKINS: We're getting a little late start here with the usual equipment problems, but appreciate you being here.

I'm Bryan Jenkins; I'm the Executive Director of the California Biomass Collaborative. And it is indeed a pleasure and my privilege to welcome you to this fourth annual Collaborative forum on the status and future of biomass resources here in the state.

And these last four years have seen significant changes surrounding energy, climate change and our own sustainability. And state to major policy, and legislative actions along these lines. We've seen a number of actions which relate to our ability to change, and change for the better, over the coming years and the coming decades.

And we've had anything from executive orders specifying instate biofuels production and electricity production from biomass, greenhouse gas reductions for climate change mitigation, and low carbon fuel standards more recently, just released in January, the executive order on that.

All of these bearing on, to some degree, what we do with biomass in the state.

And have also seen some rather comprehensive legislation recently looking at trying to identify solutions to the environmental problems that we have; and calling for significant changes in our energy use.

We've also seen increasing attention and response from industry in trying to bring new projects to the state. We have at least one new major project that's also cofunded by the U.S. Department of Energy. We'll hear a little bit more about that tomorrow.

So we see significant action on the part of industry to respond to the goals and objectives that the state has for increasing bioenergy development.

And we've also seen more recently also major public and private research project partnerships developing which also bear on our ability to innovate in this area, and further to provide new solutions for bioenergy.

The Collaborative has been an intimate partner in a lot of this effort. Over the last year the Collaborative has been involved in the development of a roadmap for sustainable management and development biomass in the state. Many of you have been directly involved in that.

And we have received comments from you and tried to take those into consideration in releasing the document that is available in the back of the room here if you've not seen it before. It's also been available on both the Collaborative website and on the Energy Commission website. And very much appreciate the effort that has been directed at producing that roadmap which makes recommendations for the future development of this significant resource.

We've also done resource and technical assessments through the Collaborative. A lot of these are being used in the actions that are being put forth at the state level, both in terms of the low carbon fuel standard that's now in development, as well as some of the other executive orders and the bioenergy action plan that went forward last year.

These actions do have ramifications outside the state, as well. So what we do here in California is under rather close inspection in various other states and across the nation. And so people are paying attention to the activities that are going on here.

We are engaged in a major energy transition across the globe now. This is a transition that will continue over the longer term. There is no going back at this point, I think.

Many people to thank for this event today, and for the events that will follow tomorrow and on Thursday. There is, of course, most importantly, you. By attending here, by participating in the activities of the Collaborative, by belonging to the membership of the Collaborative, you, of course, provide a vital force in moving us forward in this area. So I very much appreciate your participation with us here.

You are complemented, of course, by a diverse, dynamic and very strong executive board. These are people who have dedicated a substantial amount of time and energy over the last few years trying to get us to this point where we understand better how to do what we're trying to do. And provide the vision that will carry us forward into the future. I express sincere gratitude to the board for all their efforts on our behalf.

Without funding support, of course, there would be no Collaborative, at least no formal organization of the type that we have. And for this we have the far-sighted staff of the California Energy Commission to thank. They were the initial funders of the Collaborative and have provided substantial input and direction to us over these years.

But we've also now had more support coming from other agencies of the state and industries of the state, and we look forward to additional support from all sectors involved in the Collaborative. And that includes us all, industry, government, academia, environmental community and anybody else you can think of, the general public, as well. I guess we're all in those sectors.

Tomorrow's forum, by the way, is sponsored by the California Integrated Waste Management Board. And I want to thank them for their sponsorship of this activity.

And, of course, without the Collaborative Staff we wouldn't be meeting here today. At least you wouldn't see the level of organization that we have. And these are very competent excellent staff that have organized this forum for you today.

And I personally want to thank them ahead of time for all their efforts. And you will see them throughout these coming days. And I hope when you see them and meet them that you will thank them, as well, for their efforts for us here.

Today's forum on advanced bioenergy technologies addresses a number of policies and technologies providing greater opportunities for integrating biomass into our energy infrastructure, energy system. We conclude today's activities with a reception over at the Sheraton where we can engage in some discussions in a little more informal setting. So, I hope you will join us there. You should have found some tickets for that reception in your registration packet. If you did not, please check with the registration desk before you leave here today.

Tomorrow's forum on the biofuels from municipal waste also gives you an opportunity to participate directly in the research and commercialization planning that the Waste Board is undertaking currently. So I hope you will attend that forum tomorrow, and particularly the breakout sessions, as well as the technical sessions in the morning, but the breakout sessions in the afternoon, with direct comment and direct input into that process. So you will have an opportunity to speak to that Board and influence the decisionmaking process tomorrow.

On Thursday there are tours of some relevant biomass facilities. So that forum has been rather constrained in terms of total attendance. I think we're probably fairly well sold out at this point. But, if you want, come down and check at the bus on Thursday morning and see if there's any space available. You're certainly welcome to do that. We cannot guarantee additional space, unfortunately, for that. So it should be a good tour.

Now, to business. Our first keynote speaker, it's a pleasure to introduce him again. This is Commissioner Jim Boyd with the California Energy Commission. Many of you know Jim. He was reappointed Commissioner in February of this year after completing a five-year term. And he's a familiar presence in discussions related to bioenergy, as well as energy development in the state, of course.

And in addition to his other capacities as Commissioner with the Energy Commission, he serves as Chair of the Interagency Bioenergy Working Group which is dealing specifically with policy and research matters in the state, trying to bring agencies together in a coordinated fashion to address all of the issues that we'll hear about in the forum today again, but more specifically along the lines of how we will advance these goals that we have in the state for increasing biofuels, electricity and other products from sustainable biomass.

And with that I think I'll leave the introduction at that. And, Jim, if you would, please, it's a pleasure. Mr. Jim Boyd, California Energy Commission.

(Applause.)

VICE CHAIRPERSON BOYD: Thank you, Bryan, and good morning, everybody. It's a pleasure to be here, it's a pleasure to be back. Some mornings I say it's a pleasure to be anywhere, so.

As Bryan indicated, I'm back as a

Commissioner. This subject, and many of you, are a major part of the reason why I offered to come back. Of course, just offering to come back doesn't guarantee coming back. So they string you out till you have two days before you turn into a pumpkin before they let you know you will be back. But, it's great to be back. Otherwise, I'd have been filing my retirement papers and maybe sitting in the back of the room for old times sake.

But times are too exciting right now to walk away from a topic like this that's pretty near and dear to my heart. Being a keynote speech I'm not going to hit you with slides and what-have-you. But just let me say I'm grateful to see a good-sized audience here. And I really look forward, for all of you and myself, to a lot of productivity out of these two days for this subject matter.

A little bit of history, very recent history, as part of this opening remarks. In April of 2005 -- well, actually more like a year ago, I guess, the -- two years ago, year and a half, I'm losing track of time -- the Energy Commission in it's 2005 Integrated Energy Policy Report, anyway, further underscored again, but in a new policy document, the significance of harnessing California's urban, forestry and agricultural residues as a source of biopower, biogas, biofuels. In other words, energy, in particular.

And we, at that time, and I was fortunate to be involved in the preparation of that Integrated Energy Policy Report, the second major report since that process was started in 2003. We did recommend very specific steps be taken to realize the potential, both economic and social and environmental benefits, of dealing with biomass and of substantial biomass development in this state.

And so nearly a year ago the Governor signed an executive order, which most of you are familiar with, urging state agencies to expand the use of biobased fuels. In fact, just bioenergy, be it biopower or biofuels. But expand this use of this fuel source in an effort to combat, at that time, high gasoline prices. So we were talking more specifically about realizing the promise of biofuels.

And I'm glad to be able to tell you that the State of California remains committed to substantial bioenergy development. And that, indeed, progress is being made to achieve the state's bioenergy goals. But, of course, we need to do more.

On April 25th of last year the Governor said, quote, "turning waste products into energy is good for the economy, local job creation and our environment." And his order at the time challenged the state agencies to a series of specific actions and milestones to promote biomass development in California. But, again, we need to do more.

And I'm pleased to report that we have made steady progress during the last year in realizing these biomass goals, the state's bioenergy goals. In large part due to the efforts of all of our state agency partners, and to Bryan, Bryan Jenkins and his staff at the California Biomass Collaborative, which was created several years ago at the end of the first great amount of interest in the subject of biomass. But, again, I'll say we continue to need to do more.

During the past year the very close collaboration that has been created with private companies, with federal government, with

California's universities and all the stakeholders indeed has resulted in considerable amounts of the needed research funding on new biomass conversion technologies on commercial development of at least one biomass-to-ethanol project in California. And the creation of joint research centers at both Davis and Berkeley on advanced biofuels are evidence of some of the success of that collaboration.

Private industry and private venture capitalists in California have been stepping forward, and have stepped up their efforts to finance the commercial development of biofuels projects, and of course, Pacific Ethanol in California has become quite famous for that.

The Blue Fire Ethanol proposal in southern California, which has been funded by one of the grants from the federal government, or partially funded and probably will get more funds from some of us, is another example of at least getting the ball rolling in the state.

And in this vein of the private sector, private capitalists and what-have-you, a year ago, a little less than a year ago one of California's public/private partnerships that I've been involved with for quite some time, CALSTART, working with the Swedish government led a delegation of government and industry folks to Sweden. And I would say more industry than government folks for a change in that delegation.

And the idea was to talk to Sweden about their biomass utilization and their bioenergy programs, and particularly the biogas programs. Southern California Gas Company was part of that delegation. When they came back, they signed a contract with folks in Sweden to help them push that subject matter here in California.

While we were there I and the former Under Secretary of Resources Agency for Energy, Joe Desmond, signed an MOU for participation and cooperation between California and the Swedish government on biomass and biogas.

And I'm pleased that earlier this year PG&E announced its plans to harness biogas from dairy farms in the Central Valley as a source of pipeline gas for its electricity generation, which is a huge step forward. And I want to take this opportunity, frankly, to commend PG&E for its efforts to meet renewable goals of California, but to meet the state's renewable energy commitment, and helping us to meet our goals. I think that was a fairly substantial achievement.

We've expressed our intent to partner more closely with the U.S. government, particularly with the Department of Energy, Department of Agriculture and the USEPA. I see my old friend, John Ferrell, here in the audience. We've partnered for years in a low-key basis. I've met with some of the bosses up the chain recently, and we've really pledged and agreed to partner a lot more and a much higher level on this whole subject in the near future.

In addition, just last week a lengthy meeting with USEPA representatives, and I guess I have to call on old friends to do this now, but it just seems to be always I'm dealing with old friends, and they've agreed to join with us and partner more deeply than we have before on the subject of particular interest to them, biofuels.

In any event, we are making progress. And through the bioenergy working group, which Bryan mentioned, I am fortunate enough to chair for the Administration, California's government agencies are moving forward on the state's bioenergy action plan that was released by the

Governor in July of last year.

I want to run through some of the first-year accomplishments. First, and Bryan referenced this, completion of the roadmap for the development of biomass in California by the Collaborative, is going to, and is presently, guiding us on future R&D needs to address both regulatory permitting issues and recommended public education programs be initiated by all of us. And that's something we're proceeding on.

The Integrated Waste Management Board, which is a co-sponsor, as you heard, of the technology forum is seeking policy and legislative clarification of its authority over feedstock handling, is in the process of completing a strategic plan to increase bioenergy production in landfills. And kudos from me to their Chair, Margo Reid Brown, who has really personally engaged and worked with us most closely on moving these projects forward and helping resolve some of the issues. And, of course, new board member Gary Peterson, who again is an old friend, is chomping at the bit to do all he can to help facilitate movement in this area.

Another Collaborative partner, the Air

Resources Board, has been working on efforts to complete its so-called predictive model with an aim of trying to maximize the flexibility we have in blending ethanol into gasoline, and maybe being able to take it up to a 10 percent blend. And we're hoping that ARB will be able to finalize its efforts this spring and summer.

The State Water Board is working with us to resolve permitting uncertainties for biodigester projects in collaboration with its Central Valley Regional Board. A fairly new board member, Gary Wolff, has worked very closely with me and Shannon Eddy of the PUC to try to move this issue forward. And I am quite grateful to see a lot of movement in that area.

A fairly new member of our interagency group, the Tahoe Conservancy, and its new executive director, again my old friend, Patrick Wright, have worked with the Department of Forestry and Fire Protection and is presently seeking state funding for a Tahoe basinwide forest biomass program which will reduce the potential for catastrophic wildfires in the Tahoe Basin.

And we've been working with Placer County and Placer County has been working diligently for years on the general subject. And they've released their strategic plan for biomass development in the county, based in large part on the state's biomass energy plan. And we welcome them to the Collaborative effort because they're working in close cooperation with their air pollution control officer who has become one of the people who is definitely helping us bridge the information gas between air pollution control people and the bioenergy people.

The Department of Food and Agriculture continues to work hard to influence federal funding opportunities in the federal farm bill. Secretary Kawamura is another California leader who's worked very closely with us. And he's a tireless worker in working the subject. He's working with 22 other states on the so-called 20-by-25 initiative. Or I believe it's 25-by-25 initiative. Which is aimed at achieving the goal of 25 percent renewables from the nation's forests and farms by the year 2025.

And these efforts have been recognized in the bioenergy working plan; and these efforts do complement our state's renewable portfolio standard, which is another one of these efforts that tangentially travels with the subject of moving forward on biomass.

The Public Utilities Commission has approved 27 power purchase contracts by utilities, including over 350 megawatts of new bioenergy generation. The PUC is working with my Commission to streamline the renewable portfolio standard process, and to identify and resolve potential regulatory barriers to biopower development. And I mentioned Shannon Eddy earlier, the Governor's liaison with the PUC, who's been working very closely with us on all these subjects.

The Department of General Services continues to purchase large numbers of flexible fuel vehicles in the state fleet, over 1100 vehicles purchased in the last two years. With the expectation, and I underscore expectation, that a fueling infrastructure for these vehicles will be established by our fuel industry and our fuel industry partners in the not-too-distant future.

And in the past many of you have heard me, I'm sure, and others, reference the fact that we're awash in the flexible fuel vehicles that can burn E-85. But we have one, maybe two now, public stations in all of California, at which Californians can fuel these vehicles. And I think most Californians don't even know they're driving flexible fuel vehicles. So we have a huge gap to bridge there.

But government needs to lead by example. And we're trying. And Caltrans and Chevron are engaged in a pilot program on the E-85 fueling and operation, and have been for a better part of the last year. So we're making some progress there, but only some. And, of course, we need to do more.

Lastly, increasing use of alternative transportation fuels, especially biofuels, as you all know, is the subject of an alternative fuels plan, which the Energy Commission, working with the Air Resources Board, were jointly producing in response to Assembly Bill 1007. And my good friend, Chairman Bob Sawyer, and I are overseeing this operation and we will have an alternative fuels plan produced by the deadline of June 30th of this year. And, of course, biofuels is a component of that.

And lastly, I'll mention the plan includes, in order for us to do our work, an analysis, a so-called full fuels cycle analysis, of transportation fuels. Which now has become critical to providing a common technical basis for the ARB's adoption of the newly announced low carbon fuel standard, which the Governor directed as part of the state's climate change initiative.

So all of these things travel in parallel; all of these issues are connected. And as we've discovered as society finally, everything's connected to everything else. And there are reactions and actions and reactions all throughout the system. So you cannot decouple any longer most of these activities without potentially catastrophic consequences, the old, unintended consequences of yesteryear to some other effort that is the subject of policy initiatives that have already been granted.

So, in any event, we've made some progress. But as I said, we need to do more. So the State of California is pledged to continue its support to the development of advanced biomass conversion technologies. Which, of course, is the subject of today's and tomorrow's technology forum. And please, please, please, as stakeholders and forum participants, don't just walk away from what you learn over the next two days of the breakthroughs and new technologies that are occurring in this arena, and just walk away and say that was a wonderful experience. And then go back to what you were doing.

But we need to do more. We need to take what we hear about and move them rapidly into the arena. With your support and through more direct funding by the government in biomass R&D and various partnerships between the federal government, state government and industry we all will support your efforts to secure more public funding to develop these advanced technologies, and to move these subjects forward. But we need, also, to induce and seduce more private financing of these activities, as well. The government needs to do its part, but everybody needs to do their part.

So, with your support, we hope to realize the substantial public benefits that we've all been talking about of this sustainable biomass bioenergy development which we need, frankly, to attain our renewable energy goals, our petroleum reduction goals, and now our climate change goals, perhaps the greatest driver of all.

But I will say again, we need to do more. I think last year at this time I said we are faced with what I saw as fairly unique opportunities in a unique time. I didn't read last year's talk, but I'll bet you I said something about the planets and the stars are lining up and we need to take advantage of that.

And to remain celestial in my views of things, why I think the planets and stars did line up. I think we've created a new solar system or a new planet. And we need to operate. But we don't have the kind of time that's involved in the creation of universes and solar systems and what-have-you. We have very little time.

And I want to encourage you to recognize that the political planets and stars have started lining up in the last year or so. They are lined up now. They don't stay in alignment real long periods of time. We really do need to strike while the opportunity presents itself. And the opportunity for action has presented itself with the realization of political leaders at the highest levels, that we need to do lots of things that all relate to each other.

We need to reduce our dependence on

petroleum. We've made a mistake being a mono-fuel society. We need to become a poly-fuel society. The cost of dealing with waste needs to be addressed, because perhaps we can eliminate dealing with waste as a cost, and maybe it's not going to bring a cash flow to everybody, but it can be turned into a no-cost situation because we're providing a fuel or a base material for energy and for other products.

We need to recognize that we have a Governor who is quite willing to be a substantial leader in this arena by also wanting to aggressively address climate change, which I see as the greatest driver of all. In California, in the environmental arena and energy arenas, we've had air quality for decades as a driver. We've had energy security once in awhile when OPEN jerked around with the price of crude oil and got us concerned with the price of oil. And then that settled down.

So, we energy people, or the energy people of the past had energy security for awhile as a driver. But then they had to get back in line behind the air quality people.

And then we've had international

security issues post-9/11. And we've had continuous price volatility of our energy sources in California. And finally, we have climate change as the greatest driver of all.

You're never going to corral more forcing functions or drivers than we have today to move this issue forward.

So, I will say again, as I've said repeatedly, we have to do more and we have to do more now.

So I urge you to take away from what you hear these two days, and I urge my fellow government people at all levels to recognize that we need to take away issues from this conference. We need to continue to have allegiance to the bioenergy action plan in the executive order, and we need to keep the ball moving down the field because we just won't have this opportunity much longer. And I'm not re-ing-up for another term in office.

So, in any event, I look forward, with all of you, to an interesting couple of days. I will join you for as much time as I possibly can. The danger of having these meetings in Sacramento is that they know where I am, and they call me away on multiple occasions.

So, let's look forward to keeping this issue moving and let's do more. Thank you very much.

(Applause.)

DR. JENKINS: Thank you, Jim, for those excellent remarks. It's very inspirational.

I think what I hear, and I think I may have mentioned this in one of my classes, maybe my energy systems class last quarter, we have an opportunity to redesign and re-engineer the system. And I think that's what we're doing right now. And I hope we keep at it, because we need to do it.

Jim made reference also to the stars aligning, all the planets aligning here, not only at the state level, but at the national level. And to speak to this we have a representative from Congresswoman Doris Matsui's Office. This is Nathan Dietrich; and appreciate Nathan coming today.

Nathan serves as Deputy District Director in Congresswoman Matsui's Sacramento Office. Of course, Congresswoman Matsui is a strong advocate for alternative energy research and fuels. And she's a supporter of efforts to make Sacramento a leader in the clean energy fields.

The Congresswoman also is a sponsor of the Scientific Communications Act of 2007. This is HR-1453, which should assist scientists in bridging the gap between the technical research and public policy.

She's a former member of the House Science Committee. Congresswoman Matsui also now serves on both the House Transportation Infrastructure Committee, as well as the Rules Committee.

And Nathan here is a representative of the Congresswoman and relates some of her good will to us today here, I hope, as well as his own. Nathan's a 2002 graduate from UC Davis and earned a masters degree in public administration from the University of Southern California. And prior to working for Congresswoman Matsui, he also worked for Congressman Robert Matsui.

Nathan, please.

(Applause.)

MR. DIETRICH: Well, good morning, and thank you for having me here today. First I want to thank Bryan Jenkins for your leadership on this issue and your colleagues at UC Davis for hosting today's conference. Your leadership in this field is appreciated by many. And you were right on target when you spoke about exciting times here today and our government and political arena and California's leadership.

The federal government often looks back to California for leadership and guidance on these issues. And we are so lucky to have yourself and the Energy Commission and the leaders here, and all the audience working on this issue.

Also want to thank Commissioner Jim Boyd of the California Energy Commission for speaking just now and taking part in this conference. Your involvement here is much appreciated by many, and you are very correct, the political stars are lining for the first time in many years on a wide variety of subjects to move this issue forward.

Thank you very much.

It is a true honor and privilege to be here. From looking at today's program you've got a lot of stuff in front of you so I'll try to be brief.

But I am Nathan Dietrich; I work for

U.S. Congresswoman Doris Matsui in her Sacramento Office. The Congresswoman is a very strong supporter of alternative energy and alternative energy research, and particularly cellulosic biofuels. I apologize, I'm not a scientist, so I'll mispronounce some scientific terms, but I appreciate you hanging with me.

But that's why I am pleased to be here today. She is very excited about the future ultimate in biofuels and other forms of alternative energy.

She is a former member of the House Science Committee; and she now sits on the Transportation and Infrastructure Committee. And her commitment, again, remains strong.

A few months ago she wrote an op-ed in the Sacramento Business Journal about clean energy. In it she wrote about the nexus between national security and our energy policy. And I want to quote a short line from it. She wrote: There is a consensus in Washington that we must act to end this nation's dependency on foreign oil for economic security, our national security and to mitigate the effects of global warming. These three issues, our national security, our dependency on foreign oil and the evidence behind global warming are now driving public policy behind alternative energy and biofuel research."

With those words in mind, I want to talk about three main things today. First, the Democratic-led Congress' view on clean energy. Second, an emerging consensus that the federal government must fund and follow the scientific research while not allowing politics to pick winners in the clean energy field. And third, Sacramento's efforts here at home to become a leader in the clean field.

In January the Democratic Party took control of Congress. And Congresswoman Matsui and her colleagues are committed to changing the tone in Washington from one of talk to one of action in the clean energy. And we have already started to see this happen.

Routinely the Congresswoman will talk to her staff and our citizens here in Sacramento about the responsibility of governing. And she has gone, and her colleagues have gone, from a party of just putting ideas out there and not see them go anywhere. But now they're starting to put those ideas into action. And I tell you, they are serious.

House Speaker Nancy Pelosi has convened a global warming task force, while the House and Senate have already held hearings on global warming. Most political observers will note that politicians and policymakers have finally concluded that global warming is indeed a fact and time to take action.

And as you mentioned earlier, this is one of the stars that are aligning for us and driving this policy forward for the first time and it's eclipsing national security and petroleum fuels as a reason to move forward.

And the first steps of action took place in January when the House passed legislation that allocates $14 billion towards clean energy research at the federal level. Congresswoman Matsui, Science Committee Chairman Bart Gordon and their colleagues are committed to such robust research and development programs.

As many of you know here today, traditionally this has been an area where the federal government has lagged behind the states, particularly California. Where our universities and state agencies, and the California Energy

Commission, have been active for years.

It is time for the federal government to catch up and invest in high-risk, high-reward research. For example, Congresswoman Matsui is a strong supporter of a research initiative on the par with the Department of Defense's DARPA initiative. What we need is an ARPA-E or advanced research projects for Energy.

Currently the DARPA program does research on military items. It's where the stinger missile came from, where the internet came from. And we put $2 billion a year in that program. There is no reason why we cannot put $2 billion a year towards clean energy research at the same time.

The solutions to our energy problems are out there. We must give you, the researchers and professionals in the field, the resources to find them.

And now that global warming and the clean energy agenda are on the national radar screen, it's imperative that research is funded and that researchers are given the freedom to let their work guide them.

Earlier I mentioned the $14 billion the

House passed to fund research. This is on top of an additional $200 million that has already gone into the Department of Energy's Office of Science. That will happen in January when the House passed the continuing resolution. This is truly reflective of the new Congress' commitment to act on the issue and fund basic research.

The Congresswoman firmly believes that it's not the federal government's role to pick technology winners and losers. The last thing you need is for Congress to tell you what to study and how to do it. You have the expertise, not us.

That being said, there's a lot of excitement in Washington and with the Congresswoman about the problems of the biofuels and cellulosic and other waste material feedstocks. This needs to be further explored.

We must not let the corn politics of a certain midwestern state dictate our future. Smart, proven and reliable technology must lead the way. The solution to our energy crisis may be one of a wide variety of fuels, whether it's biomass or wind or solar, there's going to be more than one winner here, and we need to let the researchers do their job.

As the scientific research continues, attention must be paid to assisting the successful transfer of these new technologies into the marketplace. Which leads me into my final comments about Sacramento's emergence as a clean energy leader.

Here in northern California there are a variety of people working to make Sacramento a leader in the clean energy field. The Congresswoman has met with many of them and so have I. We have a lot of people take the initiative and we appreciate your support for this to happen.

We have SARTA and CleanStart, two nonprofits, teaming up to create a culture of entrepreneurship. We have the Sacramento State's Clean Energy Center, which is another exciting recent development. And UC Davis' continued top notch research and leadership with conferences such as this, are more than welcome.

Additionally, other nonprofits SACTO and Valley Vision are trying to lure energy companies to Sacramento for the research and economic benefits for the region. And we've already seen some successes with companies coming to the region.

And it's time for the federal government to take the lead in this area, and to be supportive of it. The Congresswoman believes that Congress must create a sustainable market for clean energy technology and tax incentives for consumers and businesses.

The federal government must also not turn a blind eye towards those of you in California working on this issue. We must reward the states and localities that are taking steps to encourage the use of biofuels and other clean energy technologies.

My boss looks forward to continuing support of local universities, researchers, businesses and utilities that are transitioning to this new economy.

And in conclusion, working together we can solve these energy problems that we face. And help Sacramento's economy emerge as a clean energy leader. Congresswoman Matsui looks forward to being a champion on this issue and insuring the federal government leads and assists those of us in this field.

So, thank you for having me here today.

And I hope you'll all take part in moving this issue forward as there's very few issues more important in this country today.

Thank you very much.

(Applause.)

DR. JENKINS: Thank you, Nathan. We look forward to excellent things coming from all of us around in the country here, particularly Congress.

So, that leads us into our first technical session. And I'm actually going to turn this over to Martha Gildart so you get a chance to meet our program organizer for the forum here. And she's worked very closely also with Rob Williams, who's sitting up here. And these two individuals have been working diligently over the last couple months to put this session together.

And we've had some additional support. Pete Dempster you'll see wandering around with a camera. I've told him not to be shy so that we can get some good photographs of the proceedings of this thing.

And we also have Cora Monce and Seonggu Hong and Dae Hyun Kim who have been working in putting this forum together. And a number of other people that I won't mention here, but I may get to them later.

In any case I'll turn it over to Martha. She can introduce our moderator for the next session, who is John Sheras, a member of the executive board. So, Martha, if you don't mind.

MS. GILDART: Well, actually we hadn't really planned on this extra introduction, but we can handle it. I do want to say, we didn't get signs up in time, but there are doughnuts and coffee and muffin in the room around the corner, the Sierra Room. So, during the breaks please help yourself. Tomorrow morning it will be in the same room, so please, you know, take advantage of that while you can.

I'm not sure if anyone has pointed out where restrooms and things are. They're sort of a hike down around to the left. You have to go past the end here and turn left; and there are restrooms over there.

John Shears has been a very active member of the Biomass Collaborative for the last couple of years; very knowledgeable. He is one of our environmental representatives. And he's going to be the moderator for this first session today.

So, please welcome John.

(Applause.)

MR. SHEARS: Well, as moderator, I guess I need a panel. So, if our panelists would like to convene, I'll try and introduce our panelists as we get settled in.

I'm John Shears; I'm the Research Coordinator with the Center for Energy Efficiency and Renewable Technologies here in Sacramento. Biomass energy, biofuels is one of the issues, many issues that we work on along with utility issues, climate issues, et cetera.

I think the Collaborative Staff has convened a very exciting panel for us to start off the conference. I'm going to shift the agenda a little bit, and ask Amy if she would actually mind giving the first talk, because I think she has some very important and interesting things that will help tee up the rest of the panel, based on earlier talks I've seen her give the research that she's been helping to coordinate here in the state.

Amy is a climate scientist with the Union of Concerned Scientists. And just so I don't go off her script a little too much, she's on the subcommittee for the science component of the Climate Action Team, which was convened and released its report last spring, which probably everyone in the room's at least heard of, if not taken a look at.

And she helps manage some of the climate research that's done here in the state, specifically looking at adaptation issues and impacts. And so her talk this morning is going to sort of show what some of the implications could be for the agricultural and forestry industry. I understand it extends to forestry, as well? Here in the state. Because that's obviously very important when we're talking about, you know, utilizing the resources that can be made available from those two economic sectors here in the state.

After Amy speaks, I've sort of gone back to the sequence that was there and have Steve Shaffer will be speaking next about essentially the lay of the land policywise here in the state.

Steve is a very very busy fellow. I can tell you, from having to -- you know, he and I work together on a lot of different issues, and I can appreciate that he's a very busy fellow and to manage to fit even the panel session in for him is quite a challenge.

Based on a brief bio that he provided me, he's been with the California Department of Food and Agriculture now for 31 years -- 32, but who's counting. And Steve's official title is the Director of the Office of Agriculture and Environmental Stewardship for the California Department of Food and Ag. I'm sure quite a few in the room have met Steve and have had the opportunity to work with him.

And given that one of the big areas that he works in is environmental issues in relation to ag keeps him quite busy. So, appreciate getting a nice update on the latest policy initiatives.

And Steve also recently helped start up a new interagency work group related around the dairy issue and the challenges going forward on that dairy issue.

Our third speaker is going to be Dr. Sven Sorensen (sic) from -- pardon my Dutch -- University of Aarhus -- I'm sorry, yes, Danish. I knew that. I knew that. So we'll be getting a perspective.

Some of you in the room may have alreaDy participated in some of the CALSTEP conferences when the Swedish delegation has been visiting, as Commissioner Boyd mentioned earlier, over the last couple of years. This will give us an opportunity to find out what's going on in one of the other Scandinavian countries in Europe that's also very active in bioenergy, trying to take advantage of biomass resources for bioenergy.

And then finally, Hal LaFlash, who directs the renewables program for PG&E. Did I get that more or less right? Not your official title, but close enough.

He's going to talk about PG&E's perspective on climate and renewables. And hopefully for those of us in the room that haven't already heard about their exciting developments, that, again, Commissioner Boyd also mentioned earlier, with regards to exploitation of biogas opportunities in the state. Maybe we can also hear a little bit about that.

So, with that, I will now step out of the way and pull out my timer, as we're running a little bit behind schedule, and let Amy tee up the panel for today.

(Pause.)

MS. LUERS: Thank you, John. Good

morning, everybody. Again, I'm Amy Luers from the Union of Concerned Scientists. And I'm going to talk today about climate change scenarios in California. And focusing primarily on general impacts found in agricultural and forestlands.

And I want to stress that I'm going to give an overview presenting mainly work that -- highlighting the work that's come out of a recent state assessment that I was involved in that was led by the Energy Commission and CalEPA.

So, first just to provide a bit of background, which probably isn't needed for this audience, but as we know the surface temperatures of the earth have risen over the last 100 years, about .8 degrees Celsius. And we're also seeing the trends consistent with this global trend here in California.

This is a graph showing warming trends throughout the west where the size of the dot is the amount of warming. And here in California we've seen about the same as the global average, about .7 degrees Celsius over the last 100 years rise in mean annual temperatures.

Along with this warming we've seen a variety of changes that have been driven primarily by these climate changes, or consistent with the changes. One of these is a fourfold increase in wildfire frequencies. This is actually throughout the western U.S.

In a recent study that came out in Science Magazine shows that this increase in wildfire frequency is actually primarily due to climate factors and not management factors. They were able to tease this out from a spatial analysis of different climates and management regimes.

We also see a decline in cold water species; a decline in glaciers in the Sierra Nevada; earlier snow melt and spring blooms. These are just some of the trends that we've been seeing in California and the west coast that are consistent with a warming trend.

So as we look to the future what we know is that as temperatures rise the impacts will become more severe. But the good news is that what we also know is that many of the severe impacts that we see can be avoided. And this, of course, is one of the reasons that we're here today to look at alternative fuels and biomass as a solution to global warming.

But this was a take-home message, this idea that many of the severe impacts can be avoided, the take-home message of the recent report that came out this past year, produced by the PIER program of the California Energy Commission and CalEPA. It was a result of about 80 scientists from around the state and some outside of the state that produced a series of papers. These are available on these various websites presented here.

I'm just going to go through some of the highlights here. Essentially what we did in this study is we compared what California might look like under a series of different possible futures. One in which we followed a continued fossil fuel intensive growth path and high emissions; and compared that to other scenarios in which the world followed a cleaner development path and began to reduce our greenhouse gas emissions.

These paths are presented here with the yellow and red as the higher, sort of business-as-usual versions of high fossil fuel intensive growth, and compared this to the lower emissions path which is a cleaner technology path.

These are global emissions development

paths developed by the Intergovernmental Panel on Climate Change and are based on different assumptions about development patterns technology, development and so forth.

And what we found is if you look at the implications of this higher emissions path, shown in the red in the previous graph, and the lower emissions path, is that the difference for what California and the U.S. would look like is quite significant.

You can see on the higher emissions path it gets a lot redder, which means a lot hotter. This is the change in temperature. So, in the higher emissions path the average summer temperatures in the U.S. and some places rises up to 18 degrees Fahrenheit above historical. And historical in this case is 1961 to 1990.

But what's also significant is that even in what's considered the lower emissions path we see a significant amount of warming. And that's an important thing to note in terms of really stressing the importance that managing climate change is not just about emissions reductions, but about adapting to those changes already underway. And I'll talk about that more.

So, what we did with the study is took these global projections with global climate models under these different emission scenarios. And then downscaled those results to look at what the impacts for California.

So this is a spaghetti diagram of the projections for California. The reason there's so many lines is we had different global climate models and we had different emission scenarios. But generally this figure shows that no matter what emission scenario you use, no matter what climate model you use, the temperature rises as time goes on if emissions increase.

And so what we did is we separated out the projected warming range shown here by the arrow. And into what we called the lower warming range, a medium warming range and high warming range. And we compared what the impacts with what California would look like if we allowed California temperatures to rise to that higher warming range by continuing a high fossil fuel dependent path. And compared that to what California might look like if we were able to keep the temperatures down to the lower warming range.

So, I'm going to talk about the

temperature; and you'll remember these different colors, the yellow, orange and red corresponding to these different warming ranges.

But I want to first say a few words about water resources. Climate, of course, isn't just temperature but it's temperature and precipitation among other things. And it turns out that precipitation is much more difficult to predict than temperature.

And, in fact, the climate models show very little overall change in precipitation in California. And this is a squiggly graph that isn't supposed to show you more than the fact that there's not much change. This is the zero line in terms of change of precipitation over the study period out to the end of the century.

And essentially this is with a lot of different climate models. And all of them show great variability but not much change in total precipitation.

There's also very little change in the pattern of precipitation. In other words, when the precipitation happens, also it is projected to be the same in most climate models.

However, the big story for California

water supply isn't so much in the change in precipitation but the form it falls in. So this shows what will happen to the snow pack as we go from what I called earlier the lower warming range to the medium warming range.

You can see here that as we go to the medium warming range we could lose up to 80 percent of the Sierra snow pack towards the end of the century. In fact, if we go to the higher warming range the projections are to lose up to 90 percent of the Sierra snow pack.

So this, of course, is a great threat to the ski industry. But also, of course, it's perhaps a bigger threat to our water supply system. And as you may know, most of the water in the spring, dry spring and summer months, comes from the Sierra snow pack.

And the impact here is not just -- is that more of the precipitation falls as rain instead of snow. And the snow that does fall melts earlier.

And we're already seeing this trend of this spring snow melt coming earlier. We've seen about a two-week earlier over the last 60 years or so. And this is showing that pattern throughout the west, with the red circle showing earlier snow melt and the size of the circle showing the amount earlier that it is, based on the long-term average.

The implication of this earlier snow melt is that -- this is months in the year and this is the change in runoff. And what this shows is that because of the change in form of the precipitation and the warming, this will lead to much drier springs and summers, this is low runoff. Which influences wildfire frequency, but will also lead to greater, higher runoff in the winter which can lead to greater floods.

So, I mentioned the issue of wildfires and I mentioned the study earlier, this is a study done by Tony Westerling and others at -- well, Tony Westerling is at Merced right now, but he was at UC Davis -- I mean UC San Diego at the time. And this was a study that came out last year in Science, which essentially took this high wet season in the winter and dry season in the summer and looked at the implications in this pattern historically for fire. And showed that in the west coast -- in the western U.S. the fire frequency had increased fourfold as a result primarily of climate-related factors.

And the projection then that was done by Tony and others looking forward under these different climate scenarios is that if temperatures rise to this medium warming range we could see about a 55 percent increase in California in wildfire frequency. This, of course, varies over the state in terms of the intensity.

This change in precipitation, the change in temperatures and the change of wildfire frequencies all contribute to the change of vegetation type throughout the state. This is a figure that was created by Jim Lenihan and others in Oregon for the projections of changes in vegetation types.

Now, you probably can't read all of the different vegetation types on this map, but one thing you might notice is the loss of -- this is historical conditions and this is a projection over the medium warming range. And you can see one thing that's very noticeable is a loss in what the blue represented here, which is virtually gone under the medium warming range. And that's alpine and sub-alpine ecosystems, which are projected to shift.

This sort of breaks down that figure into the different ecosystem types. And a couple of things to note here. One is, there is again, the loss of sub-alpine and alpine forests. In this direction of the line is loss; this direction is a gain.

And then there's also a gain in mixed evergreen forests and the loss of evergreen forests. And these are primarily driven by the changes in temperature.

But the fire mediated changes, the increased fire frequency also drives some changes with an expectation of greater shrub lands and -- less shrub lands, sorry, and greater grasslands as the fire frequency inhibits the establishment of woody vegetation.

So, now focusing in on forests, this is just sort of an overview of some of the ways that projected climate change has, impacts it can have on forests. One is, of course, just direct increase in temperature. This can affect productivity. CO2 fertilization can also affect productivity, although there's some uncertainty in terms of how exactly that's going to affect it.

Show an increase and then a decrease, and where that decrease begins is not clear.

A longer dry season can affect the forest increased vulnerability to wildfires past and other mortality. And, again, going back to the figure that I just showed, it can lead to -- all these factors can lead to a shift of the vegetation types species distribution throughout the state.

So this is done by John Battles and others at Berkeley as part of the state assessment. And it shows the decreasing productivity yields of forests, pine forests and mixed conifer forest. Going from the historical shown in green, to the lower warming range; and then if we go to the medium warming range. We don't have the higher warming range here for a number of reasons.

But the general trend here is we just look at temperature in productivity in the forest shows a decline as temperatures rise.

The other concern, of course, in the forest sector is that things don't change linearly. There are thresholds and abrupt changes, for example, that could result from pests. This is an example from British Columbia of the effects of pine beetles. And as temperatures rise, very low temperatures in the past have limited beetle activity. And what they found in British Columbia is as temperatures rise these low temperatures are disappearing; and this makes the bark beetle more productive.

So now I'm going to switch to impacts on agriculture. Some of these are quite similar to forests in many ways. There's the impacts of higher temperatures; CO2 fertilization; the CO2 fertilization can have responses in the plants in terms of water uptake.

But also the changes in water supply n terms of the irrigation, ability to irrigate agriculture in the state, and changes in pests and pathogens. And, of course, one thing I'm not going to talk about is over-ride, overlaid on all of this is the changes in the market forces. How is climate changes affecting other places in the world, and how people are responding.

So the rising temperature can affect crop yield, but it can also affect crop quality; both in the rising CO2 concentration and rising temperature can affect the quality of the crop.

This is a study that shows the decreased wine grape quality as a result of increasing temperatures. Because of the increasing temperatures the wine grape ripens more rapidly and the quality of the grape is decreased.

And you can see in all the regions -- the colors on here are not really right, but this is supposed to be orange. I don't know why it came out that way. But, so this is the lower warming range, medium warming range and high warming range. And you can see in all of the areas essentially as temperatures rise the grape quality goes from what was initially optimal or marginal to an impaired state.

Of course, not all areas are affected quite equally. The cooler coast can handle a little bit of warming and actually goes slight increase before it goes to impaired with more warming.

Pests also affect agriculture, as I'm sure you know. And this is a study done by Anna Gutierrez in Berkeley which looks at the expansion of the cotton boll worm range as temperatures rise. With the red showing the suitability of the cotton boll worm range. And this is the current conditions. And you can see as temperatures rise, this is equivalent to the lower warming range, that the range goes from just southern California to pretty much most of the agricultural region of the state.

Another area how climate change can affect agriculture is decreasing the amount of really cold hours. So as the median warm range changes, so do we also lose the sort of extreme cold periods. And it turns out that these extreme cold periods are needed by many fruit trees to sort of come out of dormancy and bear their fruit.

And so this shows a trend, historical and then the projected, for the decreasing chill hours that we have seen and expect to see looking into the future at Davis and Fresno, you can see this is just drawn on top of it actually, just to highlight the trend. But this trend is declining.

And in many areas is reaching the minimum, if we look out towards the projections towards the end of the century, are really reaching some of the minimum requirements of these chill hours to bear fruit for certain fruit trees.

So, that's a summary of some of the impacts. This is a sort of summary of some of those, not all of them. In the report you can find a more extensive summary.

But I point this out here because this is supposed to give indication of -- first of all, it's supposed to be optimistic in the sense of as temperatures rise the impacts become quite severe up to when we reach the higher warming zone we could virtually lose all of our Sierra snow pack. But the good news of this figure is supposed to demonstrate that we don't have to reach that higher warming zone.

We don't have to reach the medium warming zone. And I'm hoping that some of the discussions here today help us learn -- help us figure out how to avoid those.

The question is, though, then how much do we have to reduce our emissions to stay -- to avoid some of these severe impacts. Well, what we did as part of the state assessment is ask, well, what if the industrialized -- if California -- if the industrialized world followed California's lead and reduced 80 percent, below 1990 levels, which is the California long-term target, by 2050, and the developing nations followed the lower emissions path presented in the study, then we would be at or below on track to avoid the impacts in the medium and higher warming range.

So, I think that, you know, this is the good news that this is where we're heading. In thinking about highlighting the importance of biofuels and other solutions to global warming.

The bad news is that even if we do really go forward on a very aggressive track we may very well find ourselves at or close to this lower warming range and the impacts associated with it.

And as a result, we really need to think about managing global warming in a dual strategy; thinking about reducing greenhouse gas emissions and preparing for those changes. And it seems to me, especially in looking at solutions like biomass, we need to think about both of these changes in terms of managing biomass as in the agricultural -- in a changing agricultural and forestry landscape in California.

So just to conclude -- two slides of conclusion. Because of this need for a dual adaptation mitigation or emissions reduction strategy for managing climate change, when we think about California's future landscapes we really have to think about how adaptable are California's landscapes to the change in policies, climate policies and change in climate.

And California agriculture, of course, has been very adaptable in the past to changes in prices, changes in weather. But I think that as we look to the future there are a lot more risks, a lot more challenges. And as we shape that landscape we need to think about managing both for the climate changes and climate policies the opportunities and constraints those present, as well as the opportunities and constraints of the changing climate.

Thank you.

(Applause.)

MR. SHEARS: So next we're going to have Steve Shaffer. And just in order to help us get sort of try and get back on schedule, I propose that we have the discussion after all the panelists have spoken.

And also for our transcript service, I just want to give everyone a heads up that what we're going to try and do is have people come up to the mike to help the transcript service, or you know, we can relay, I guess, whoever's standing here, if it happens to be one of the panelists, can relay the question, at least to the transcript service through the mike.

MR. SHAFFER: Thank you, John. I would say I'm no busier than anybody else in this room, you know. We are all committed to certain goals and objectives in solving these issues that are all looming before us. And there are past and solution sets, but thank you for highlighting my schedule.

Also I want to thank Jim Boyd for his opening remarks. Sometimes he makes my life more complicated, but in this time he certainly simplified it. He gave us an excellent overview and covered a lot of what I was going to say. So I'll reiterate a little bit and also from the schedule of panelists and speakers to follow me, will hear some of these things in greater detail.

But it is a pleasure to be here. Renewable energy, and in particular bioenergy, is near and dear to my heart. It's how I cut my teeth on the environmental issues surrounding agriculture starting in 1981 when one of my mentors and former colleague at the Department of Food and Agriculture, Vasha Chervinka (phonetic) hired me out at the plant pathology lab to work on these issues.

I don't have any slides. You'll have to pay attention to me for a little bit. And I'll make these talking points available to Martha; if they want to post them on the Collaborative website they can do so.

Real quickly, and again I'm a little puzzled why I was asked to present this overview of the state policies regarding biofuels. The main driver now is CalEPA and the Air Resources Board under AB-32 implementation. And they would be much more adept at presenting this than I. And then in close collaboration with the Energy Commission.

We serve on both the Interagency Bioenergy Work Group and the Climate Action Team to make sure that agriculture is considered as these things move forward, both in terms of improving agriculture's environmental performance, and also providing some of the solutions that we're looking for in terms of bioenergy feedstocks and what I like to term multiple objectives, management of the agricultural resource base for other environmental services such as habitat and cleaner water and what-have-you.

I think Jim already touched on AB-1493, the Pavley Bill, and establishing greenhouse gas emission standards for light duty vehicles. And I believe that is still pending a legal challenge in the U.S. Supreme Court. But if it withstands the challenge, it would put into effect starting in 2009 through 2016 emission standards resulting in a 20 percent by 2009 and 30 percent reduction of greenhouse gas emissions fleetwide.

We heard a little bit about AB-1007, which was passed in 2005, and the Energy Commission's process in moving through that. And we will hear, I think, a much more update of that in the next session, so I won't belabor that.

AB-32, again, the major initiative that is driving much of this now. To reiterate, by 2020 to reduce California greenhouse gas emission levels to 1990 levels. And the Air Resources Board is moving through a process right now to establish by January 1st of next year what that 1990 baseline is.

The Air Board will also establish reporting and verification system by January 1st of next year. It's moving through a process of establishing caps of major emission sectors. It remains to be seen exactly which sectors will fall under that cap at this point. Certainly electricity generation and petroleum refining, cement manufacturing seem to be the big three that are always talked about.

We hear about others such as landfills and commercial boilers. And I think those are still under evolution or development.

The Air Resources Board will identify these early actions for greenhouse gas reductions with regulations for implementation. The early actions must be identified in the next couple of months by June 30th of 2007. And implemented by January of 2010.

To continue, ARB will prepare a plan to achieve maximum technologically feasible -- these are key words -- and cost effective reductions by 2020 -- before 2020, by also January 1st of 2009. This will include market mechanisms. So, again, the cap-and-trade approach.

It will adopt methodologies for voluntary reductions. I think this is a key area for the California Climate Action Registry. They're already exhibiting leadership in the agriculture sector, developing a protocol for anaerobic digesters on dairy farms. And to verify those emission reductions so that dairies can participate in the carbon trading market.

These emissions, of course, must be real, permanent, quantifiable, verifiable and enforceable. And CARB may adopt fees down the road to implement this, as well.

Right now there are four advisory committees that have been established. The joint development of electricity sector recommendations; the market advisory committee; the economic and technology advancement advisory committee; and the environmental justice advisory committee.

These have all been established over the past month or so, and I believe they're scheduled to complete their work by June 30th. So it's a very short timeline. I would encourage you to track these subcommittees and get involved in these subcommittees. And the information is all on the Air Resources Board website.

We've heard also about the Governor's other executive orders. And the main one to be paying attention to right now is the low carbon fuel standard. Bryan Jenkins, along with Dan

Sperling at UC Davis, are a part of this. And they're supposed to be completing their work --

DR. JENKINS: We will complete the work, yes. Sorry. Go ahead.

MR. SHAFFER: Okay. Yes, and when Bryan says they will complete the work, they will complete the work. And it's by the end of June of this year?

DR. JENKINS: Yes.

MR. SHAFFER: Let me just focus on -- and, of course, there is the interagency bioenergy work group and the bioenergy action plan that Jim alluded to, and all of the participating state agencies have actions and performance metrics to meet those actions. Some of that may be slipping a little bit, but that continues to move forward.

Air Resources Board also has its AB-1811 appropriation, $25 million. They have let and received -- there was a solicitation; they've received proposals. They will be finalizing the selection of projects and that will focus on clean vehicle incentives, hopefully getting the E-85 infrastructure in place that Jim has been coveting for so many years now.

Fuel production incentives and research

and development grants for clean fuels and vehicles, and state fleet incentives, as well.

And CARB is anticipated to hold a workshop on this, this September, I guess, to announce the -- well, no, I take that back. These projects have to be in place before the end of this fiscal year. And completed by the end of next fiscal year.

Just to talk about a couple of things, as Secretary Kawamura is directly involved with, and one of those is the reason he's not here today. He is back in Washington, D.C. meeting with the National Association of State Departments of Agriculture, and making the rounds on Capitol Hill, again to inform our electeds on the farm bill, and what makes sense for California and other specialty-crop states.

The farm bill, as I understand it, will be completed by September of this year. So, again, it's a very daunting fast track.

This is the first year, first time in farm bill reauthorization where the Administration, the Bush Administration, actually put forth a farm bill proposal. It does look at significant attention to the energy title of the farm bill.

And as part of that, House Member Cardoza has a marker bill in place, HR-1600. That, again, is highlighting the conservation title, the nutrition title, the energy title, and the research and development title of the farm bill. Particularly highlighting California's needs.

Secretary Kawamura has worked very closely with Cardoza's Office, and actually held a series of listening sessions on the farm bill. We, at the Department, have prepared a whitepaper on the farm bill that's been approved by the Governor's Office, that it really does synch up quite nicely with Cardoza's bill and with the Administration's bill.

One of, I think, the major efforts is to inform the California delegation, those, most of whom represent urban constituencies on what the benefits of a farm bill, the reason to engage on the farm bill, really are in terms of, again, the benefits to California, both in terms of the continued production of half of the nation's fresh fruits, nuts and vegetables, as well as moving into the bioenergy arena and other renewable technologies. And, again, to meet a number of the environmental challenges facing us all. And that includes habitat and clean water, clean air, open space, as well.

Two other things, and then I'll get out of here or sit down and wait for questions. The Secretary is also on the 25-by-25 steering committee, the national effort that Jim also alluded to.

The goal of that group is to put policies in place that will meet the goal of agriculture and forestry sector providing 25 percent of the nation's energy supply by 2025, an ambitious undertaking.

They now have an action document that is out on their website, 25by25.org. And it calls for federal spending under the energy bill and under -- I'm sorry, the farm bill and energy policy, as well, of $13 billion a year for the next 5 years to achieve this goal. And, again, the details of all of that are on their website.

Finally, the Governor is in discussions with the Legislature. He was on the news yesterday, in the paper today, on the strategic growth plan, or the infrastructure bond measure that will be on the ballot in 2008.

Amy highlighted the linkage between energy and water. It is particularly important to keep that in mind as this infrastructure bill is debated, in terms of exactly what the key features are. So that's one other initiative to really pay close attention to.

So, I look forward to the discussion. And, again, Secretary Kawamura sends his regrets. He has participated in these in the past and absolutely would have been here if he wasn't called back to Washington.

Thanks.

(Applause.)

(Pause.)

DR. SOMMER: Good morning and thank you to the organizing committee for giving me this opportunity to present some of the European policies on the -- you can't hear me? I have to stand close to this one, sorry about that. Shout to me again if I forget it.

What I would like to present today is first something about the policies in Europe on how to use bioenergy as a renewable energy. How they would support this policy. I will give some ideas on the projection of how much biomass we are having in Europe that can add to the renewable energy supply. And then I will give some examples of technologies that has been developed and is under development.

So, the first slide is just part Europe. I don't know -- in the past it was EU-15; we were 15 countries in the European Union. Today we are 25. And the new ones is the Baltic States, three of them, Poland, Hungary, Czechoslovakia. In the future there will be Bulgaria and Rumania. So Europe is actually getting quite a big entity. And I suppose it will be also -- and hopefully it will be very powerful when you think about developing these new energies.

The reason why Europe is so concerned about the energy supplies is the same as what I hear here for the United States, is that for example, take Germany. Last year the Russians were turning off the natural gas supply to Germany. And Germany is more or less 50 percent of the power plants there running on natural gas, so of course they were quite nervous.

And we can see in the future that we maybe have the same kind of problems as will be more and more shortage of energy produced in Europe. So that's why we are concerned about this issue.

And what are they doing? They will do more or less the same as what we have talked about here in the conference, and I think everybody is talking about secure energy supply. We need creating working places because bioenergy production and technology for bioenergy production will be a commodity that can be sold throughout the world, beyond doubt.

And we also want to promote the existing fossil fuel production is really damaging the environment. It's greenhouse gases, but there is also sulfide coming out; it's captured at moment. And there's also NOx and there's different kind of things that is a problem for the environment. And if we are using the bioenergy is actually they are more or less environmental neutral.

They're not always environmental neutral, you may say, because producing these energy crops might produce -- create some problems in nature.

So what they want to do in Europe is they would support co-production of fuels. Co-production means that on the power plants, for example, it means that on the power plants they'll use some of the heat produced on the power plants produced biofuels.

For example, ethanol. They will use the biomass for incineration; produce power and heat. And they will also integrate, produce, or we will have an integrated producing production of the biofuels from biomass, but also using the residuals for feed production, for example. Feed for animals. Because otherwise the biofuel production would be very very costly and we'll lose quite a lot of the biomass if we don't use them.

And some of the tools for support is regulations. I suppose they will demand that the petrol salesmen are adding 5, 10 percent of ethanol or something else to the fuel. There's a market-based support, for example, in biogas. The payment for energy in Denmark is, for example, .08 Euros per watt hour, which is about 50 percent higher than the price for conventional power.

In Germany the price is much higher. And there's a big difference here. Because in Germany we see they are producing very many biogas plants. In Denmark the last five years there have been no establishment of new biogas plants because the price of energy is not high enough.

And then for the bioenergy crops, you know, producing the biomass, they will start to support the producers with about 45 Euros per hectare. A Euro, I think it's about $1.2 or something like that. We still have kroners in Denmark, being very nationalistic. So that's what we want to do in Europe.

Also research programs are supported like here. This is the old, we have frameworks. It's called in Europe. We have frameworks and we are now at the seven framework program. I can't say too much about that because I haven't seen it; I couldn't collect information about it. But the old ones, there's about 200 million Euros for energy research.

And that's not including demonstration. I would say demonstration is considered a very very powerful tool for transferring the new knowledge or the new developed technologies into something that is usable. So when you're demonstrating the new technology, at the same time you're actually developing and making it right so that it can be commercial.

Then you can see, just go through the lines, but I would emphasize that there's a lot of focus on producing the biofuels for transportation. There's here, I suppose, that we really consider transport energy to be the problems for the future. Because you can get coals for producing power and heat, and so that will not be a problem for the first 20 years. But transportation is going to be a problem. And that's why there's as much focus in Denmark. And I suppose it's the same more or less here in United States.

So why are we really concerned about that in the moment, just look at the slides to the left. You can see that the European Union not producing much biofuels at the moment. And USA and Brazil is really the big producers. And that is something that the European Commission wants to change.

And if you look down to the right the blue ones, you can see that the goals and the targets, these targets of biofuel production and use has just been established March, this month. They agreed on it in the EU Commission; that is environmental representatives. And they say that in 2010 5.75 percent of the biofuels should be renewable energy. And for transportation. And in 2020 it should be 10 percent.

They also stated that the amount of renewable energy used for energy production should be up to 20 percent in all of Europe in 2020. And if all industrialized countries agree on this, they will increase their target to 30 percent.

So, renewable energy is not only biofuels or biomass, it's also windmills. And I think that was what I read, at least, in the newspapers that the French has demanded that nuclear power is also considered renewable energy.

So that's the kind of discussions we're having in Europe. It's anarchistic and that's the way that leads to changes, I think.

We also think, and I think it was stated, that the kind of energy we are going to produce, it's what is called second generation bioenergy. Second generation bioenergy is energy produced basically on lignocellulosic which is much more complicated than if you use grains from cereals or maize or corn you call it, or from the (inaudible). We're doing that.

I think one of the concerns here that if you are using feed products and we'll have a competition between feed consumption and energy consumption which will be a bi problem in the future, because a lot of people throughout the world, it's getting richer now. And when they get richer they'll switch from eating vegetable food, will eat -- products that cost so much more production capacity and agriculture. So there will be a lot of competition on the land for production feed or producing these energies.

So that's why I think there's a very great focus on this second generation bioenergy production, which is production on lignocellulosic basically.

Then just a little bit about what are the bioenergy production potentials in Europe. Up to the left you can see that more or less the organic waste which is used for energy production, that is through mainly I think today it is through incineration producing power and energy, power and heat. There's some from forestry, that is remaining branches, tree tops, that is from forestry that is used also for incineration.

And then you can see that in the

projections it is bioenergy crops that really account for the increase in the biomass being produced.

If you go down to the left you can see this is European Environmental Agency that did these calculations and projections. I had to add a little bit to comment to what they are thinking about this, or the thinking behind this.

They say that the energy production should be environmental compatible. That means that if you want to produce energy crops it should not increase the pressure on the environment. That means that you cannot choose crops where you need an increased pesticide use, for example; or you need more mineral fertilizer that can increase nutrient leach into the aquifers or the oceans. And you cannot use crops that may increase erosion or may need more water.

So that's why, if you look at this, if you go down to the left, the oil crops and the crops for ethanol, where use grains for ethanol production, it is not part of the prediction in the future. This might not be the EU policy, but that is from the environmental agency, that protections.

The other thing you might see then is that they really, they very much focus on perennial crops; they focus on short forest rotations as being something that could be very very useful in the future.

And preconditions for that, you know that is lignocellulosic biomass is that you have this second generation technology for to use biofuels. We already have the technology to incinerate this for power and heat, so that's not the problem.

Up to the right you can see that from the forest there's more or less no increase expected in how much it can deliver for biomass. If you look down to the right you can see that agricultural waste is quite a significant source of biomass. And also domestic waste.

To me, I have to say, I didn't tell you before, but I have an agricultural background. I'm working with biogas productions and environmental technologies for lots of production. I never really thought that excretes from animals was a waste. I always looked upon it as a manure, but for the last ten years I have to accept that most people think it's a waste. I think manure is not a waste.

So, when they call animal solid agricultural products, which is manure waste, it's a little bit hard to me to accept that. And animal slurries, it's the same. It's also considered a waste. I don't know if in this group, but we could discuss that later on.

It is a product that can be used to fertilize crops. And it is a product that also can be used to soil ameliorations. And I think that'll be a competition, as well, between the use of it for energy production and the use of it for something that could be used for plant production.

Two minutes, okay. Very few countries in Denmark will contribute to land to biomass production. That's what this is showing. You can see it later on.

I was asked to talk a little bit about landfills and methane collection from landfills. Actually it's not a lot of energy that will be produced from landfills. And it will not be much more in the future because the policy of Europe is not to produce organic waste and put it into landfills.

And then I could talk a lot about biogas production; and I think there is a lot of opportunities for collaboration between universities here and our Institute on biogas production. And also I had an idea, this was biofuel production, ethanol production, second generation. Within my 20 minutes.

But just one thing, the reason why you can change, you can go to this second generation bio ethanol production is that the enzymes that is used to split down the cellulose and glycos is going -- has reduced in price very much. And you can see here from 1999 to 2005 that the enzymes that is used for this process is not the most costly thing.

And proudly I can say that Danish company, Novozymes, actually have established a company here; President Bush was out there to look at it when it was opening. And we hope that -- we have two competing companies working on these enzymes; and that's very good. Because I think that will reduce prices much more in the future.

Also, coming back to this manure business I talked about before. It's also about environment and the production of energy. We are very concerned about having all of those and prime nutrients in Denmark on the farms. That if you have very high concentration of farms in one area, you will have too much plant nutrients in that area. And that will leach to the environment somehow. Also the atmosphere.

And therefore we separate it and we try to transport it out of the region to areas where it can be used. If we separate it, we have a very high dry matter; where you can have a product, high dry matter content, and you can use that actually for energy production, either in a biogas plant or just from incineration.

You may want to take all, for example, ammonia model it. Ammonium can also be used for power cells, fuel cells for example. And thereafter you are incinerating the stuff, and you have actually the phosphorus left.

I can say that within 100 years we are not going to have enough phosphorus. So I think it is also, you have to look at it in the total system. You have to capture this phosphorus and use it again, or either storage for later use.

I was going to talk a little bit about how to calculate the total advantages of producing biogases. That will take five minutes. But I'll just state here that if you, for example, if you look at using these energies, and the concern is to reduce greenhouse gas emissions, then if you're having, for example, a biogas plant. Then you would know that from agriculture having an animal slurry, the slurry when you store it, it's producing a lot of methane. When you apply it in the field it produce a lot of nitrous oxide. Both are very very potent climate gases.

By treating this slurry in a biogas plant you reduce the dry matter content considerably. By doing so you reduce methane emissions during storage. And in the field you are reducing the nitrous oxide emissions also considerably. It has been shown in several studies.

We have tried to develop a model that take all of this into account, and thereby reduce that to show that actually producing methane in the biogas production is a very very cheap way of reducing greenhouse gases. This is also something we might -- I could hear from the earlier presentation, that we could talk about and we could collaborate about. We probably should, we are using it now in the Danish national inventories.

And it could reduce 2 to 3 percent of the Danish greenhouse gas emissions could be reduced this way, by having more biogas plants.

This is maybe -- this next slide here is quite important, because this is raising discussions. And it is a discussion we're having in Denmark. How are we going to use the biomass. What is the best way of using them.

We should realize that the biomass is a limited resource, so it means that you should use it where it is providing most reduction of greenhouse gases, for example; or maybe you think it is better to use it for transport energy.

In this slide you may see that this biomass can be used for bioethanol, or you can use it for power and heat production. And then you can compare it to that you are using fossil fuels as a petrol.

And to the right you see a different slide. It's just like you can see it relatively. The green one is where you use the biomasses for power and heat production and use petrol for driving your cars.

The second, the blue one is you use car

petrol for driving the car -- yeah, ethanol. And fossil fuels for power and heat production. And then the down, the red one is just what the baseline, what we're doing today.

And what you can see is you are reducing greenhouse gas emissions considerably more by using the biomasses for incineration and producing power and heat.

I know that there's a difference between here and Denmark. In Denmark we are having district heating so it means that more or less 80 percent of the energy coming into the power plant is used actually. But once you discuss where you use this limited source of energy most efficiently.

And then it's the last one. I think today everybody is realizing in Europe and in Denmark that biomass for power generation is best for the environment. You reduce greenhouse gas emissions mostly. And for heating it is just cheapest, for district heating.

But it is, as it is here, there is a need for transport energy. And that is why we're producing bioethanol or biodiesel, I should say. And that is because there is a gap. Everybody, I suppose, is saying that in 20 years we'll have some other sources to produce our energy for transportation. And within that gap we need some kind of energy to get us running.

And that's why we are producing this bioethanol. It is something one can discuss because, as it's said, the biomass is limited, and it's not a lot of energy you can get for your transportation in the future from biomass. It's just a part of it.

And then I would say we had the Rio conventions in '92, and the Kyoto in '97. Now I think there's been agreement that we will all meet in Copenhagen in December 2009. And I hope there'll be enough biomasses for heating Copenhagen so that you're not freezing.

(Laughter.)

DR. SOMMER: Thank you for listening.

(Applause.)

(Pause.)

MR. LaFLASH: Good morning. I want to talk about the role of biomass in utility portfolios and some of the other things that we're looking at in biomass right now, and bioenergy in general.

You can see from this slide, this shows our electric portfolio, and it shows that it's very clean. Over half of it is carbon free. And the breakdown to the right of the carbon free portion shows that 5 percent of the portfolio is actually made up of bioenergy.

This is a comparison of our portfolio, the U.S. average and California average. And, again, you can see the 5 percent for bioenergy here. And the breakdown of that 5 percent really is, a lot of it's based on some older contracts that we've had in effect for a number of years. The list here, the 14 contracts, 54 megawatts and the 21 for 447 are some historic contracts.

But then we've had the renewable portfolio standard which started in 2002, and we've been contracting under that now for a few years. And you can see we've added seven bioenergy contracts, about 1 percent of our load has been added to that. And then recently the two biogas projects would add onto that, also.

And this is just a quick run-through here; not going to go through by line. But I highlighted in yellow the ones -- presumably they show up there better than here -- highlighted in yellow the ones that are bioenergy from 2002, '3, '4, '5 and then the 2006 offers have not yet been filed. But we did do the two biogas contracts, as you already.

I didn't show the quantities in the biogas because they were actually gas quantities, not power plant quantities. And their contracts really aggregate a number of smaller facilities. If they all deliver to the full capabilities it could be up to 40 megawatts equivalent electrical each.

We have a number of alternatives, the renewable portfolio standard, the one I just mentioned. That's for the larger projects; generally those are over a megawatt. We have a new small generator contract that we just got approved by the Commission for four uses. We're going to try to standardize that more for the under-megawatt projects, to make it easier for them to get online.

We have a number of digester gas options for net metering, and now the small generator contract. And I mentioned the pipeline option, which I'll talk about in a little more detail.

We're also working with agencies on

trying to find some alternatives to open burning. And then I also wanted to talk a little bit about the greenhouse gas offset value of bioenergy.

And another program that we filed for recently in our long-term procurement plan proceeding is an emerging renewable resource program that we'd like to have to do the demonstrations. I noted when Sven was talking he was talking about how important it is to have demonstration projects. And there is funding out there now, but I think the PIER funding only goes so far. And now that it's going to have to be stretched for transport and carbon sequestration and other things, we think there's a need for some more funding to specifically target demonstration projects.

Just some more detail on the dairy biogas overview. Commissioner Boyd's talked about it, and Dan's talked about it earlier, we see an opportunity here, and especially now that the climate change issues are to everybody's front of mind.

The methane that was coming off of these dairies was a contributor to not only local problems with reactive organic gases, but global warming problems. And with the number of cows in California, 75 of which are pretty much in our service territory, we saw an opportunity there to do a couple things that worked well.

And the fact that's pointed out here that methane has 21 times the greenhouse gas value impact of CO2, and we've seen different numbers, 20 to 25, but 21's pretty much an accepted number. It shows the value of trying to get greenhouse gas offset credits for the methane destruction that's going on here.

And the benefit we have by looking at this from a pipeline standpoint, is we could have it cleaned up, put into our pipeline and we could transport it away to a power plant that's already been certificated as the best available control technology. It's generally a more efficient power plant than you're going to see in a small location. And it avoids having the combustion going on in the valley which already has its air challenges.

Now, this is just more detail on the two contracts that were mentioned. We have been working with the Energy Commission to get these certified as being eligible for the renewable portfolio standard. Things are going well on that front. And we're working with the two companies and these agreements have been filed at the Public Utilities Commission; are going through the approval process there right now.

The supplier in this case, and I don't want to say that this is a panacea for everybody who has a dairy out there, because there's some limitations on this. And you can see from the list here of supplier responsibilities, the supplier is responsible for the digester, the scrubbing and the collection pipeline into our system, and to compress it.

And so if you're not -- a dairy's not of a big enough volume and if it's not on a transmission pressure pipeline it may not work. But this is just another opportunity that goes along with the already existing and expanded opportunities to convert the methane into electricity.

And this is just sort of a summary of -- I won't go over this in great detail, but a summary of the options now available for dairies, the different options of whether they're doing net metering and use onsite and selling it to PG&E

under the small purchase agreement, or under the renewable portfolio standard, serving their own load or now able to sell it as gas into the utility.

And one last comment on the selling it as gas to the utility. There's two functions that the utility performs. One is receiving the gas as a pipeline, and the other one is purchasing the gas for the power plants. Those are separable functions. The pipeline's an open access carrier, so other people can buy this gas, once the pipeline takes it. They're not obligated to sell it to the utility for procurement purposes.

The other thing we've been looking at, and we've been doing some work with the San Joaquin Valley Air Pollution Control District to try to assist them in some of their open-burning issues. They need to ramp down the open burning that's been going on in the Valley due to some changes in regulations.

The last year we looked at, 2005, a complete calendar year they permitted the open burning of 800,000 tons, which is, under the right circumstances, if you could collect that all it could be the equivalent of about 300 megawatt generator.

Of course, the challenge is collecting it all. That's basically the challenge with agricultural waste, is it's very dispersed and so you can't economically collect it for a central plant. And it's very seasonal. You get one or two good months a year. So there's some challenges still to be worked through there. And we have been working with the agency to try to figure out ways of getting this utilized somewhere into energy conversion.

So, along with the options I show here about co-firing gas plants, restarting old plants, and some things that we've been doing on pipeline gasification, we're also seeing a lot of discussion now that cellulose is being pursued as a source for ethanol. So there may be some ways of harvesting that there, too. And it may have more value there than even as electricity.

I mentioned this emerging renewable resource program. And this is just a slide to sort of show some of the things that we think we should be looking at from the standpoint of demonstration projects. And I mentioned some of the challenges already. But based on those challenges, you know, if we could find a way to get smaller gasifiers out there; a gasifier being cleaner than open incineration. Small necessary because the waste is so distributed across the Valley.

The low emission is an issue, not only burning biogas, but burning landfill gas. I saw recently that the Bay Area Air Quality Management District did an inventory of all the CO2 in the area, and the landfill gas CO2 from open flares I think exceeded every other category. And so there's a challenge there to find a way to be able to convert that flared energy into something more useful. And the biggest challenge around there is air quality.

The pipeline quality biogas, I talked about biological sources as far as anaerobic digesters. The other sort of goal we would have is to find a way to do this on a gasification basis where you create a synfuel, a syngas which is the carbon monoxide and hydrogen, and find a way to do methanation of that, to convert that to a pipeline quality methane.

That's being done with coal. Gasification products would be a little bit different with a biomass, but certainly there's potential there. And that's one of the aspects that we'd like to see. And we've been doing some work with Gas Technology Institute and other agencies, trying to find a way to get that to happen.

And then the liquid biofuels that I mentioned that we're starting to see some of the attention on cellulose now.

The other thing we have, in addition to converting bioenergy into gas and power, is we have a new program called ClimateSmart. And ClimateSmart is a strictly voluntary program that we recently had approved that allows customers to designate a portion of their bill basically to neutralize their carbon footprint, their greenhouse gas footprint.

And the premiums that are used up there to buy offsets and invest in projects, which are initially forestry projects, the second protocol being organized now is for dairy methane. And we expect more agricultural and forestry protocols down the road so these industries will benefit from having more investments there. We expect to be rolling this out in another couple months.

Now, I want to talk a little bit more about the renewable portfolio standard program. This is the paid commercial part of the presentation. We have a request for offer that we started just a couple weeks ago. And it will be outstanding till the end of May. I'll have the schedule here shortly.

But I wanted to talk a little bit about the market price referent and the supplemental energy payments, the SEP program. The California program is a bit different than most of the RPS programs you see throughout the country. There are 23 RPS programs in the rest of the country. California's is the most aggressive. And it's also a little bit more complicated.

So I wanted to explain a little bit about that complication and sort of encourage people to participate in the projects.

The market price referent is really the level of the price that is considered to be reasonable for the utility to pay. The way the process works is people will propose a price for their product. And if the price is under the market price referent, the utility pays the whole amount. If it's over the market price referent, the utility pays up to that benchmark, and then the rest of it has to be taken through a supplemental energy payment.

And the current process on that is it goes to the California Energy Commission and goes through a proceeding there to get the remainder of that.

Now, I want to put that in perspective. These are the prices that were set for 2006. They change every year. They'll be changed again before the numbers are finalized for our 2007 offering. This is just a way to put this slide in perspective.

This will change as gas prices change. These are based on forward curves and the Public Utilities Commission will do the analysis on this and create a new price that they'll release after we've closed our -- after all three utilities have closed their current request for offers.

But this shows you an 8 to 9 cent level. So if somebody's coming in with a project that's under that level, it's strictly a negotiation with the utility. If it's over that level, it gets into the supplemental energy payments.

Now, one of the challenges with the

supplemental energy payment is the funds that are there can be earmarked by the Energy Commission. But they still go back into the general fund. And they get held in the general fund. So if there is a statewide emergency the money could still be taken off if needed for the state.

And that's created some challenges with financing projects that require SEP payments. So there is a bill that was recently submitted by Senator Perata that would reform the SEP payment and basically turn it into something that the PUC would administer entirely, instead of having a two-agency administration on that.

So for those of you that have had some concerns that you didn't submit a project in the past because the MPR/SEP combination was too daunting, there may be a change to that coming down the road. So just keep this in mind, that this would change the way that this is administered. It might make it one less step to go through.

I did mention the solicitation that's going on now. We will look at a number of bids. We've had a pretty good turnout in the last few years. And it is a competitive process, so not everybody that comes in makes it through the process. But they will be considered on a least-cost/best-fit basis and come up with a short list.

We review the short list with a procurement review group which is made up of nonmarket participants that advise us on a number of the procurement issues.

This is the schedule, as I mentioned. We issued it two weeks ago. There's an optional notice of intent to bid, which has already passed, but you can say that's optional. We do have a bidders' conference on April 3rd, if anybody's interested. It's at San Francisco in our auditorium. Where we go over the details, give people a chance to ask more questions.

And May 31st deadline for offers. Short list in July and then try to get these all negotiated, submitted by the end of the year.

The highlights of the current request for offer is we're looking for 1 to 2 percent of our load. The state law is 1 percent a year. We generally try to target 2 percent. If we have a robust offering, we've had years where we've gone as far as 3 percent under contract. But we can fall down to the 1 percent if we don't get enough of a turnout.

Delivery anywhere in California. We'll even take delivery outside of the Independent System Operator service area which is basically the investor-owned utilities. We have some contracts we signed recently, we're taking it from municipal utilities in southern California. We've taken power from Oregon, so fairly flexible on that.

We've done some things to reduce some of the credit collateral issues. The time-of-day factors aren't as relevant for bioenergy, which is generally a flat-out production. But if there is any ability to control that at all, there's quite a bit more value in the peak hours that you can see here from the summer months. Super peak is worth twice as much as the market price referent in those particular hours, at least.

I wanted to close with just if you're more interested in this you can go on our website and you don't need to remember this whole line here, this whole URL. But just to know that if you go on our website click through suppliers and purchasing, click through wholesale electric suppliers and you'll see the renewable solicitation there.

We also have an email box here that if you have questions on the program that you can send in to, and people will respond to you. So I want to make certain that everybody was aware of these things that are going on right now.

Thank you.

(Applause.)

MR. SHEARS: So we're going to take -- told we can make five minutes available for questions and discussion; and also I didn't intend for Sven to skip over stuff that I know is of particular interest here in terms of biogas stuff. So if anybody has any questions with regards to biogas, approaches to biogas production in Europe, could also take the opportunity to talk about that.

So, opening up for questions. If you want to come down, sure.

MR. NOBLE: My name's Dan Noble; I'm Executive Director of the Association of Compost Producers. And this question was going to be mainly for A.G. Kawamura, but also for Steve. And it sort of bank shots off of something that Sven mentioned about organic wastes not really being wastes.

And since we speak for building healthy soil using organic residuals for all the benefits that they provide, like conserving water, increasing soil fertility naturally and with the growth of the organic market, and others, do you see that we should have, as part of this, a soil policy where we would, you know, look at organic matter and organic nutrients in addition to, you know, chemical nutrients, as well as the balance of carbon sequestered in the soil? For those benefits versus the others, that's my main question.

MR. SHAFFER: Let me see how well I can answer that. I'll try and do this from a number of angles, but, yes. There's more and more of a push. We've identified this as one of the over-arching issues facing agriculture is this issue of sustainability.

And it's becoming a market driver. You look at the major markets, the Sysco, Walmarts, Safeways, what-have-you, and they're developing sustainable policies. And that's coming down to the agriculture producer.

So, maintaining soil quality is going to be one of those basic parameters. There's no question. So how -- I was hearing myself so I thought I was okay -- so there's absolutely a role for soil quality and therefore compost is going to play a role in that. Already does.

We're working with Integrated Waste Management Board right now on research and getting parameters out there to inform producers in terms of better utilizing compost.

On the flip side of that, of course, is some of the potential for contamination in terms of the pathogens and now the leafy green marketing agreement. And I understand that it's had some impacts on the compost market.

So there are a whole lot of moving pieces to this. The work in the Collaborative, I think we've recognized that while, you know, what's sexy and getting all the attention is biofuels, there's a whole range of opportunity of utilization of biomass for chemical feedstocks and construction materials.

And then closing that loop in terms of the external inputs that agriculture relies upon is one of those, as well. So I hope I answered your question.

MR. NOBLE: Hopefully we'll be able to work with the Collaborative on this issue.

MR. SHAFFER: That would be great, yes, thank you.

MR. NOBLE: Thank you.

MR. ANDERT: Yes, good morning. My name is Greg Andert, Lead Process Engineer, Alpha Laval Biokinetics. I just have two questions for Amy. Should be pretty quick.

The first one is are you planning on benchmarking what rate we're in as far as the future is concerned? Say in this particular five-year period we know we're in a medium growth rate. So that people will have an awareness of where we're at?

And the second one is I believe the Department of Agriculture did a study two years ago on the effect of the .5 percent CO2 on the growth rate of plants. And certain agricultural species, and particularly those weeds, love that stuff and were growing at a 20 percent faster growth rate. The impact that would have on landfills as far as biomass contributions. Is that what you're talking about when you say the CO2 fertilization process?

MS. LUERS: First of all, in terms of the rates, so you mean in terms of which of the paths are we on, are we closer to the higher paths in terms of emissions? Is that what you mean?

MR. ANDERT: Yes, just --

MS. LUERS: Well, there are obviously a number of different projections. And if you look out at all of the IPCC scenarios, all the intergovernmental panel climate change scenarios, and the EIA scenarios, for the next 30 years there's really not much difference between them. They deviate within 30 years.

So, you know, we're somewhere within that band over the next couple decades. And the decisions we make today will decide where we go in those three years.

On the second question you're absolutely right. I mean the CO2, the issue of the impact of CO2, that's why I didn't put it in my slide increase or decrease, it affects productivity. And some say that in effect it's a transient state for many productions, but also affects weeds, as well as plant growth directly, non-weeds.

So it's a complicated thing to figure out what's going to really happen to a lot of agricultural sectors because there's so many things happening at once, and there are very few models that integrate all those factors. And some of the science is still not understood.

MR. ANDERT: Okay. And the final question for everybody there, being from a private engineering consulting firm that's seeking to help this process, I would be looking for some direction through my management on how to do this. So our services are available.

MR. BENET: My name is Reed Benet. This question will be under that hat of a researcher at UC Davis. Steve was saying that liquid biofuels from biomass tend to get a lot of attention. And Sven had said something along the lines of that biomass is a limited resource, and we need to be able to make sure we use that effectively.

I mean I don't know how it is in Europe. Without heavy subsidy we would be 100 percent dependent on petroleum for transportation as opposed to 98 percent dependent we are now. Hal was essentially presenting numbers that says we're 2 percent dependent on biomass, and attempting to get greater.

So given the fact that I acknowledge

that CO_2 is difficult, but perhaps it's also most difficult to effectively control in the tailpipe in the vehicles. We're not at 40 percent in greenhouse gas emissions in California; we're whatever, down to 20 percent. But I'm just kind of -- where am I getting it wrong in terms of this, liquid biofuels might be absolutely the appropriate place to focus biomass resources.

DR. SOMMER: What I tried to explain on prices that you can use the biomass as many different places. And if you think that some of the energy for power and heat is produced on, let's say, petrol or diesel, then when you use the biomass for power and heat production very efficiently then actually you can use the diesel for transportation.

That means you're still driving 100 percent fossil fuels, but actually you have reduced your fossil fuels use in the power and heat production. If you see what I mean. Therefore it need not be a very good idea to go down to like let's say 90 percent fossil fuel for transportation.

But it's something that one can discuss and that is a political issue. If you want to be, you know, be that much -- do like that's called energy security, that means that you don't want to import that much from Africa, which is not a very reliable source of energy, I know that. But that's something different than using the energy efficiently, I would say.

That's the discussion I think one should have in mind when you are making these kind of decisions.

MR. LaFLASH: I actually have a question for Sven, too. It sort of follows up on Reed's, but it was on the chart of the EU forecast of the future, you have all the oils going away, all the oil seeds, the -- seed and everything seems to be no longer producing at 2020 and 2030.

Are we going to be left -- I know Europe has a very heavy emphasis on diesels, and they exempt people by diesels, and so there's a pretty wide market for them over there. Are we going to be left with just petroleums that fuel the diesels? Or is there going to be something else biologically to take the place of it?

DR. SOMMER: Well, fortunately I said this was protection by the Environmental Energy Agency. And I'm not sure at this moment it's the policy of the EU Commission. But if they want to pursue that it has to be environmental, best decision for the environment also, then what the Environmental Agency is saying that these oil seed rate, for example, is not a good energy crop.

But if the Commission will adopt that idea, I don't know. Because actually it was here in March that the politicians agreed on these targets and how the Commission is then going to pursue the targets, I think there's no decisions on that at the moment.

MR. SHAFFER: And if I could follow up. Is the EU actively conducting research and development in Fischer Tropsch process, for example?

DR. SOMMER: I don't know.

MR. SHAFFER: Okay.

MR. SHEARS: Unfortunately we've used up our budget for discussion period. And so now we're going to take a ten-minute break. In order for those who want to check the plumbing, Martha already gave you directions to one set of bathrooms. There's some other bathrooms along the walkway over towards the elevators on this level. So there are two sets.

And we'll convene back in ten minutes.

(Brief recess.)

MR. KRICH: I'm Ken Krich. I work for the California Institute for Energy and Environment, part of the University of California Office of the President. My interest is in anaerobic digestion, so of course nobody on this panel will be speaking much about that.

But our first speaker knows a great deal about it. Val Tiangco is the Senior Technical Lead with the California Energy Commission's Public Interest Energy Research program. Very knowledgeable on biomass and also knows a great deal about the other renewable technologies; has provided leadership in all of them.

He's won a number of awards for his work. I think the most interesting one is he won a United Nations award for developing biomass technology transfer to the Philippines. He's written 80 technical papers and reports. He's an engineer, has a PhD from UC Davis in ag engineering. Works in education and has been a leader in the whole biomass work research program in California for many years. Val Tiangco.

DR. TIANGCO: Good morning. I'm asked

to share something today on the advanced research, development and demonstration projects that we have in California. And I'll be sharing some of what all of you heard today, some of the policy drivers.

The program that we have, the Public Interest Energy Research program, provides funding for research, development and demonstration. I will share some of our key goals and the barriers that we are facing in advancing bioenergy technologies in the state, some of the technology gaps that we are facing. And I will share the status of the research, development and demonstration projects in the state.

I will not repeat what you just heard this morning. The greatest and foremost is the AB-32 key drivers. The Public Interest Energy Research program is an investor-owned utilities ratepayer funded program. And it was launched in 1997. It addresses electricity, natural gas and recently transportation-related areas.

Our funding is about $80 million a year. We have spent nearly $400 million on projects. We try to be the leader for no-carbon or low-carbon technology. And as you have heard, we try to help to mitigate some of the problems that we are encountering with regards to global climate change.

The PIER program has right now different subject areas that involves efficiency and demand response, renewables whether in biomass or bioenergy, biogas, biofuels. That includes also wind, hydro, geothermal and other renewables. The clean -- fuel generation, the transportation, energy system research and environmental research area that do R&D research on -- and climate change.

We emphasize a strong collaboration, partnership. We try to avoid duplication and we should be building on past work, or see the things that we do is of relevance to advance science and technology.

We coordinate and we try to leverage our investments with federal government. We use California as much as possible, California capabilities, such as our universities, national labs and the high technology companies in the state.

The PIER goals are solution, and it includes biomass. That's the good news. We develop advanced bioenergy technologies. And now it includes transportation technologies. We try to advance science and technologies in this electricity generation technologies, and also biofuel conversion technologies.

The program where I am in is the PIER renewables program. And the vision, as you can see here, we try to achieve 33 percent of the electricity for the California energy system, coming from renewables.

We'd like to acknowledge what the Biomass Collaborative has provided. They help us develop this biomass roadmap. It's a -- division is layout properly here. And there are five priority areas that includes resource access, market expansion, interest more on the RD&D, and also education and policy development.

Under RD&D it includes resource-based sustainability access by science, by technology, biomass conversion processing system analysis, knowledge information and resources. Again, thanks for the Biomass Collaborative in developing this, and also the contribution made by the board members of this Collaborative.

We have heard this morning biomass

should not be considered waste. It is traditionally, and some of us perhaps in this room and the stakeholders-at-large consider biomass as a disposal problem.

You have heard this morning that is an increasing wildfire risk in the state. Four times in 30 years. We spend, every year we spend over a billion dollars I think just to suppress wildfires. Studies show that if you thin the forest and use the thinnings materials to convert it to bioenergy you can help reduce catastrophic wildfires.

We have a mandate to reduce the materials that goes to the landfill and we should help reduce that materials. And once you recycle we should find home for the recycled materials in one of these goal is to convert it to energy, biofuels or biopower.

We have so many cows in the state. We heard this morning 1.7 cows. And you know how we count the cows in the state; we use calculator to count that 1.67 million dairy cows in the state. And it's a big concern.

Greenhouse gases. This is, if you go to our website, it's a small print here, but if you go to our website you can see the inventory of non CO2 greenhouse gases. You can see landfill contributes 20 percent of the CH4 in million metric tons CO2 equivalent.

Followed by, you can see it first, it's agriculture and forest. Both forestry and agriculture. And you will see also the major management, the wastewater contributes a lot on this non CO2 greenhouse gases.

Here are some of the gaps that we are trying to do within the program. The biopower technology gaps and the biofuel technology gaps. First for biopower, we need to reduce the cost; both capital costs and also depreciation and maintenance costs, or the levelized costs of electricity at the end.

We need to do something. We need to lower the emissions, particularly the nitrogen oxides emissions. And the technologies to date have been specially using biomass-derived fuels such as biogas. There is no existing technology that can really meet the 2007 natural gas and fossil fuel standards for 2007. That's .07 pounds per megawatt hour. We may have a technology. You may see it in my presentation.

But utility scale size development; we need super-clean, super-efficient systems with high degree of responsiveness. And a -- level or distributed generation application; we need to develop small modular scale biopower wherein you can bring the technology where the fuel is. Interface of forested area. You can use the forest material directly and connect it to the grid for this power and incorporate those other value added product.

For biofuels there is a lack of commercial demonstration of lignocellulosic biomass to ethanol. You have heard, some of you in the audience, I will repeat it again, (inaudible) used to say biomass-to-ethanol has always been a bridesmaid, never been a bride. Maybe with the help of DOE with the biorefineries service station now, and with the small contribution that we can make we can make lignocellulosic biomass to ethanol a real bride.

There is a lack of track record for biodiesel. That's another issue for biofuel, for biodiesel.

Now, I would like to share the status of some of the things that we have done through the program, some of our bioenergy research, development and demonstration projects.

Thanks to our partners in demonstrating this technology is someone from Truckee-Donner TPUD here? Thanks to Truckee-Donner Public Utility District demonstrating the 15 kilowatt system. How about Community Power Corporation? Is there someone here? The developer on this gasification, a small-scale gasification using forest residue. They demonstrated the unit in Truckee for 15 kilowatt system, installed to the grid. And they tested the system for over a year. They also capture waste thermal energy for heating the office building next to the facility where it's being tested.

And the nitrogen oxide emissions for this technology is about 30.1 parts per million at 6.2 percent oxygen. And if you compare it to normal 15 percent it's less than 10 ppm. And CO is 2.1 ppm; total hydrocarbons about 4 parts per million.

The other technology that Community Power Corporation is developing is the 50 kilowatt system. And this will be demonstrated in Branscomb, California. It's a gasification technology also. It's a upscale to the 15 kilowatt system. They have completed the design and publication of this system. They're planning to demonstrate the technology and field test it as early as July 2007.

The NOx so far, the nitrogen oxide emission is about .39 pounds per megawatt hour using catalytic converters. So it's emitting the .07 pounds per megawatt hour for fossil fuels.

But, of course, depending on the local air quality districts, they have different requirements. So perhaps it permits this level, they can get a permit also, depending on the local air quality district.

The other project, is someone from SCS here? Would like to acknowledge SCS who help us in the demonstration of the 250 kilowatt microturbine using landfill gas fuel. This is perhaps the largest microturbine that has been demonstrated for using landfill gas.

It was demonstrated in the City of Burbank, landfill number three. They modified the natural gas microturbine, Ingersoll Rand, by the way, is the microturbine. And use it to run for test. They run the unit for over 10,000 hours.

And the NOx emission is .265 pounds per megawatt hour. And the availability during testing is about 90 percent.

HCCI, otherwise known as homogenous charge compressor ignition engine. Being tested, or been -- test the system for over 500 hours. Butte County landfill. The developer for this technology is Makel Engineering, a small company in Chico. Is someone from Makel here? Brandon. The guy who did not sleep just to do the run, 95-hour run, and 70-hour run.

HCCI, there is -- power plant on this engine. It's a homogenous mixture; the homogenous mixture of fuel and air is formed early in the cycle. By the way, it's a super lean combustion. The mixture is compressed to high temperature and pressure. And the fuel/air chemistry results in an ignition near the top of that -- and it's about very rapid combustion.

HCCI, by the way, is an old technology, but what Makel did is they use all the information from Sandia National Lab, from UC Berkeley, from Lawrence Livermore and applied it to biogas derived fuel, which is landfill gas.

Their goal is to achieve about 35

percent efficiency operating on landfill gas with system stability less than 10 percent using the efficiency variation. The system durability of greater than about 10,000 hours. And produce NOx about ppm, or .07 pounds per megawatt hour.

And with those economic objectives, $750 per kilowatt; and also to reduce LCOE, or levelized cost of electricity, around $.05 per kilowatt hour.

Here is the performance data that they have achieved so far. This shows the system efficiency and the ordinate shows the nitrogen oxide emissions, both in parts per million and the nitrogen oxides in pounds per megawatt hour.

If you operate the system between 31 to 33 percent, you're going to get NOx level between 2 to 4 ppm, or .03 to .05 ppm. Then if you operate the system at 33 to 37 percent, they're getting NOx between 4 to 8 ppm, or .05 to .1 pounds per megawatt hour. And if you increase the efficiency between 37 to 39 percent, the data shows between 8 to 14 parts per million, or equivalent to .1 to .17 pounds per megawatt hour.

The red line shows the target, the .07 pounds per megawatt hour. the system operates with great stability at 31 to 33 percent. And you will see the next, in this graph it shows the stability testing during 95 hour continuous run using landfill gas. So you can see the efficiency, oh, easily, coefficient operation is 8.9 -- 3.2 percent; coefficient operation on the NOx 8.9; and the equivalence ratio is about .34. It's really lean, lean combustion. And it operates with great stability, less the coefficient operation for the data that they've obtained is less than 10 percent.

Here is the 70 hour continuous run. Again, the equivalence ratio at this time is about .32. They're achieving NOx here around 4.4 parts per million; and the efficiency about 35 percent. Again, they were able to show us that the system operates with great stability.

They did so many continuous runs, 95 hours, 40 hours, 28, 25, 70; and the data shows the NOx equivalence ratio efficiency in all of this testing. And as you can see, all of the coefficient operation is less than 10 percent. That's the objective. So the system operate with great stability.

With regards to the other emissions,

carbon monoxide and unburned hydrocarbons, if you use the equivalence ratio .31, the data shows that the unburned hydrocarbon using catalytic converter is around 8 ppm, or .03 pounds per megawatt hour. And CO is less than 15 ppm, or .12 pounds per megawatt hour. And increase the equivalence ratio, of course little bit increase on the emissions.

So perhaps we have a technology here that somehow can meet the 2007 fossil fuel status, because they're getting emission level less than .07 pounds per megawatt hour.

The other technology that we have supported is the TIAX. Anybody from TIAX here? They develop a technology called bioHALO. Biogas hydrogen assisted lean combustion. The idea is they have to reform the landfill gas. And use the reformed landfill gas, of course, for this hydrogen. And then mix the hydrogen gas, again, with landfill gas.

So far they have achieved using a synthetic reformulate for biogas hydrogen. They have achieved also of 2.5 ppm. They -- the engine using (inaudible) engine and they use synthetic landfill gas. When I said synthetic landfill gas, that's natural gas.

So far they achieved, as you can see in the data, the NOx corrected to 50 percent O2, 5 ppm, or .03 by grams, their brake horsepower or .1 pounds per megawatt hour. NOx is less than -- to 10 ppm, depending on the test levels. They use indicated mean effective pressure here as the point of reference for the coefficient operation.

They haven't tested the system yet on the real landfill gas. They tested the unit only, using synthetic reformate and synthetic landfill gas, otherwise known as natural gas.

Yolo County bioreactor. This is the other technology that we in the program, the PIER program at the Energy Commission, started funding. Is Ramin here? And Don Augustine? And Sacramento Municipal Utility District, they help us in demonstrating this technology.

They covered the Yolo County landfill and they call it bioreactor that somehow accelerated the competition of landfill materials. So far they collected data that shows that landfill bioreactor can accelerate organic portion of the solid. And recovery rate is from 4 to 7. And the project is documented technical data that other states follow; about 13 states so far follow this technology.

And the Yolo County bioreactor project has so far available data out there, well documented, and other people can use and other state can use. So, it's a good project.

The Valley Fig Growers, an anaerobic digestion of food processing waste, has been demonstrated really well. They developed an anaerobic lagoon at Valley Fig Growers in Tulare. They demonstrated the system; they were able to reduce the biological oxygen demand and suspended solids in that location for about 90 percent. And generates 25 to 65 kilowatt of electricity using, by the way, Ingersoll Rand 70 kilowatt system.

They were able to save an annual cost of $100,000 that currently Valley Fig pays to Fresno City for their wastewater. And the project reduced greenhouse gas emission about 148 tons. And this project received two awards, a certificate from the City of Fresno and the Commission -- biogas digester that they have installed. And an honor award, 2007 engineering excellence award competition.

Chino. This is Chino Basin. They are

through the Inland Empire Utility Agency. They are demonstrating a centralized digester. This is above-ground, European design centralized digester. They're going to use this digester to co-digest dairy manure and food waste. And hopefully they will generate 1.5 megawatt of electricity. And it's a 60-foot diameter, weigh 300 bone dry tons of capacity.

They're going to start the system hopefully next month. No data yet to report. But this is the first European design in the state being transferred to California.

The other project that we've been funding is the UC Davis high solid APS digester. Is (inaudible) and Onsite Power here? They are trying to demonstrate the three tons per day; this is the pilot unit in Davis. By the way, they are co-producing hydrogen in this anaerobic digestion facilities. And hopefully they're going to run the unit this coming month, April 2007.

The dairy (inaudible) we supported the dairy power production program. We are generating 2.5 megawatts at the moment of the ten existing dairy to power project in the state.

I am happy to announce on our California biofuels research development grant solicitation we received 19 proposals to target the development of biofuel energy conversion technologies using agricultural biomass, forestry, urban waste, food waste and other waste -- such as grease or -- grown crops.

We received 19 proposals. The notice of proposed award has been released, released on March 14, 2007. And we are awarding three projects subject to full Commission approval; hopefully by April 11 the full Commission will approve these three projects.

Metcalf and Eddy. Is someone from Metcalf and Eddy, San Francisco Public Utilities, they number one; they going to receive close to a million. They will try to process 10,000 gallons a day of waste material and produce 300 tons a day of biodiesel in this project.

Renewable Energy Institute International. Someone from REI? Dennis. They will receive about a million, also. They're going to demonstrate integrated biofuels and biopower production in this proposal.

By the way, all of these three projects, these three projects will be co-located to an existing facility, so biomass facility. Like Metcalf and Eddy will co-locate their system to wastewater treatment facility, San Francisco Public Utilities Commission.

REI will, of course, integrate the two together. They going to demonstrate 200 tons a day of thermal conversion using gasification -- option.

And last, but not the least, BlueFire Ethanol. Basically they will upscale or scale up the systems to generate engineering data. And help commercial demonstration that biorefinery solicitation from DOE project. They will produce ethanol and again they will co-locate their system to an existing landfill gas facilities.

I conclude. California is, I would say, serious about bioenergy, as you can tell. The PIER program, together with the bioenergy interagency working group, and all the other member agencies that focus on making California biomass resources part of the state's energy future, in planning and implementing and to serving potential barriers, in developing next generation technologies, in working closely and cooperatively with key stakeholders to meet

California's special needs. And take advantage, of course, of the unique opportunities that we have.

In the PIER program we are motivated and enthusiastic; and as you may see, we want really to help develop, together with the partners that we have, to develop clean and affordable biomass system, both biogas, biofuel, the small modular system, and the other technologies that we call super-clean, super-efficient biomass energy conversion system.

Thank you.

(Applause.)

MR. KRICH: Our next speaker will be Tim Olson, who's the International Program Manager for the Fuels and Transportation Division of the California Energy Commission. He's worked in fuel technologies for many years. And focuses on developing international development of California technologies. And he's going to speak about AB-1007.

One comment, by the way. All these slides are going to be on the website in a couple of days.

MR. OLSON: Thanks a lot, Ken. Also

just to let you know that I have several different tasks I'm doing. One of them, which have been borrowed over the last six months, to manage our AB-1007 report.

So I'm going to go through what that plan is for California. And discuss some of the elements of it, and try to show you where there's some relevance to bioenergy, biofuels, biomass.

So, AB-1007 is a legislation passed about a year and a half ago. And it directed the Commission to, in conjunction with the Air Resources Board, to develop this plan that, for the most part, is a method to fulfill petroleum reduction goals that were adopted by both agencies in 2003. And I'll go through that in a little more detail here.

In addition to that team, when the Governor announced his executive order on the low carbon fuel standard, we started integrating other partners, UC Davis and UC Berkeley, into this process of kind of some shared analysis.

Just to give you a little background on the petroleum reduction goals. The Energy Commission and the Air Resources Board spent two years in the 2001, 2002, 2003 to basically develop a plan on how to reduce petroleum in the transportation sector in California at the direction of the Legislature and Governor at that time.

And the overall conclusion was this, that we set these goals, both agencies adopted goals that would reduce transportation -- petroleum use in the transportation sector by the year 2020 at 15 percent below the 2003 level. And that 20 percent of the fuel in 2020 would come from alternative fuels, and 30 percent in 2030.

And so this plan also -- this petroleum reduction goals were also kind of evolving at the same time as the greenhouse gas emission goals were being developed. And so what's happened is our work on the petroleum reduction has been kind of connected to the AB-32 Climate Action Team type of work.

This AB-1007 plan will be an embellishment of three transportation alternative fuel initiatives in the original Governor's Climate Action Team 46 initiatives. Three of them are transportation. This AB-1007 will be the embellishment of three of those.

The conclusions from the bioenergy

action plan are incorporated into our AB-1007 report. And then we're providing information from our full fuel cycle analysis into the development of the low carbon fuel standard analysis; which then, in turn, will be fed back into the AB-1007 report sometime this spring.

So kind of just summarizing, these petroleum reduction and greenhouse gas emission goals have been set. And about a year and a half ago we got this direction, now come up with a plan on how you're going to get there. And that's what the AB-1007 is about for alternative fuels. It does not cover fuel efficiency or land use planning in the same depth that we wanted to. It's basically the law directs us to look at alternative fuels, what contribution can alternative fuels have to petroleum reduction and greenhouse gas reductions.

So, we described this approach as what are the circumstances and conditions to maximize market penetration for any alternative fuels, any and all alternative fuels.

And some of those things that we want to include in that are market penetration estimates, measured in terms of fuel volume and vehicles. We want to know where the alternative fuels, what market niches they're going to go into. How they're going to expand from what I would call kind of an infant stage development today.

We want to know what investment requirements are needed to reach those goals. We want to know when the economy of scale manufacturing will produce cost reduction for any of the vehicle infrastructure side of things.

We also want to know whether there's a need for incentives or other government interventions beyond what exists today. There are a lot of federal incentives that exist for a lot of the fuels.

We want to know what California needs to do to either embellish that, to augment, extend. We want to know whether an incentive is needed. Who needs it. How long they need it. What the magnitude is and whether it's going to be effective. Those are big challenges to deal with them.

We also are looking at what the timing and pacing of the development will occur.

So, in essence, it becomes kind of a business case that we're describing. And it requires lots of input from parties in the real world.

Another element of the AB-1007 is it needs to reflect the full fuel cycle analysis of options, alternative fuel options, compared to petroleum and gasoline and diesel. So we look at this; we describe this as lifecycle or in transportation, well-to-wheels analysis. Covering extraction, production, refining, transport, storage, use of the fuel. So there's an existing report out that's published now, it's initial analysis on that full fuel cycle analysis.

We're looking at what the greenhouse gas emission footprint is in conjunction with criteria pollutants, toxics and other multimedia.

And the direction of the legislation was we want to see petroleum reduction and greenhouse gas emission reductions, but no slippage on criteria pollutants standards, toxics or any of the multimedia.

Again, the market penetration is a big part of this. We're given milestone years identified in the law. And the Energy Commission and the Air Resources Board added two other years, 2030 and 2050, to get a little better picture for the future.

These technologies and fuels are the areas that we're concentrating on. It's heavily dependent on data available to -- all those different factors I listed before. And we have work groups for all ten of these areas.

Those work groups include environmental organizations, industry people, oil companies, fueling infrastructure, automakers; it's a whole range of things. The groups are as small as eight or nine, and as big as 60 in any single group.

In addition, we have kind of overall groups that include the environmental coalition, oil companies and automakers.

So, additional requirements in the law. We need to complete three different kind of economic analyses. And the plan for alternative fuels must include an evaluation that maximizes the environmental and health benefits in a cost effective manner. The plan must show us how to minimize the cost to increase alternative fuels in the state. And the plan also must maximize the -- analyze how you can maximize the economic benefits of instate fuel production in California.

And then, of course, this is due to the

Legislature by June 30th. And both agencies plan adoption of the plan just prior to that in our scheduled meetings.

Just a little more elaboration of what the report will include. As I mentioned, the fuel cycle analysis; the initial draft of that is available; it's on our website if you're interested in that you should look at it. We're still taking comments on it.

And from this standpoint our public comment period ended March 23rd, but we're trying to get additional data that helps us define some of those factors I mentioned before. And we're trying to make this as close to real world data as possible.

A big part of what we're doing now is what we call the story line scenario development. And it includes several ingredients. Many of them are relevant to the bioenergy. This analysis of instate fuel production; that's focused almost entirely on biofuels.

The bioenergy technology assessment, this is a contract that we've had through the Western Governors Association with TSS. It's a combination of work addressing R&D technology and we think that's an input into this report.

As I mentioned before, the incentives. This is a very significant part of what kind of not only incentives, but government interventions, programs, mandates, incentives are needed. A lot of this is focused on what's working with incentives now, and whether others are needed.

We have some surveys we completed, mostly of fleet managers, not mass market. We're borrowing other studies on mass market consumers for passenger vehicle markets. But for the most part, we think early adopters and mostly alternative fuels are going to be fleets. And we've got a response from 1300 fleet managers on under what conditions they use alternative fuels; or if they're not, what would motivate them to.

I mentioned some of the analytical work that's coming out of this. And then the final report.

You can see this is the schedule. We're looking at a draft of the report in mid-May; a workshop on May 31st; and the June 3th adoptions by the Air Resources Board and the Energy Commission.

We've had a couple other workshops in

the past. All that information's on our website.

And just getting to where there might be some relevant to the bioenergy biofuels. There's several areas here. In instate fuel production we're looking at how much, what's the potential for instate, how much, what type, when is it going to be available, what's the cost. This is a piece of work that will feed into this.

The supply part of this analysis also looks, if you look at our full fuel cycle analysis report, we've got some pretty good pathways described in there that reflect biofuels and biomass and electric production.

Just to give you an example, in the fuels area some of the scenario work we're finding -- some of you already know this -- existing E5.7 additive in gasoline now is 900 million gallons per year. We are estimating that E-10 increase will produce 1.5 billion gallons of ethanol use in the state.

Feedback from suppliers on E-85 initial few years, if we can get to that point, is 200 to 300 million gallons. So when you add that up, it's still about maybe 7, 8, 10 percent of the total fuel use. And there's still room to grow beyond that for other fuels and other technologies.

And then part of this study in biofuels covers not only supply to fuels, but what are the barriers and what are the prospects for vehicle use. And, of course, there are different markets. Biodiesel in the heavy duty engine area; of course ethanol in the passenger vehicle.

And what we're also finding is electric drive train. Our assumption in our analysis is that electricity will be a marginal new electricity supply either from natural gas or renewables. And so biomass-generated electricity is one origin for electric drive train.

And then some of the -- some initial analysis of the full fuel cycle report shows a couple things here. Biofuels and electricity come out in a very positive fashion out of this report when you look at the well-to-wheels.

We did 59 pathways, 10 different fuels, various fuel origins. And after our first analysis we decided to go back to comments in our process to take a closer look at the feedstock, biofuel feedstocks for each of these pathways that related to biofuels.

And so we're still in the process of doing that analysis. And this might update what I have on the slide. But you can see that there's some real positive results for biofuels, for electricity, plug-in hybrid electricity and a few minor drawbacks in terms of local biomass conversion, in terms of increased PM. This is an estimated case for California cellulosic ethanol. The higher the ethanol blend the greater the greenhouse gas emission reductions. And we found that biodiesel had one of the better positive results, the B-20 biodiesel, compared to existing ultra-low sulfur diesel.

So what are the things that we're looking for between now and mid-May. We still would like to get additional data to verify capital costs, not so much on environmental impacts, but investment, capital costs, some of the timing. We're going through several meetings with individual companies to help us understand what their individual and their industrywide estimates are for market penetration.

So if there are any of you here that can provide any of that insight information, data, needs to be verifiable, we're very interested in that.

And then we also have some other things that if you're interested in peer review process, participation in any of the workshops, we have a number of things coming up. And we're also looking, you know, part of this plan is recommendation for new initiatives. So that's something we'll be soliciting.

And then if you need to contact me here's where you can reach me. Thanks a lot.

(Applause.)

MR. KRICH: Our next speaker is Mark Melaina. He's a Project Scientist with the Institute of Transportation Studies at UC Davis. Focuses a lot on alternative fuel infrastructure development. He is trained as a physicist and an engineer with a PhD from the School of Natural Resources and Environment at the University of Michigan. So, here he is.

DR. MELAINA: Thank you very much. Can people hear me? Okay. So I'm working with a team of researchers at Davis and Berkeley, both. It's about 15 people. The directors of the study are Dan Sperling and Alex Farrell. There are several other professors and graduate students working, as well.

The goal is to provide two different reports that are recommendations for the low carbon fuel standard.

So, quickly, what I'm going to talk about here is sort of starting from a general perspective, climate change policy and goals; why a sectoral approach is justified, meaning the sector here is transportation fuels; and then some of the design and implementation issues that we're going to try and address in our reports. And some thoughts on what that might mean for biofuels.

So there are four goals, general climate change goals, that we have in mind when we're thinking about climate change policy. And there are two shown here. One is the near-term goals set, if this will work -- can people see that? The near-term goals for 2010, 2020, reductions below, a business-as-usual path for all of California's greenhouse gas emissions. That's goal number one. Near-term off-the-shelf technologies can be deployed to meet that goal.

A different goal, number two, is a longer term deeper greenhouse gas reductions by 2050. The UK has a similar reduction goal. And what is needed to meet that goal is very different than the first goal. So this longer term goal is what I'm talking about. Near-term off-the-shelf technologies will not help us meet those goals. We need to have more R&D into preparing other technologies that will be ready to be commercialized in the long term. So it's a very different response to meet that second goal.

Two additional goals are strengthening the economy while we're doing this. That's goal number three. And then goal number four is improving energy security. So, reducing petroleum imports.

So, one reason why a sectoral approach is needed is that the alternative, or one of the alternatives, which I'm calling here economywide approach, which you could say be maybe a carbon tax or a cap-and-trade for the whole country, that is really going to push goal number one. That's going to help getting near-term technologies into the market. But it won't necessarily help with the other three goals.

So, as an example here we have the low price of carbon; say this would be a tax. It wouldn't have a lot of effect on the transportation sector, as part of the argument here. It would have effect on a lot of other energy industries, but not necessarily transportation. So recent MIT report on coal, I don't know if people saw that, but they said that you would need a pretty high carbon tax, in this range, to have an effect on the coal industry to say, induce carbon sequestration. I think you would need even higher to get real technological change in transportation.

So this just goes through to say that innovation for the long-term goal number two is not necessarily going to happen as a result of that. And the other two goals, energy security, strengthen the economy, are not necessarily going to happen in transportation for these economywide approaches.

So one approach is the low carbon fuel standard, which is sector specific. As an example, you can think about this in terms of price signals, if you had $1 per ton CO2 tax, you would have these different price signals for these different possible technologies. And the idea is that the response to this price signal would not be very strong; you wouldn't see much change even if that carbon tax was a lot higher. You would see a response for the other technologies.

Okay, so we're in the middle of our study. I'm not going to talk about any conclusions because we don't have conclusions yet. The main focus of the low carbon fuel standard is a 10 percent reduction in intensity, greenhouse gas intensity. One way you could define that is CO2 equivalence per megajoule of fuel. There are other ways to define it. But the idea is that will be reduced by 2020 by 10 percent. How that happens we're not sure yet. And that's going to be part of our recommendations, is a broad array of different options on how to do that.

Compliance will be met by blenders, refiners and importers. The idea is to take into account all global warming gases, so the total global warming impact. So that means lifecycle analysis, full lifecycle analysis. It will be met by blends of low carbon fuels and other alternative fuels and probably implemented through a credit trading system.

There are a lot of different issues that we're going to discuss in our reports. I don't know if I need to go through all of these, but what I'm going to talk about in a bit is how you treat vehicle efficiency in the full lifecycle analysis of the fuel.

Penalties, imports, baseline issues, how do you define the baseline; how is the reward system going to work; how it would affect farm practices. How is electricity treated. Where would credits go for some of these expensive vehicles that are very efficient, plug-in hybrid electric vehicles and fuel cell vehicles. Maybe credits should go to the people who paid for those costs of those expensive vehicles. That's one option.

And then how do you put in place a consistent monitoring and tracking system for all of these different alternative fuels that will reduce the greenhouse gas intensity.

So this is a simple representation of a lifecycle for a fuel. The top one would be ethanol from corn; bottom one would be petroleum fuel, gasoline or diesel. And this linear phase approach might look really simple, but when you really look at the numbers it's not necessarily very simple.

So I'm genuinely curious, how many

people have used or have people in their organizations that have used the GREET model from Argon National Lab? Just a few people. Some of you are UC Davis students, so that's my organization.

So, of those people how many have actually gone into the Excel spreadsheets and looked at the calculations that underlie the -- on top of the GREET model? All right, about a third of those original people. So, those people will believe me when I say that this can get really complicated. And GREET is actually a simplified version of what might be required to do a really detailed lifecycle analysis.

So one of the issues we're going to talk about is where do you draw the boundaries of this, and how much detail do you need to incorporate, and what are the tradeoffs with actually getting something that can be implemented as a policy as opposed to published as an academic study. Those are two different things.

We know there's a lot of potential for reducing greenhouse gas emissions from different types of fuels. These are some ranges on the percent change for different fuels and feedstocks.

These are broad ranges. But we also know that that's not necessarily the only thing that can happen with alternative fuels. Some of them can actually increase the carbon emissions if they're introduced as alternative fuels. Especially tar sands from Canada. That's a big concern for the U.S.

But there are a lot of other options, synthetic fuel from coal without sequestration would increase carbon emissions quite a bit on a per-fuel basis. If you want more specific values you would talk to Tim or the 1007 people to see what they have in their report.

So this is an issue I mentioned earlier. The accounting system for lifecycle analysis can get very complicated, or it can be done fairly simply. If it's too simple you won't actually capture what's going on and you won't be able to direct incentives in the right places for the different steps along that lifecycle. So you have to strike a balance there.

And the balance, one of the core things is what becomes too cumbersome to actually implement as a policy. If you take the full analysis of everything that can go into this, it could be onerous in terms of asking people to actually track all those different changes for a single fuel. Especially if it's on a per-producer basis. Because the different producers would have different -- they'd have unique conversion processes.

So some ways to deal with this tradeoff. One idea is to have default values for the greenhouse gases from different fuels. And then a producer could opt in with a lower greenhouse gas intensity below that default value. And they would do the verification of how that was met, themselves. They would do the accounting. Self-certification, and that accounting would be subject to third-party review. These are just options.

Another idea is that the number of variables that would go into the lifecycle analysis would maybe be smaller first. The big variables to have a big impact. And then over time, more and more variables would be taken into account to get finer resolution for the total greenhouse gas impact or reduction.

And then similarly different fuels could be certified in sequence over time. We certainly can't do all of them at once. Just think of all the different types of biofuels.

I mentioned before that there are different ways to define intensity. Our current thinking on this, and in our report we're going to describe different alternatives for what the different types of intensities might mean in terms of policy implications, is to include all upstream greenhouse gas emissions above the vehicle. So that's like the well-to-pump or well-to-tank values. Also include the carbon content of the fuel. And then have an efficiency adjustment for the vehicle.

Now, the idea behind that is that the drive train of the vehicle, maybe not other characteristics of the vehicle, the drive train is intimately linked to the actual fuel qualities. You know, fuels are designed for certain drive trains. Drive trains are designed for certain fuels. It's really hard to conceptually think about delinking them and still be talking about a full well-to-drive train analysis. And that's important for biofuels. And I think after lunch we may have some speakers that can talk about that.

General trend is the higher quality fuels require more energy to produce. But because they're higher quality, if you talk about hydrogen or electricity, they can be used more efficiently in the vehicle. That's how you can see how this becomes important.

These numbers are from an earlier version of the 1007 work, so don't worry about the precise numbers too much. But what we have here is energy inputs for all the upstream processes. On the X axis is the efficiency of the vehicles that would use those fuels. And you can see this general increase. The more efficient vehicles use fuels that are more energy intensive.

Now if those energy inputs are carbon based, if they're fossil fuel energy, they'd also be more carbon intensive fuels. That's the next slide, but I'll just skip this and go to the full comparison, which is the total well-to-wheel carbon intensity; it's on a per VMT, per mile basis.

And you see that the vehicle fuel economy becomes a huge factor in making sure this downward slope happens in most feasible cases where increased fuel economy will compensate for that previous graph by reducing the total well-to-wheel greenhouse gas emissions.

Okay, I think this is my last slide. We're not the only people looking at low carbon fuel standards. Some of you have probably heard on the news a lot of people are looking at it globally; other states within the U.S. are looking at it. And on the federal level, as well.

In general, what this probably means for biofuels is this will be a market pull policy for new technologies, rather than just a subsidy creating some type of market for green biofuels.

And the way we're doing it here in California is it's not a pick-the-winner approach. It allows flexibility. But the overall goal is carbon reductions. So the winners are those that reduce carbon; that's the idea. And you want to do it consistently, so the best reductions get the most credit.

However, carbon's not the only issue, especially in Europe they're talking about, as we heard earlier, broader issues about sustainability of different fuels. And that's also important.

So, here's just a note that we are trying to help provide input for this. And I've got some contact information. This is my email. We have a website through the UC Berkeley Institute where we're putting some updates on our work. If you don't have time to write this down right now, you can just Google Sperling, Dr. Sperling and Farrell and low carbon fuel standard and you'll get this website.

Thank you.

(Applause.)

MR. KRICH: All right. Our next speaker, and the last speaker on this panel, is Jim Pena. He has worked for the Forest Service for nearly 30 years; spent plenty of time out in the field. Currently is the Supervisor for Plumas National Forest, but is about to be the Deputy Regional Forester for the Pacific Southwest Region of the USDA Forest Service. Mr. Pena.

MR. PENA: Thank you. I appreciate the opportunity to be here today on behalf of Bernie Weingardt, who is the Regional Forester for the Forest Service in California. I think that our opportunity to contribute to this forum, based on at least the short period of time I've been here, is going to be unique. Because I didn't hear very much in the previous speakers talking about biomass wood products or how we in the Forest Service and some of the public land agencies, management agencies, might contribute to the energy solutions facing California and the United States.

And so with that what I want to do is give you a little bit of overview of how the Forest Service in particular, but the land management agencies in general, could contribute to some energy solutions and sustainable energy solutions. And then give you some information more specifically about what's going on in California, and what the Forest Service is contributing to hopefully some collaborative solutions.

In case you nod off in the next 15 minutes before lunch, or you get hungry and you split, the bottomline for this talk is the biomass solution is growing as we stand here. Our future is growing; and our ability to contribute to future sustainable energy production, both biomass production with cogen or electricity directly; or with some new technologies with say, cellulosic ethanol and those types of things, is growing. And we're contributing to the development and evolution of those technologies through our research branch. So, with that we'll see if we end up at the same place as I started here.

Want to cover some policy, little bit of background on what the land base is in California; some of the timber harvest trends, which is the outputs for how we get products into biomass. And then some opportunities for partnerships in order to develop a more robust place for biomass and energy in California.

This is an example of five national Acts, federal laws, that have been passed since 2000. And when I look at these Acts, the thing that strikes me is starting in 2000 and moving to the proposals in the 2007 farm bill, there's three things that I think come through.

One is beginning with the first bill, the Biomass Research Development Act, and the first couple, is trying to increase collaboration and coordination at a federal level of how land management agencies, in particular, can contribute to energy production in the United States beyond oil and gas leases. Some other forms of renewable energy.

And so the Forest Service is a part of

the United States Department of Agriculture; and so at a national level a lot of the land management departments, Department of the Interior, Department of Energy -- not Department of Energy, but Department of Agriculture, and along with the Department of Energy, have, I guess, a sub-secretary task force that meets on a regular basis looking at how we can best and better coordinate our policies in order to support this effort.

National fire plan set out some goals on reducing fuels. And I think that's a connection right now that we're struggling with in California. We have a growing forest base. We're having reduced opportunities for managing that forest base with competing social interests. And we have an ever-increasing fire hazard because of that.

And so we're trying to look for ways through fire safe councils and developing partnerships with communities in order to reduce the fuel loading, that fuel loading equates to biomass. As we do that we need to find places to dispose of that biomass other than burning it out in the woods. And that provides for opportunities for increasing utilization for energy sources, as well as addressing some of the carbon issues that some of the speakers have spoken to previous to me.

If we treat biomass either through conversion to some type of ethanol source, or through cogen electricity, it's a much cleaner disposal of that energy, or that energy that's locked in that biomass than burning it out in the woods or burning it in wildfires. And so that's a thing that we're trying to look at, a more holistic solution in how we can contribute to improving the environment, improving the energy situation, and not just in California but across the United States.

The 2007 farm bill and the Energy Policy Act of 2005 both are looking at developing new technologies and encouraging incentives across the United States to utilize alternative energy sources. In the farm bill, both from ag waste as well as from forest products, trying to increase the utilization in order to offset some of the demand for petroleum and foreign petroleum products.

The billion ton report is an outgrowth

of this policy effort. And it's trying to set the stage for what is the capability of the nation in producing a biomass source that's sustainable at a certain level so that it's meaningful.

Right now about 15 percent of the electricity generated in California from cogen comes off public lands. There's quite a bit more potential there. In reference to the point I made is our future is growing. We're growing at about 8-to-1 our harvest rate. And so there's a huge pent up supply that needs to be addressed, because as that grows that's fuel.

And that conversion to a biomass in the right areas where social pressures and urban interface and to protect key and critical habitat for threatened and endangered species, public watersheds and riparian areas, we can get agreement through our planning processes. That source and that supply can be increased significantly.

And I think this report illustrates some of the things that we're facing in challenges, as well as the opportunities that lie ahead for becoming a more significant contributor to sustainable energy in the United States.

This slide gives you a sense of the magnitude of potential growth, as well as the current contribution to energy. The four columns on the left, as you're facing, indicate right now the potential for growth in the yellow. And the purple is where we're contributing across the different landscapes to current production or current biomass capability.

There's about 100 million dry tons of primary forest residue currently available. So that's the stuff that's going out in logs; it's being developed right now as cogen fuels, and being taken out of the woods. At an eight-to-one potential growth rate that's not being harvested or utilized, that is a significant increase above that 100 million tons.

And so the strategy that the Forest Service is developing right now is key to our ecosystem restoration strategy that we've been following for the last four to five years. And that is to provide a reliable and predictable supply for federal lands. Getting at a situation where we're not seeing huge fluctuations in the product reliability that we've seen in the past.

Foster partnerships to facilitate woody

biomass utilization. Respond to community and regional interests. And this is where we need to capitalize on some of the existing collaborative efforts we have going. The fire safe councils and the local watershed groups that are focusing on what are the treatments that we need to apply to the landscape to address some of the sustainability issues across the board. Not just from a vegetation standpoint, but from water production and wildlife habitat, scenic vistas, recreational opportunities.

And so as we develop more partnerships and the national interest to improve or to change our reliance on other sources of energy and go to potentially a little more cleaner or definitely a more renewable source of energy, hopefully it can become more of a factor in developing some collaborative efforts that helps us move forward in this area.

We're also producing science and delivering technology that will enable sustainable woody biomass utilization. The Forest Service has about three major arms that the public sees and may be aware of. One is obviously the national forest system which manages the national forests across the United States.

Another is a world class research arm in our forest research department. And significant research is going on now in California and across the United States on this issue, on how we can contribute to sustainable utilization of biomass in producing energy in an ethanol.

And then increased markets for woody biomass through our work with partners. And I think the key for us is being able to capture more of the growth into the future so that we're addressing a number of issues about sustainability in the national forests and the conditions in the forests as well as sustainable energy.

This gives you a sense of the potential biomass available when we simulated some thinnings by uneven age treatment across the west. This was done by the Western Governors biomass task force in 2006.

And so there's a lot of concentration in California, particularly in northern California. And in the interior northwest, Montana and Idaho. And from what I see coming in from the field, as a forest supervisor, and the conditions in the Plumas National Forest and the forests around me, this is a no-brainer. We're continuing to see this growth at the harvest levels and the treatment levels we're able to implement right now, we're not even scratching the surface of what we could be contributing to the local cogen facilities in our area.

So, again, our future is definitely growing; and our mission is to find ways to capture it and build partnerships to utilize it.

This gives you a sense in California of how forests are distributed in different land types or different ownership categories. As a single entity, national forests are the largest single entity. And then the next largest is nonindustrial.

And so nonindustrial are all the small landowners, five to 10 to 20 acres. A lot of that's urban interfaced. A lot of it is supported by local fire safe councils on putting the energy and the capacity for them to treat their biomass potential through fuels treatments.

The challenge, I think, for us, moving forward, on both private and public lands is the same, being able to get that product to a place that can utilize it at a cost that makes somebody want to do it. Because right now that's the biggest barrier that I'm seeing and that a lot of our potential is going unmet. Is being able to get it from the woods to a place that can utilize it, whether it be a cogen plant or future technology for some type of ethanol conversion.

Just plugging the Forest Service. This is where we exist in California. If you notice that most of the upper elevation forests are national forests. And so what that means to our capability is not all of it is trees. We have a lot of the upper elevation rock and ice type ground, as well as a lot of the prime timber-growing ground in the Sierras and the Coastal Range. And then a lot of the -- down in southern California the mountaintops around the high urban areas. So we are contributing a lot of things to California in the way of environmental services, biomass is but one potential addition.

And so when you look at our lands, we've got 17.5 million acres in California. Of the 17.5 about 6 million is rock-ice, nonforest type ground. And so that leaves about two-thirds of it as potential for production.

Of that two-thirds, about, probably

about 50 percent, a little more than 50 percent, is key or is sensitive to threatened and endangered species, watersheds, old growth habitat where it's just not -- it's more of a challenge socially to treat the fuels in those areas and generate biomass.

So, suitable timber management is about 2 million acres; and then wilderness, wild and scenic rivers, reserved areas again are pretty much off the table. So, we're dealing with the potential in California of about 9 million acres, which is quite a bit of area.

This is the trend for California harvest for about a little bit more than the last 30 years, or close to the last 30 years. It's downward and it probably should be no surprise about that with the shifting demographics in the state.

But what that tells me, though, is as you get down to the bottom for the Forest Service, our potential still has ability to come up. I think if we were to implement at the level that our plans, our current management plans, indicate, we would probably come up above a billion boardfeet a year overall timber output. A portion, probably about half to a third more of that would be available for biomass. So we have a significant potential working through the Collaborative efforts and developing the partnerships to make that a reality is what we're focused on right now.

Again, here's the biomass sold by the region in the last seven years, and the projection for the next two.

This is just to reinforce what our opportunities are and how our land base is set out. And so for opportunities I think we have some things that we're putting in place that could help stabilize the public lands as a source of biomass.

Stewardship contracting opportunities allows us to put in place longer term contracts that provides a more stable and level supply for producers.

New markets for biomass could benefit forest operations and stretch limited budgets, looking at a way to capture some of the environmental credits; and using that as a resource to develop some of this market.

And, again, our role in the future, I

think, is our potential; and being able to tap that potential growth. And what we're seeing right now, we have the potential on public lands, in particular, but definitely in private and nonindustrial private lands. There's a lot of opportunity if we can figure out how to get it from the source to where we can utilize it and convert it to an energy source that's in demand.

And so, lastly, I think I'm here today to commit from the Forest Service leadership to try and be a partner and to get involved with this to a higher degree in California, as we're trying to do across the United States.

So, with that, I appreciate the opportunity to be here today. And thank you very much.

(Applause.)

MR. KRICH: I want to thank our entire panel. Considering that we're running nearly, I think, an hour late, we're going to not have time for discussion.

Martha will tell us about lunch arrangements.

MS. GILDART: Thank you, Ken. We'll hold questions till the final discussion period of the day, I think is about the best way to make up some of our lost time.

I do have two housekeeping things. One is a set of car keys has been turned in. It's a Honda car key and four others. If anyone thinks they're theirs, please come forward and identify yourself.

The other thing is the lunch. We're really really happy that so many people turned out for this meeting. We had something like 30 people sign up just today. But it means we're going to be a little bit tight on the lunch that's being served. It is around the corner; you go past the stairs, make a sharp right there where the coffee was served.

It's going to be sort of buffet style. There are some tables for people to sit at, but we're not going to be able to accommodate everyone. You may have to wander around. There's a few tables here in the lobby. We're just going to have to be real friendly and rub elbows with everyone. But I think there will be food for folks.

We're going to give you one hour for lunch. We tried to make it an hour and a quarter in the agenda. So if folks could come back here at about 1:40, so that we could get started with the third session. Thank you.

(Whereupon, at 12:38 p.m., the forum was adjourned, to reconvene at 1:40 p.m., this same day.)

--o0o--

AFTERNOON SESSION

1:40 p.m.

MR. ZALESKY: What I thought I'd start with is a little bit of the perspective that Chevron has for the context that we're facing.

I've been in the business coming up on 30 years, and most of my time was in refining. My most recent job was the Refinery Manager in Richmond, California.

One of the things that the average person doesn't spend a lot of time thinking about is the world's desire for energy going forward. And in the next two decades it's expected to go up by 50 percent. Don't know about you but my brain explodes when I try to think where in the heck are we going to get 50 percent more energy than we currently have today. That is an enormous number; nontrivial challenge.

Now, where's that coming from? It's coming from prosperity. It's a good thing. One of the sort of double-edged swords, as societies become more successful, their energy consumption comes up. They want what countries like the United States have. And with that comes a higher energy need.

So, for the first time in my career we actually see that the traditional resources of oil and gas, although they will arguably be the foundation, will not be enough to meet the world's demands. And we we'll talk today about how biofuels fits into that picture.

Even the traditional sources, it's getting tougher. Some of you may have heard about a well we drilled in the Gulf of Mexico, down 27,000 feet. That cost more than a buck. So, if that's the type of thing that we're going to have to do in order to get at some of these reserves, it also opens up the playing field for other options.

Clearly there's going to be an ongoing need for cleaner fuels and cleaner technologies. I don't think the world is doing nearly enough about improving energy efficiency. I can't get my wife to put in fluorescent compact light bulbs in our house. She says, "I don't like the color." I really think that's an irrational consumer behavior, but it's founded in the fact that economically I'm indifferent at this point in time. And there is a lot more that we can do about energy efficiency than we're currently doing.

Biofuels, and a variety of other things I'll talk about, from our perspective are about diversifying our choices. And clearly this is kind of like the trifecta of issues, the perfect storm, fill in your favorite analogy. There's multiple things we have to do.

We do have to meet the world's demands. We do have to do that in a sustainable way. And we have to do it in a fashion that is good for the climate around us. So, it's a complicated world.

This is our projection about how things might look a couple decades from now. One of the things I want to make a comment around, coal-to-liquids, gas-to-liquids, and extra heavy oil and bitumen, that's kind of where the tar sands world lives, from our perspective we recognize for those to come to market requires something we don't worry as much about with traditional fuels, although we will be, and that is carbon capture and storage.

So, you can't bring things like this to market without a plan that says how you're going to manage your CO_2 footprint. It's a given. So the technology risk is not just the risk of finding those resources, processing them, et cetera; it's also in the technology that you're going to have to have to manage the carbon footprint.

Biofuels, quite interestingly, has a, oh, depends on how you want to have the intellectual debate, but at least the carbon neutral footprint.

So the purpose of this slide is to say that our view is that if you're a couple decades from now, biofuels, and for us it's a wide open plane. Could be what we have today, biodiesel and bioethanol, perfectly okay. Could be molecular gasoline derived from grass clippings. That's okay, too. So there are a variety of things that could constitute, not just the two that we're most familiar with.

But fundamentally, it's big. It's several million barrels a day. And people say, ah, yeah, but oil's, you know, 110, so what if biofuels is 5 or 3 or whatever your number is. That's enormous. When the world does not have adequate recognition between supply and demand, base human behavior takes over. If you've ever been to a park and seen young children playing in the sandbox, fighting over toys, it kind of gets like that. So biofuels, even though it is not the big number, it is not the answer, it is an enormously important part of the picture. That's how we're looking at it.

One of the first questions that we were contemplating, as a company, is this about advertising or is this real. And by real we mean can we deliver these things to the marketplace in a sustainable, economic fashion. And we've concluded the answer is yes, both now and into the future. So that's our backdrop.

I want to talk about what we're doing. And I always start with this. This is stating the obvious, but I find that it is rarely understood. Consumers are smart people. And there's, I don't know, a couple hundred of them here in the room today.

And the way this works hasn't changed one iota over time. And you can't wish a different outcome. It goes like this: You got to give me equal or improved driving performance, safety, reliability, and comfort in my vehicle, period. Can't trick me; can't fool me; I'm going to figure it out every time. So that's the part of the equation that our auto colleagues have to manage. And they understand that and they've done a great job over the years.

The next part is sort of our equation is, I've got to have equal or lower vehicle and fuel costs. We're in the fuel cost piece there. More expensive fuel, consumers don't want that. If you have a choice they're going to go with the lowest cost option.

And finally, we need to have improved fuel economy and environmental benefits. Fuel plays into both of those equations. You can't get past this. This is the commercial reality.

I will tell you one other thing that I worry a little bit about when I see mandates happen. And I don't want to have a discussion about public policy today, but I just want to point out one downside. If you mandate something that's not there, it's a problem. Because the one thing that's not on this list that the consumers absolutely go bat-wacky over is, I can't get fuel. So if you thought playing in the sandbox was ugly, try that one on.

And I came back from the evacuation for Katrina in Houston a couple years ago, and in one day it was really ugly to see what was going on in Houston. And we all knew the fuel would be back in a couple of days. But it was really not pleasant. So, making sure that when you're deploying new technology that the fuel is really available is extremely important if you want consumer acceptance.

Now, there's another stating the obvious point of view, what's it going to be required for biofuels to be a successful business going forward. Same thing it is today. Not one bit of change. You're going to have to have industrial scale infrastructure. I would argue that the corn-derived ethanol industry that has grown up in the U.S. over the last several decades is, in fact, industrial scale technology. Clearly what we have going on in Brazil is.

So I don't mean that it has to be big honking refineries to be industrial scale. I just mean you have to have the volume to deliver what the consumers need.

The next piece we're going to have to have is second-generation technology. And although I said production technology, I'm going to talk in a minute about feedstock. For us, second generation in our company is code for nonfuel feedstock -- excuse me, non-feed-derived feedstock.

It's okay to start where you start; that's life. But what we're currently doing, by most people's view, is not sustainable. and I don't mean that to say that ethanol from corn is out. I just mean you can't depend exclusively on that. We're going to have to have other options.

One of the reasons that Europe has sort of hit the wall is that their biodiesel is predominately derived from edible vegetable oils. And we've reached that threshold point where their need to be in the food chain is now competing directly with their need to be a fuel, and that's a problem.

So the key to that is actually developing technology that would be able to process non-food sources into fuel.

And the last thing is if I was the guy in "The Graduate" and I forget whichever one said it, but, you know, "son, it's plastics." If I was telling you biofuels I would not say, "son, it's technology." I would say, "son, it's all about feedstocks."

Now, it's not simple as just grow something. It's way more complicated than that. So having large concentrated supplies of feedstock is really important. That does not mean that unless it's a large concentrated source of feedstock, it's unimportant or cannot be done.

These are Chevron's perspectives. So, for us to be involved, just with the overheads that we have as a company, it needs to be a fairly large business of scale. So, for example, some of the things that were shared earlier around processing recovered grease or things of that nature, and turn those into biodiesel, go for it. Works great. It's just not a business we will be the right people to be involved in that activity. But others could very well be. So, this is what we think about.

The other one that often gets skipped over, and in my experience is actually the key to get through the valley of death, it's not more money, it's a sustainable business model. So, today if I went out and said, "Hey, Mr. Farmer, would you grow switchgrass for me?" He'd say, "What are you going to pay me?" "What are you going to pay me year after year?" So, what's the market for that? So there is a chicken-and-egg, even in the farm sector here, to use a pun there.

Okay. So what are we wanting to do? Really, as many people think about biomass-to-fuel, that's one choice. You can also make bioproducts in other things that we have all been talking about here, and I'm sure will continue to talk about.

We're concentrating right now, personally as a company, primarily on turning biomass into liquid transportation fuels. This is just pure conjecture on my part, because it's so complicated I don't know how anybody could be accurate about this, but I'll say something anyway.

I don't think you can feed grass clippings to a fluid catalytic cracking unit. I don't really think that's what's going to happen. What I do think is possible is some clever people will invest technology that could be deployed in the farm sector, in the agribusiness sector, that would take those grass clippings or that corn stover or whatever the biomass is, and pretreat it and convert it into a synthetic oil that can, in fact, be fed into the refining business that I'm familiar with. That would be hugely cool if we could pull that off, to use my son's terminology. Very complicated. Very complicated, but worth going after.

It does not mean that that's the only thing we should do. And if you're going to develop biofuels from a biochemical route, which is a lot of what you hear about, that one is better than the other. Again, since we need 50 percent more energy in a couple of decades, our view is they're all complementary; there is no competition; it's a bigger pie, not a zero-sum game; everybody's welcome.

So these are just pathways that we're working on that are unique to where we think we could offer the most to them, as well as benefit our shareholders.

Now, one of the things I also want to kind of mention about the existing infrastructure that we're trying to blend into, it's very capital intensive. One of the nice things about biofuels, and I don't mean to insult anybody who's in that business, it's not capital intensive on the same scale that refineries and oil exploration is. It is capital intensive. If you're a small guy and need $100 million, that's really intensive. But it's not of the same scale. You don't need billions to build a manufacturing facility. So this actually opens up more people to be involved.

The current infrastructure is very technology intensive; requires highly integrated systems. I don't see a difference there. I think we're going to need exactly the same thing that I've said earlier.

Infrastructure tends to be long-lived systems. And if you bet wrong, as a company like ours, it's a very painful experience in the marketplace. So we tend to be, and are criticized, for being fairly conservative on those infrastructure switch-over bets.

And actually, we don't get that man of them, if you think about it. And so we don't have hundreds and hundreds of experience with complete infrastructure turnover. It's actually happened more like small evolutionary steps over a long period of time. And I don't think I need to say anything more about this one.

If I counted to five, the planet would have just consumed 200,000 gallons of fuel. So one of the things we've got to keep in mind is the scale of the current petroleum-based infrastructure and systems, and that of biofuels are not at all synched up yet. That's not a problem. It's just a statement of fact.

Every human on the planet, when you aggregate it out, sucks up half a gallon of fuel a day. The United States infrastructure transports 250,000 million gallons of fuel around pipelines, trucks, you name it, each day. And I think I've covered most of this already.

The one that I did want to mention is what is it going to take -- remember the chart I had in the bottom right-hand side as I was looking at it, I think it's your left-hand side, those new oil and gas resources coming on. To do the continued investment we need to do in our base business, plus go after those, IEA estimated that's going to take $17- to $20 trillion. I've never tried to write that number out; I think it's got a lot of zeroes with it. That is enormous.

And so the scale of our base business, in terms of the capital that's going to go in, is very daunting. That's why biofuels, I think, has a nice entry there. So, let's talk about some things that we're doing.

When we think about a new fuel technology, this is about how long it takes us. And it's about the same amount of time, maybe even longer, if we find a new oil field. A new oil field might take us 20 years to fully develop to get to this point.

In the biofuel space we're thinking that turning that grass clipping item I told you about into some type of synthetic oil, that could then be processed in a thermochemical. That's probably a good ten years' worth of work.

One of the other things we learned is you don't go from a .01 barrel-a-day lab glassware plant to a 100,000 barrel-a-day unit. People who skip those two intermediate steps never like the result. Because scale-up does matter. And you learn things along the way.

So, we will be approaching our biofuels activity in many of the same thinking. So, we're thinking for these advanced technologies, and I actually would say for the agri side of this, as well, some of these like the purpose-grown energy crops, we're really talking more like a decade, not 100 days or two months.

But the good news is the industry's

already in motion. There's a number of things already happening today. So, we're not exclusively depending on that.

These are all solve-able. Huge amount of press these days about, oh, the biodiesel thing in Minnesota; or, oh, the ethanol thing in Queensland. Those are for the people that don't want it to happen.

And what you need to understand is we know how to make quality fuels. We're bringing a vast number of new people into this business, and they may not have those same experience sets, but by working together there's no reason to believe biofuels can't meet the same consumer quality standards that the fuels that we have today are. This is all solve-able.

I'm going to skip over this. My message about biodiesel, great technology; we're really not going to go very far with it unless we find other feedstocks. Detropha looks very interesting; algae looks very interesting. But strictly if you wanted to make that a very very large fuel, we're going to need to have something besides edible vegetable oil.

Again, this is going to be posted, so

I'm going to let it go. One comment I wanted to make here is we actually believe small-scale manufacturing works just great. And we learned that through our hydrogen efforts. So we were able to convince ourselves that we could make hydrogen onsite with steam methane reforming for the same price as a gasoline gallon equivalent. For a tiny little station, about the footprint of a regular Chevron service station.

The conventional engineering wisdom is you can't do that. That is counter-intuitive; the economy of scale says you will fail. Well, if all you did is shrink the parts and have the same number of pots and pans you would fail. But if you get some of your students involved and some of your bright minds, you'll discover small-scale manufacturing works just fine. You have to be clever about it.

We believe in learning by doing. So one of the things that we're learning and doing together, and Mary Beth will have some more things to talk about shortly, is a demonstration program here in California with General Motors, Pacific Ethanol and the state where we're providing the fuel and they're providing the vehicles and the drivers and so on and so forth.

And we're going to learn kind of well-to-wheels how does this work. How did the service work; how did the fuel work; how did all the things that you need to know work. So that we'll be more confident when we're ready to make those bets and deploy that new infrastructure. We've got data on which to make those deployments.

We're learning by doing in biodiesel. We're a large investor in a facility in Galveston Bay; it's 110 million gallons. Goes online next month. It works great. And you can solve all those quality problems.

But when the price of your raw material unsubsidized is higher than your finished product, it's a tough business. So, it's a transition state that works now economically with those provisos, but long term you don't want to have that happen.

And these are the research collaborations we've got going. Just added one more last week. Our perspective here is as good as Chevron thinks it is, and we are a pretty good company, there's no way we could have all the right ideas. So we want to work with a variety of entities around the country and around the world to understand what could we do for that next generation of technology. Whether it's the conversion technology or it's the agribusiness technology that has to come along with it. And these are examples of some of the things that we're doing.

What I like about universities, and particularly what I like about the young minds there, they've not been polluted by society yet. They don't know what can't happen. So they take very different approaches to problems we've been struggling with for decades, and they solve them. Because they have not inherited our paradigms. So we're very high on working collaboratively with the universities.

The national labs, they have stuff that all of us in this room, through our tax dollars, have paid for that none of us could afford to have because they're so expensive as "one-of's". So working with them and applying that technology here is also very important.

Again, this has already been said, we don't really want to pick winners. We like some of the things that are going on in California, which are performance-based solutions, but they allow the innovators in the marketplace to choose what goes on.

And I think the other one I was trying to make a point on is it will take a little bit of time, so let's be patient. You can edict anything you want, but life will be what it is. So if we can be patient and hang together, I think we'll be quite happy with the end result.

So, that's all I wanted to share for now.

(Applause.)

MS. GILDART: Thank you, Rick. Our next speaker is from General Motors Corporation. Dr. Mary Beth Stanek is the Director of Environment and Energy Program, and has been with General Motors for 24 years.

Her responsibilities are in the area of biofuels and safety policy. And she's currently leading many of the co-marketing E-85 partnership activities with fuel retailers and ethanol suppliers.

Please welcome Dr. Stanek.

(Applause.)

DR. STANEK: Well, good afternoon,

everyone. I think this has been an excellent conference. I think all the information is not only useful, I think it's all knitting together very very well, especially this morning's presentations and some of the issues about proper land management; and then also some of the new activities with the various groups and where they're going with biofuels. So I like to see the convergence that's going on.

And I also like to see the debate that goes on, because out of debate comes really terrific solutions.

I'm going to focus today primarily on our marketing efforts, but I'm certainly going to talk about our policy and also some of our technologies with the vehicles. And as we go through it I'll highlight some recent activities, as recently as yesterday, with our CEO was in Washington with President Bush and the other CEOs, again reinforcing the importance of biofuels.

I think it's important to start at the very beginning where we are, as a corporation. First of all, we want to implement technologies that improve fuel efficiency and reduce the environmental impact. But also it's important to know we are always linking with fuels. Not on designing advanced engines, transmissions, et cetera; we're also working with fuel providers to make sure that we can optimize the systems.

We want to make sure that we're promoting alternative fuels that make sense economically. And they're also environmentally friendly.

This chart we use a lot. It's been revised several times. It's infamously known as the swoop chart. It really is our map of where we're going as a corporation. People say, well, are you hedging one over the other. And the truth is we're not hedging; this is a very deliberate and purposeful plan. We're playing in all these spaces, because again, you know, the over-use of the term no single solution, no silver bullet, it is important that all these technologies grow and mature at the same time.

So this is how we will achieve some of our offsets with carbon and other things, through looking at a number of pathways. The first being improved internal combustion engines. The lightweight materials that are aerodynamics and all sorts of things including transmission, engine improvements in mass, overall mass we're able to achieve a lot more fuel economy. In fact, because we are a large full-line manufacturer, we have more models that get over 20 miles per gallon than any other manufacturer. I don't know that folks know that.

In fact, we also have very affordable vehicles that get close to 40, such as the Avio gets 37 miles per gallon with a price point of about $12,000, $13,000. So we not only are making large trucks an issue, we're certainly participating in very efficient vehicles, as well.

Also, hybrid electric vehicles. We are beginning to talk in terms of vehicle electrification. That covers a much wider scope than traditional hybrids. We have hybrids -- we'll be offering four additional new hybrid offerings this year on our products.

One of them will be what we call the two-mode, which is actually fuel efficiency savings, not only in the city, but also on the highway. This has been elusive with earlier hybrid offerings. And so now you have the ability to save both in city and highway.

We worked together with Daimler Chrysler and BMW on the two-mode effort, and it's really quite outstanding. So you'll be seeing a lot more of that around the fall timeframe.

Also, hydrogen vehicles, Rick talked about it a little bit. We will have a fleet of 100 vehicles in consumers hands towards the 2008 model year. Naturally a lot will be in the coast and, in particular we'll be in California for experimentation and customer evaluation.

But I want to come back to biofuels because that's primarily why I am here today. I have been working with Chevron and several other companies, including some hypermarts like Kroger, Myers, different one to usher in E-85 in key markets where we have an awful lot of vehicle registrations.

So I learned a lot in the pathway of trying to make sure E-85 gets to the markets in an affordable way. So that retailers can find ways to convert that's affordable, working with government agencies such as the one here in California.

And also making sure that there's ongoing and regular fuel sales. Because it is important, not only to revamp an infrastructure, but it's very important to a retailer to make sure they have margins. So I've become much more sensitive to their day-to-day world and that's where I spend a lot of time working to insure this happens.

Our perspective on ethanol, again much of this has been recited this morning, so I won't go through it. But I think the primary thing is renewable, the greenhouse gas benefit, especially of the higher blends. And the future of cellulosic, I think, is very powerful.

Some of the challenges. We do believe that E-85, you know, market is still very limited. And we're glad to see it growing outside of the midwest. But we do feel more work and more incentives to get E-85 in markets such as California, are needed.

And, of course, near-term pricing. This is a little bit older chart, but we just leave near-term pricing on because it's up and down and all over the place. So it's one of the things. It's not very stable.

The U.S. fuel growth. As you know, as well as I do, especially with a green-based ethanol, it's growing pretty substantially. The greatest thing, I think, though, that's beginning to emerge is some of these folks that are very involved in green-based are also moving into cellulosic investment.

I think the recent awards by the Department of Energy were very exciting. I know we have some of those folks here today, like BlueFire Ethanol. Their input source is very very direct of how they're going to go about this. But also, I would add, companies such as Broin, which have been involved in grade-base production of ethanol, are also going into cellulosic. So it's nice to see industry convergent.

We're also excited about some of the awards that were in Georgia with Coastal Ventures and others, which is looking at woody biomass. Because, again, I think when we begin to look at all sorts of input sources, we're really going to be able to grow the fuel even to be of a quantity that matters that offsets some of our current carbon and fossil fuel usage.

This chart was generated through a consortia group at GM with some of the universities. And, again, it was doing an assessment of best land management and assumptions of developments in enzymes and pricing, and understanding how much really could we get if we got into cellulosic ethanol. When I say we, I mean we as a nation.

And the general belief was that around the time of 2020, even with growing energy demands, that there is a potential to offset total energy use with about 35 to 39 percent. This number has since been kind of recasted. It's a little bit higher. But I think you're going to see all sorts of range variance on this number, depending whether it's, you know, a billion-ton study, or 25-by-25. But at least it's showing people believe, through their own kind of efforts, that biofuels will be a great offset to our current energy needs.

I don't think we'll spend too much time in well-to-wheels. I think we talked a little bit this morning about the great analysis that was done by Argon. And essentially assessing all the inputs al the way through. Is it on a positive energy balance. We believe it to be. We do believe Michael Lang's work is very good.

And we also think, as we move from green-based to cellulosic or generation two, that those benefits will really be reaped.

One of the things, though, I think it's important to amplify and emphasize, and it was mentioned a couple times already, you must start somewhere. I think for those of you who have been involved in biomass, especially at the research level at your universities, you've known how to do this for some time.

Moving that research into commercial scale; monetizing it, getting investors has been the harder thing to do. And so I think what you're seeing is with the increase in demand it is attracting the capital markets to generation two fuel. And I think that is critical.

I think ongoing support by DOE for funding, and through the award-based approaches they're doing is also critical.

So I think, as we talk about green-based and how there's a ceiling on that, I think it could serve a very very good purpose; not only supplying us current biofuels, but also creating demand around the need for ethanol, driving us to generation two.

Again, the studies we've all looked at. I'll just summarize for those of you who haven't seen this, this is sort of an assessment that Wayne did, looking at the net energy balance. And he put a lot of researchers kind of on one chart and said, where are they; are they above or below the line. And in his opinion the majority of researchers with adjusted inputs and outputs say that -- grain-based ethanol is positive. We know that will improve with additional efficiencies.

Also we're beginning to see some of our grain-based producers also producing two types of fuel from one input, so they're getting ethanol and biodiesel, and they're also getting high protein distillers grain.

So I think this is something that will continue to work, and there will be greater efficiencies over time.

From an automotive perspective we have 16 models; currently there are 14 because two are retiring, and there's more coming on. We are expanding our offerings as fast as we can. As you know, we've committed to double the goal from 400,000, 800,000 annually. And we've also signaled that we would go to half of our production by 2012, assuming all the other right things are in play. Enough ethanol, enough infrastructure, we will gladly participate in rapid growth.

Some of the things I've been working on is, again, trying to make sure that as we move in E-85 that this becomes a consumer fuel choice, that it's a regular fuel purchase. One of the things we've done is we've changed the vehicle to put exterior -- on; the other OEMs, many of them are adopting these features, as well.

We've done a national advertising campaign called -- go yellow. We're also very focused at the regional level now, working with our dealers and regional marketing arms to make sure that once these stations open that we're directing our customers to these stations who are flex-fuel owners. We're encouraging -- drives and offering fuel coupons.

In Chicago and Minneapolis last year if you came and bought a GM flex-fuel vehicle you were awarded a $1000 fuel coupon to a partner stations that offered E-85. So what we're doing is a continuous, a reminder that E-85 is available in these key markets.

We also have a website in the green or yellow, which, you know, talks about our products and also the benefits of ethanol. We've done an awful lot at auto shows. And we continue to talk about biofuels and spend a lot of time, particular this year you'll see some in Houston and certainly in the Ohio markets, where we are opening E-85 pretty quickly this year.

Whenever we have partnership announcements we do kind of base it with a governor announcement and subsequent fuel stations. And this is just some samples of some of the ads we've run, thanking our partners for participating in the biofuel promotion.

This is a list of our partners so far. I'm also pleased to say that this list is outdated. We've added nine additional partners from the Colorado market. And we had an announcement there around mid-February, additional 40 stations which GM will be supporting with dealer and regional marketing.

This is kind of a little bit out of whack. Looks like I've lost my margins. But this is sort of an example of the partnerships we've been doing around the country. It's just important to know that we have partnerships in 13 states which are supporting and have kind of helped broker over 250 pumps in those states.

We're active in most states across the country now, trying to develop more marketing opportunities for E-85. Especially where we have a lot of regional density of flex-fuel vehicle ownership. We have over 2 million vehicles that are flex-fuel on the road, and we want to make sure that those owners can experience the fuel, if they so choose.

Another thing we do is we work on the governors ethanol coalition. We provide each of the governors who are member states a -- vehicle. They're used for promotion and awareness. You might see them at state fairs or at various events. It's not only a good marketing program, it's a good awareness program for those in legislative groups to understand that there are products available right now for purchase. And in particular we often have the Avalanche or the Tahoe or the Impala.

So, that's it. I wanted to speed this up a little bit, so I hope I got you back on time with that.

(Applause.)

MS. GILDART: Thank you. Yeah, that has

brought us up pretty much almost on time. Our next speaker is from the California Public Utilities Commission. Her name is Judith Ikle. She's a Program Manager in the Energy Division, and works in the procurement, renewables and climate strategy branch.

Her responsibilities include electric procurement and resource adequacy, the renewable portfolio standards program, distributed generation and the California Solar Initiative.

Prior to joining the Public Utilities Commission in '98, she worked at the USEPA as a policy analyst in the climate policy and programs division. So, please welcome Judith.

(Applause.)

MS. IKLE: I wasn't here this morning, but how many of you live in California? How many of you are from California? Okay. About half.

For those of you who aren't familiar at all with the Public Utilities Commission, which is probably all of this audience, it basically is an economic regulatory agency that's based in San Francisco because the reform governor who established it as the railroad commission wanted to keep it away from the influence of the politicians in Sacramento. And it sets rates and allocates costs for investor-owned utilities.

In the energy sector, in the electricity sector, that's about 80 percent of Californians load is investor-owned utilities, Pacific Gas and Electric Company, Southern California Edison, San Diego Gas and Electric are the big utilities. So it doesn't regulate municipal utilities like SMUD, which is the local utility here.

So I was asked to talk about the emissions performance standard. It's an important step in changing the carbon intensity of the electricity generation that California's investor-owned utilities spent more than $10 billion on each year. And that's basically the half the room that raised their hands, your money, you, as ratepayers, you know, pay for buying all this electricity that PG&E provides.

The emissions performance standard prescribes a maximum rate at which a pollutant may be emitted per unit of a given output. And we recently adopted a standard, and it's 1100 pounds of carbon dioxide per megawatt hour generated. So it's kind of an old-fashioned government setting standards, shaping market choices.

And basically California ratepayers agree to pay utility contract costs. And in effect, this can provide financing for generation facilities. The CPUC, and we have five commissioners that are appointed by the Governor, had reached consensus that ratepayers shouldn't be exposed to the risks associated with high carbon electricity choices and sources. So they set this standard.

The California Public Utilities Commission is basically pretty much ahead of the game, a pioneer, in terms of public utility commissions. A few years back we had, for the first time, a climate change en banc hearing where all the Public Utilities Commissioners sat and heard from all of the utilities about what they were doing in climate change. And that included the energy utilities, but also we have communications utilities, railroads. We even actually regulate airport shuttles in some cases.

So we started our climate change activities quite a few years ago. This led to a 2004 decision in the long-term procurement proceeding, which is the proceeding where the utilities put forth plans to enter into long-term contracts and procure electricity.

In that proceeding in 2004 we adopted a greenhouse gas adder which is used in evaluating bids. And that was another kind of first-time-in-the-country sort of thing.

The emissions performance standard was initially signaled through the issuance of a policy statement in October of 2005. And then we started a proceeding, which is an order instituting rulemaking. We're basically a quasi-judicial body, so it's hearings and judges and stuff like that.

And in that rulemaking we adopted this emissions performance standard; and we also signaled that we would be establishing a load based cap. That was issued in April of 2006. A load based cap really relates to what has now become AB-32, and the greenhouse gas activities that CARB is overseeing.

We are very interested in pursuing a load based cap in the electricity sector because electricity makes about 20 percent of California's greenhouse gas emissions. And about half of that is from imports. Imports only make 40 percent of our electricity, so there's a disproportionate amount of California's greenhouse gas emissions that comes from imported power.

So by imposing a cap on load, we feel that we can get at the whole problem of greenhouse gas emissions from the electricity sector.

So, within this rulemaking we kind of had this back and forth in terms of we started something, and then the Legislature actually mandated something through SB-1368. We adopted the emissions performance standard in the January meeting a couple of months ago.

The emissions performance standard covers what we regulate in the long-term procurement area. So, all new or renewed contracts of five years or more, it covers only baseload generation, so not peak power; and it applies at the facilities level. We do allow some substitute system power for basically firming up renewables.

In terms of implications for bioenergy, basically we're going to need more low- and zero-carbon power in California. And bioenergy is automatically deemed compliant under the EPS if it comes from -- if the source of the fuel is open burning -- the source would have otherwise been disposed of through open burning, forest accumulation or landfill.

And if there is fuel that's grown specifically for this, then there'd be more of a full cycle analysis. Also, the emissions performance standard does not allow for renewable energy certificates to substitute in compliance for it.

So, luckily, Hal LaFlash from PG&E went over a lot of the elements of our other activities related to bioenergy this morning. So I'm just going to -- hopefully this is a review for all of you. You know what net metering is. It's basically that the generator is credited at the generation -- okay, the generation is credited for onsite power at the generation portion of their rate. And you know also what a power purchase agreement is. That renewable energy can be purchased by the utility through a negotiated price.

We also have something which is actually a live issue before the Commission right now that I wanted to bring your attention to. A renewables purchase power tariff. Leland Yee has proposed some legislation which passed last year which basically requires utilities to purchase renewable energy from public water and wastewater agencies via a standard tariff.

The standard tariff would be the market price referent, which you're already familiar with, which we set every year. On March 12th, the Public Utilities Commission asked utilities to propose a standard tariff by April 11th, and to comment on whether to make this standard tariff available to other renewable generators.

So this is an active proceeding at the Public Utilities Commission. To participate in this proceeding you need to be a party. It's a fairly formal process, but I'm sure some of your, you know, industry groups are participating in this. And this basically opens the possibility that there would be more of a standard tariff for purchasing renewables, depending on what decision comes forth through this process.

And that might allow people to sell more than they consume onsite. So, basically selling excess power. You know about self-generation incentive programs, I'm sure, already.

I just wanted to finish up with our RPS program which we also, I think you heard about earlier this morning, in terms of all the various renewable contracts. This is basically the utilities buying large-scale power contracts to comply with our renewable portfolio standard. This renewable portfolio standard says that they will have 20 percent renewables by 2010.

The good news is that we are on track, given the short-listed bids and the contracts that we already know about, to meet the RPS target, although it's going to be close. And I'm sure we'll be hearing more about that.

There was reference to an expanding pie; I guess it's more like a Napoleon here, with the base being biofuel, as you can see at the bottom. We do have expanding load in California. So there's going to be a need, if you have 20 percent renewables and the amount of power you require is increasing, then that megawatt hour requirement is going to increase, as well.

So we are going to -- you know, biofuels make up a good proportion of our current mix. They are going to stay high in terms of the megawatt hours; however, they will decline in terms of the relative percentage according to the information that we have now.

However, we do have continuing requests for offers and additional contracts that we will be adding to the database in terms of how we track progress in making the renewable portfolio standard goals.

That's about it. And now we're on track.

(Applause.)

MS. GILDART: Well, thank you. That was a very good and quick overview.

(Pause.)

MS. GILDART: Our next speaker comes to us from the Philippines. Raphael Lotilla is the Secretary of the Philippine Department of Energy. And he will discuss the recent Philippines biofuels policy framework, which addresses energy security. And a new law that was passed in the Philippines in January dealing with biodiesel, gasoline and their bioethanol program.

So, Secretary Lotilla.

(Applause.)

SECRETARY LOTILLA: Thank you. In the interest of speeding up the proceedings, let me focus on just a number of things.

Before we passed the biofuels law, we

decided to go ahead and jump-start the biofuels initiative in the Philippines by adopting certain administrative measures for government agencies. So the President issued an executive order which mandated a 1 percent, use of 1 percent blend of cocomethylester in government vehicles where supply was available.

But in January of this year our Philippine Congress passed into law a republic act which, among others, mandates minimum blend into all diesel and gasoline fuels for the following: 1 percent biodiesel within three months from activity of the law, which will fall around May of this year. And then a 5 percent bioethanol within two years from January, from 2007. And any future increase in mandatory blends to be determined by a biofuels board.

Now, the initial, if you take a look at the objectives of the law, of course the same concerns that have been discussed here were present, but the moving elements were increasing the economic activity in the country by boosting the agricultural sector; and to improve air quality.

Now, among the incentives that are

provided for in the law are zero specific tax per liter as against fossil fuels, which bear the burden of specific taxes. And exemption from the value-added tax. The value-added tax for fossil fuels is at 12 percent as against zero for both renewable fuels and for all renewable sources of power.

And then, of course, there's exemption from classification of -- from wastewater charges of water effluents from the biofuels production process. And preference for financing for related activities.

Now, as I mentioned, the targets for major feedstock. And right now the focus is on transport sector, because in the Philippines 58 percent of the total oil imports is consumed by the transport sector. Nevertheless, both -- the other sectors, including power and industrial fuel use, are also subject to the requirement for mandatory blending.

And in the meantime we are having alternative fuels being used on an experimental basis for innovative stoves being developed locally.

Right now, I'd just like to draw to your attention that most or all of the bioethanol production in the Philippines is imported. And while we are encouraging the use of bioethanol through elimination temporarily of the import tax, so it's down to zero, we intend that this, of course, is going to be substituted for by domestically produced ethanol in two years.

The supply infrastructure, if you take a look at this slide, you will find out that if we are going to require E-5, then two years from now it would either require additional cane hectares of 63,000, or a yield improvement for sugar cane of 17 percent. But, the 268 million liters actually can be met from existing production.

So, as shown in the slide, we have around 264 million liters per year committed projects, which can meet this demand.

Now, the supply for feedstock is being also addressed as there are areas which may be converted from sugar production to ethanol. Now, with respect to the conflict between feedstock used for fuel and for food, we expect that these will not be a huge problem for ethanol in the first year because of the presence of a surplus at this point.

And so we are looking at other bioethanol feedstock, as well, including sweet sorghum, casaba, corn and sugar cane. But as you can see from this slide, the most efficient production is from sugar cane.

Now, in the biodiesel program our best candidate right now is from coconut. Coconut biodiesel or cocomethylester. And we have enough volumes, again, of production in the Philippines to meet the demand. But the Jatropha methylester, this is still mentioned, still in process.

Now, for the various technical requirements and standards that we have had to promulgate we have had the assistance also of the NREL, and through USAID. And the supply infrastructure, as I mentioned, is in place.

So, the Jatropha plantations are being put up all over the Philippines, but, of course, we are discouraging conversion from other crops to Jatropha, because as of right now we are encouraging the use of Jatropha primarily for its ability to regenerate marginalized lands.

So we expect foreign exchange savings in the case of diesel, nationwide, when it becomes mandatory, of at least $50 million a year. And in the case of ethanol, a 5 percent blend would bring us to around $184 million U.S. dollars in foreign savings.

So these are some of the issues that you have pointed out, are the ones that we are facing in the next few weeks, actually. So, for example, the use of cocomethylester is expected to introduce a 16 percent increase in the pump price, at most. But we are hoping that the oil companies are going to -- who have expressed support for the biodiesel program, are going to assist by absorbing some of the initial costs that will result from the introduction of biodiesel.

So, I think, on the whole, we see a positive impact of biofuels on the entire economy. Thank you.

(Applause.)

MS. GILDART: Well, our speakers have done such a fantastic job of getting their word across that we're now ahead of schedule. We will have time, in this session then, to have some questions. If folks do have any questions, we'll have the microphones.

MR. NORWOOD: My question is for GM, specifically. I'm wondering if you're doing any research into engines with higher compression for use with E-85 or higher blends of ethanol.

DR. STANEK: We always are looking at optimization technologies. I think that's a very good question. One of the issues, as you know, is with different Btu, if you're in a flex-fuel vehicle, people have the assumption that it's maximized for gasoline but not for ethanol. That's not the case. We actually are optimized for ethanol in our vehicles right now.

Going beyond that with supercharging and different things to harvest more out of it are always being studied. And we're always also trying to balance it from consumer affordability standpoint, because that adds a lot of price to the vehicle.

But more importantly, the thing that we have to navigate very carefully is calibrating for emissions. So we were doing optimization studies or vehicle studies; we're looking into building our calibration around vehicle performance for gas, for ethanol, and also for emissions. And that's actually a lot of work, a lot of engineering investment.

So we are looking at it; it's a part of

the whole portfolio. So, did that answer your question?

MR. NORWOOD: Yeah. Can you talk a little bit more about the emissions and what kind of problem you see with ethanol emissions versus gasoline?

DR. STANEK: From a calibration standpoint or just from an environmental standpoint, or both?

MR. NORWOOD: From both.

DR. STANEK: Okay.

MR. NORWOOD: More from an environmental standpoint.

DR. STANEK: Well, I think it's really important to know that from an emissions standpoint all the automakers have really had amazing achievements in vehicles because of working with EPA and the Air Resources Board of California and other agencies, have insured that the new vehicles are really terrific.

When you get into the higher blends of E-85 you're going to find that the emissions are good, because we measure greenhouse gas. But also from permeation, you know, tank permeation is really much better than lower blends. So, there's a lot of benefit to that, too.

But, you know, we are required by law to meet a certain emission standard. And there's no variation on that. So, we are self-certifying, but the emissions are very clean regardless if they're for gasoline or ethanol, they're the same.

And obviously we see a reduction in CO_2 when you go to high blends of ethanol. There's some debate on the level of NOx, whether it's increasing, the same, or what-have-you. But I think there's some additional studies. I think we saw a little bit of it this morning, as well.

MR. GUERRA: Hi. I was wondering when is GM going to go ahead and warranty B-100 in their motors.

DR. STANEK: Okay, I'm going to ask that biodiesel questions, we haven't talked about it as much as we have ethanol. We support the B-100 ASTM spec. We also need a better B-20 spec. And this isn't just for General Motors. This is all the automakers. Until we see that spec being out there, and it's in process, it's going to happen, and hopefully it'll be relatively soon. Because we have to build our engines around a B-20 standard.

The other thing we need, and this may seem unusual coming from automakers, we need enforcement of biodiesel out there. So B-20 is being retailed in the consumer market. We need to avoid some of the situations that we saw in the states that ratcheted up to B-20 without enforcement by EPA.

So, the question you really came back to is when is this going to happen. So I would say we're going to certify B-100 engine, we're going to certify the B-20 first. And then that will be in the relative near term for most of the automakers, and especially for GM.

MR. GUERRA: Okay. I've spoken to most of the major builders and manufacturers of farm equipment. And as of next year they'll all be B-50. In the following year or the year after they'll all be B-100. Seems to me that the auto industry is very far behind.

DR. STANEK: You know, I think if we had more time I would debate that. I think they are the small engine manufacturers have indicated some of the big ones that they would certify the B-20.

I have not seen, and I may be wrong, a large engine company certifying the B-50. I may be wrong, and I apologize if I am.

MR. GUERRA: Cummins, Newhall and International. We're from the ag industry. And here in the Valley we went to the ag expo and we spoke to all the engine representatives from all the major manufacturers for farm equipment. And they're all saying the same thing. We're on board.

DR. STANEK: Well, we're on board, too, but I'm hearing B-20 first. And fuel standards are critical. Cummins is not going to go out there if there are not fuel standards.

MR. GUERRA: Oh, yes. I make biodiesel for a living. Fuel standards are all about it. If it's not clean and pure then why are we bothering. So, thank you.

DR. NAND: My question is in fact, a follow-up question. First of all, you know when going to be decided to start off, you know, lower the consumption of the fuel, gasoline, et cetera. The first thing comes to mind that your fuel efficiency should be much higher. In general, general criticism -- in Washington, all the hoopla is going on, Victor or somebody, I don't remember, from environmental group. He made the comment that, yes, ethanol is a good business because you are jumping on that wagon. But still the efficiency of the cars, in fact, you know, they're far lower in comparison to other countries, especially which was coming from Japan. I'm sure you are trying to improve it, but that's very important.

Now, I live in southern California, which is -- all the cars and the way you drive. And all the air pollution problems which we have, in fact, 70 to 80 percent, is from automobiles. In fact, mobile sources.

Now, you were saying that the emissions overall you have an efficiency, but when you use ethanol, actually, can you tell me that what happens to your NOx emissions and VOC emissions; that is the real cause for the smog formation. What happens to that?

DR. STANEK: I think the answer to the previous question depends on whose study you want to use. If you select a Bruce Dale (phonetic) study from MSU, and other folks, that they say could be the same, or could be slightly higher. It's all dependent on the processing of the fuel all the way through, you know, wells-and-wheels, again.

So, it just depends. And, you know, I guess it's your -- you obviously read various studies. So we know CO2 goes down. I think the NOx and VOC, I think those still have to be looked at.

MR. HOEKMAN: Hi, I'm Kent Hoekman from Desert Research Institute. I have a question for Mr. Zalesky. You didn't speak very much about hydrogen in your presentation. I wonder if you could give us some comments about biomass-to-hydrogen, and whether you see that as a growing concern.

MR. ZALESKY: Our perspective on hydrogen is that if you're asking the holy grail question of what do you really need to do to make those CO2 concentrations come to life, we would agree with General Motors that you should not give up on renewable-derived hydrogen fuel cell vehicle. But that technology isn't ready for prime time, yet, so you got to do what you got to do.

So, we're still very actively involved in that. But we see it as maybe something that's a decade or more away. Where biofuels are here right now.

One of the interesting things about all those more difficult hydrocarbons to discover is, to use a technical term that my son invented for me, was they're hydrogen hogs, dad. Things that require more processing typically require more hydrogen. Biofuels, if you're going to convert them thermochemically are right in that camp.

So one of the things that we'll be looking for is if the pathways for thermochemical conversion in fact become viable for biomass, then you're going to need hydrogen to support it.

So in parallel to that technology, what other aspects of the conversion step could you use to make your own hydrogen from the biomass.

So, we see those as an enabler to that other technology. It's usually skipped over. Most people don't ask that level of question. But, we think you're going to have to have it somewhere. You got to get rid of the oxygen somehow.

MS. GILDART: Question in the back?

MS. MORGENTHALER-JONES: Last Saturday in Florida there was --

MS. GILDART: Please identify yourself.

MS. MORGENTHALER-JONES: Lisa Morgenthaler-Jones, LiveFuels. Last Saturday in Florida there was a panel where other representatives of GM and Chevron were present. And the question is the point was made that there are more cars than there is ethanol at this moment, and that's likely to continue to be the case. We can't satisfy the need for ethanol.

But another point was made by one of the audience members which is that it doesn't work well in northern climates. And so an E-50 blend is likely to be the maximum that's really tolerable.

Would you talk about that? Are there additives that can be used? Is that reality as we know it?

DR. STANEK: Obviously I'm not sure where this discussion took place. I will tell you that E-85 is fine in northern climates. Now, in the winter it is ratcheted to E-70 because you need more gasoline for cold start. But it's not bad. I mean it's just a different blending for what they call winter and summer blends. And actually that goes on with gasoline blending, also, right now. So it really is perfectly fine for everywhere in the United States and Canada. And it's just a matter of use in having flex-fuel availability.

MR. ZALESKY: Mary Beth got it right. The other thing that often comes up is how do you use biodiesel in very cold climates. The answer is you have to know what you're doing. And so you have to understand that the properties of the mineral diesel that you're blending in can offset from -- and typically what you're worried about is it gets cold and the material that's in the biodiesel will crystalize, turning into a material that doesn't flow very well for diesel engines.

So between additive packages, understanding the constituent of the diesel from the petroleum side of it, as well as the biofuel, if you know what you're doing you can manage that. If you just slap together any old stuff in any old way, you're going to put something out in the marketplace that won't work for a consumer. And they will walk away from that fuel for quite a long time.

So, shame on us if we allow that to happen. That is Mary Beth's point about enforcement. You really do need those standards because the standards would say you can't do that. If you don't pay any attention to the standards, unfortunately today there's nobody checking. And so you can make fuel that is not to spec.

Ultimately that won't happen. These will come into place, the standards will be there. So it's great that anybody can get involved; there's another side to it, and that is you really do need to understand a little bit of the technology involved. But it's all manageable. This would be my response.

MS. GILDART: Question in the back there.

MR. GAMBLE: Paul Gamble, Norcal Waste. Mr. Zalesky, I understand -- I really appreciate what all you guys have to say, firstly. Secondly, when you presented the infrastructure paradigm and how it's probably not going to shift all that much in terms of what's established right now, and then you said there can be refineries that are the size of gas stations or smaller.

Do you see that being the model that's to come, where it's kind of a smaller, more regional system that's based on localized feedstock?

MR. ZALESKY: If I knew the answer to that I wouldn't be sitting here, because that would be crystal ball stuff. I think what is perspective, our point of view is could very well be both.

For example, I see it very viable for the middle of some farmer's cropland that they have some technology that converts that crop into a form for further processing. And that technology could be strikingly similar to the kind of technology that might have been in the Richmond Refinery where I came from. That's very possible. I think it's going to be logistics and site-specific.

On the other hand, if that farmer's field is right next to the Richmond Refinery, they're probably going to take that stuff, stick it in the pipeline and pump it across to the fence. Because that would be the most economic way to deliver.

So, I think it's going to be very geographically dependent. What's nice about biomass is it grows lots of places. And you're going to have to adapt your technology to that. And so that's kind of what we mean.

So, the people that say, I told you it wouldn't work, and if their "I told you" is founded on you can't have small-scale technology work successfully, I would say that's bunk.

So, exactly how much of one flavor versus the other, we don't know yet. Because the technology hasn't been invented to work all that out.

MS. GILDART: Okay, thank you. You will notice in your packet that you were given at registration that there are two survey forms, one for each day of the forum. And I just want to make sure that at the end of each day you take a moment and fill it out and turn it in, so that we can get some feedback on what the forum presented.

We are ahead of schedule a bit, which is wonderful. It means we'll be able to make up the time that we sort of cut from an earlier panel. They didn't get a question-answer session. So, we probably will fold that into the end of the day and have a longer question-answer for both panel two and panel four.

So right now we are going to have time for a break. It will be 15 minutes. So please be back here at 3:10, I guess. Thank you.

(Brief recess.)

MS. GILDART: There is some good news. I want to give you instructions on how to get to the reception.

(Pause.)

MS. GILDART: Okay, well, for those of you in the room you'll notice at the end of the program today there is a reception. It is sponsored by four industry members, BlueFire Ethanol, Pacific Gas and Electric, RealEnergy and Waste Management, Incorporated.

It's at the Sheraton Grand Hotel, which is just three blocks from here. You go out the front door here, the Cal-EPA, go one block over to J Street, turn left and go up about two blocks. It's at 1230 J Street. You can't miss it. Very large building.

When you walk into the building the reception's at the far left-hand side. There's a little interesting history. When they built the Sheraton Grand they had to build it around a historic structure which was called the Sacramento Public Market. And it is a Julia Morgan designed building from the early part of the last century. And I think it's a very attractive venue for our reception.

So I do hope you will all attend. There should be, in your registration card or packet, a couple of drink tickets you can use when you're there.

So, our last session of the day is on biorefineries. And the first speaker is Dr. Eric Larson, who's on the research faculty at Princeton University. And is a senior member of the Energy Systems Analysis Group in the Princeton Environmental Institute.

His research focuses on technology assessment and systems analysis relating to clean energy production and use. Advanced biomass energy system has been one of his main research areas for the past two years, and he will be speaking to us today on advanced systems for biorefineries.

Dr. Larson.

(Applause.)

DR. LARSON: Thank you. I see the timekeeper isn't here right now, so I'll try not to take advantage of that.

So I'm going to speak about advanced gasification based system concepts. And the kind of work that my group does, we look at systems that are not here today commercially, but if they were to be developed commercially would it be worthwhile -- would they make sense at that point. So we're looking at systems a few years down the road. But in this case, not too many years down the road, as you'll see.

And let me start by first defining what a gasification based liquid fuel is. And these are three that I'm going to mention in my talk. I think some of you are familiar with all of these, and others may be with some of them.

Fischer Tropsch liquids, the so-called gas-to-liquids, a synthetic diesel, and also a gasoline blend stock can be derived from it. There's a huge investment going on in the gas-to-liquids industry in this technology. There's also huge investments going in in China and starting to be contemplated in the U.S. for converting coal to Fischer Tropsch liquids. And there's also an initial plant in Germany that's commercializing it from biomass.

A second liquid fuel that you can make via gasification is dimethyl ether, which is what's used as a hair spray propellant today. But it's a cousin of methanol and it's actually an excellent diesel engine fuel. It's also a propane substitute. It has the similar properties of propane. So you can actually blend it.

And in China there are large investments going in now to make dimethyl ether from coal. There is, of course, long-standing methanol production which is, again, very similar to the process for DME, making methanol from coal. There's a lot of, again, investment going on in DME production from natural gas. And there's some interest in this idea on the part of the Swedes in making DME from biomass.

Mixed alcohols is another thing that you can make via gasification. It's ethanol plus higher alcohols. And all of these liquids are made by catalytically converting CO and hydrogen, which you derive from a gasifier. And using the appropriate catalyst and the appropriate conditions you can get these various fuels.

The mixed alcohol development is not commercial today, unlike the DME and the FTL.

So these are the kinds of fuels I'm going to say some things about. And we've done quite a bit of analysis on gasification related systems over the last several years, and I've listed some references you can dig into details if you'd like.

I was going to talk about sort of three types of systems today. I think I may skip the first one in the interests of time. But one idea is making Fischer Tropsch liquids or DME at a stand-alone, what I call a stand-alone biorefinery using switchgrass. This would be a very large scale, by biomass standards, something like 5000 dry tons a day of biomass coming into the facility and making Fischer Tropsch liquids.

I'll say some things about that briefly. I'll also talk about what I think is a more promising near-term option is integrating biorefining with the craft pulp and paper industry. And the feedstocks there are black liquor, which is the lignin-based material that comes as a byproduct from extracting the cellulose for fiber production. And I'll get into some details there.

I'm also going to say some things about using biomass and coal together, which I think is a very interesting near-term option that's worth looking at.

And finally, I'll also bring in the idea of carbon capture and storage deep underground in saline aquifers or for use as enhanced oil recovery. And this idea of CO2 capture and storage is becoming quite prominent in the fossil fuel energy circles. There's a couple of major sort of million-ton-per-year CO2 storage projects ongoing in places in the world now, and a couple of other projects at the planning stages. So, it's an idea that I think is certainly relevant for fossil fuels, but it has some very interesting things that it brings to the biomass option, as well.

So, first this is a system for a stand-alone production of liquid fuels from biomass. And I'll just go through it quickly. You have an air separation unit that makes oxygen which feeds a pressurized biomass gasifier. In this case, our particular design, we used a fluidized bed gasifier like the one that the Gas Technology Institute has been developing.

What you come out with after gasification is primarily CO and hydrogen and contaminants. And you need to clean up that gas, cool it down in order to then remove what little bit of hydrogen sulfide there might be and CO2. And the reason you remove these is not because of the blue oval there. Even if you're not doing underground storage of CO2, you still need to take these things out in order to improve the efficiency of the next step, and to keep the catalyst from being poisoned, the FD synthesis step where you make the liquid fuel in a raw form. And then you upgrade it into the finished product that you want.

And in the particular design that I've shown here where there will be some unconverted gas that comes out of that synthesis stuff, and we send that to an electric power plant to generate export electricity as a byproduct.

And I think I won't go through the -- well, then in the case of the CO2 storage, the last couple of bullet points, typically you would compress CO2 to 140 atmospheres for pipeline transport to bury it deep underground, or to use it for enhanced oil recovery.

And so we've modeled systems like this in quite a bit of detail. And I won't go through, I think, the details of this; except I'll just come to the conclusions. Because, as you'll see, the reason for the conclusions is the technologies that are in that type of system are, I would say, near commercially ready.

Everything downstream of the gasifiers, commercial technology in the gas-to-liquids or coal-to-liquids industry. And what's left to be demonstrated at a commercial scale is the gasification step. But I think we're quite close to that, and a concerted effort to do that would have this technology able to be built at commercial scale within a few years time.

However, the economics that we went through in our analysis were not very promising. If you're using a crop like switchgrass, which it's not cheap to grow switchgrass. And if you don't have a value on the carbon emissions avoided with this system the economics don't look very promising. That's even in the case if you can sell the CO2 for enhanced oil recovery. You still need oil prices that are above $60 a barrel to be interesting.

If you do have a value on greenhouse gas emissions, which looks like is certainly coming down the road pretty quickly in this country, the economics look a lot better. But you still want to go with larger scale facilities to get the scale economies with this particular type of technology. So the logistics of that biomass supply are going to be pretty challenging in the near term.

So, how to get started today with this gasification-based system, well, the one place to look is in the craft pulp and paper industry. And this is a project analysis that we finished up. It was a couple of years of effort with support from the Department of Energy and the forest products industry.

Focusing on the existing biomass energy sources in a craft pulp mill. Craft pulp is the primary type of pulp that's made in this country. The U.S. industry already uses about a quad and a half, an -- joule and a half of bioenergy. And most of that is black liquor. And just to put that quad and a half in perspective, the total energy -- primary energy consumption in the U.S. is about 100 quads. So this one source of biomass is equivalent to 1 percent of what we use in energy in the U.S.

The paper industry is in a kind of an interesting situation where they're getting the pulp beat out of them by the international competition. Sorry about that. And they're looking for ways to diversify to stay in business, basically, to put it bluntly.

And a promising avenue is gasification technology coming in to be able to make alternative products from their traditional ones.

And on top of that you have an age distribution of the equipment in pulp mills, particularly the black liquor boilers that are used to convert the black liquor today to make steam to run the process. And those recovery boilers are aging; and I've shown a graph here that shows that most of the boilers were built in the '60s and '70s in the U.S. And with a 30- or 40-year lifetime they're ready to be replaced. The red bars indicate a rebuilding that's going on to try to extend the lives of these things.

So, there's an economic opportunity to bring in new technology that you don't have in this situation where the equipment wasn't ready to be retired.

And so we looked at the idea of bringing in gasification technology and integrating it into the pulp mill system and seeing what kind of impact that could have on the overall economics of biorefining.

And this is, again, a sketch of what kind of system we've modeled, in quite a bit of detail, both from an energy balance and carbon balance standpoint, as well as from an economic standpoint.

Again, we have, up in the top set of blocks -- a little bit hard to read -- but you have black liquor coming in from the left into a pressurized high-temperature gasifier which looks a lot like the one down below here. It resembles an entrained flow coal gasifier for those of you who are familiar with coal gasification. And it's, in fact, being developed by a Swedish company and using some of the ideas that come out of coal gasification.

Following the gasification you have a gas now, a synthesis gas, that has to be -- I think somebody set this on a timer to keep me under control -- you need to clean up the gas and cool it down. And then in the case of black liquor, it's a sulfur- and sodium-laden mixture, because those are the pulping chemicals.

So you need to -- the sodium comes out

of the gasifier in a condensed phase. The sulfur, some of that comes out in the gas and you need to recover that, both to prevent poisoning of your downstream catalyst, but also to recycle back to the pulp mill to keep the economics of the pulp mill reasonable.

So you take out, using rectisol technology, which is again off-the-shelf acid gas capture technology. And then, again, a once-through Fischer Tropsch synthesis process where you convert the gas to liquids. And in this case we decided to, we'll just make a crude liquid and sell it. We'll ship it off to a petroleum refinery where they'll refine it into finished product.

And then left-over gas, in this case, goes to a gas turbine, combined cycle, to make electricity. And also to provide, very importantly, the process steam right here, process steam to the pulp mill, because that's essential for the mill.

And then a pulp mill also has access to woody residues of biomass. Some of it comes from the logs that are chipped to make the pulp wood chips. And then there's additional residues that are available in the forest. And the infrastructure is already in place for collecting these.

And so we decided to look at, if you're going to go to biorefinery refining you would want to try to maximize the benefit that you get out of those, as well. So we put in a biomass gasifier in this design to go with the black liquor gasifier and augment the syngas production.

And so with this kind of system, we looked at several different designs all in the same amount of detail. And this summarizes the technology that's in all of these seven different detailed designs that we developed.

And without spending a lot of time on it, the one column that's marked status, I just want to emphasize, all of the technology is either commercial or has been demonstrated at a pilot scale where the next step is commercial scale. Except for one item, which is the -- which I consider to be still at the laboratory scale, which is the synthesis catalyst for mixed alcohol production.

But everything else in these systems is essentially near commercial technology. So, it's not far out sort of ideas that we're dealing with here.

I think I'll skip the detailed discussion of how the performance of these things comes out relative to sort of existing technology. But I will show you this graph, which a lot of people talk about how much liquid fuel do you get per ton of biomass that you put into the system. And I've tried to show a comparison here.

The top scale is in gallons of ethanol equivalent per dry ton of biomass. And the bottom scale is gallons of gasoline equivalent per dry ton of biomass. And the various bars are different studies that have been done of biorefining.

The bars above the dashed line represent sort of stand-alone facilities that aren't integrated with a pulp mill. The bars below the line are integrated with the pulp mill. And you can see, without going into details, the integration gets you a lot of benefit in terms of the effective efficiency with which you're converting biomass into a liquid fuel.

And the reason you're getting that benefit is because some of the biomass is going to supply the needs of the pulp mill, and so you're getting a credit for that biomass. So it's effectively a very efficient way to use biomass to make liquid fuels.

We went through detailed capital cost estimates, and, again, without going into details, these are the overnight capital costs for the biorefineries. They cost two to three times the cost of replacing an existing system at a pulp mill with the same technology that's there now. So there's a much bigger investment involved in going with biorefining.

And the question is does it make any sense to do that from a financial standpoint. And we went through, again, a detailed analysis of the financial aspects. And the blue bar at the top shows you the internal rate of return on this investment, which is the investment above and beyond what you would need to invest to keep the pulp mill running with a new replacement system that matches the old one.

So, in this particular design it was a $330 million capital investment. We assumed we have about a $50 a barrel crude oil energy price scenario going out 25 years. And you get about an

18 percent rate of return on this investment, which is reasonable. And it's one of the few places where you can get a positive return on biofuels today without any incentives involved in the mix.

If you bring in the incentives then the green bars down below show you what happened. For example, if you have an excise tax credit here that's equivalent to the 51 cents a gallon that ethanol gets today, that would, you know, close to double the rate of return. And so on. There are other credits that are potentially available, as well.

And we did this same analysis for all of the different configurations that I sort of flashed through, both for dimethyl ether production here for Fischer Tropsch liquids; we also did it for the mixed alcohol case. And all of the blue bars here are the internal rates of return. Again, with no incentives and with about a $50 a barrel crude oil price. And they're all in the 15 to 20 percent range. So it's a fairly robust result that we got.

And, again, the reason the result is quite good relative to many other biofuels -- most other biofuels that are out there today is because you're integrating with the pulp mill and getting some credit for that integration.

So, you also have a relatively low-cost feedstock. The black liquor is available at the mill. You have to provide the mill with its energy, onsite process energy needs. And that's effectively the cost of the black liquor. The wood chips that are available are also relatively low cost compared to, say, growing switchgrass. And so those two factors give you the low feedstock cost; and the sharing of the capital costs gives you these good economics.

But, the pulp industry is a conservative industry. They're technology-risk averse. And the reason is pretty understandable. Their whole operation depends on the black liquor conversion process running at more than 95 percent onstream time. And so putting in a gasifier instead of what they're accustomed to in the pulp mill involves a lot of risk for them.

So, what the pulp industry really needs is energy industry partners to help manage this risk, and to contribute know-how on how to move forward with this kind of biorefining.

And one sort of initial step that one could take is to focus on the woody residues and leave the black liquor alone initially so that you're not threatening, you know, risking the pulp mill operation.

And another idea that I want to just touch on briefly to finish up is that when you gasify wood chips you can gasify wood chips with coal in the same, either in the same reactor or in parallel reactors. And this has some interesting implications for biomass.

And we've done some looking at what it could mean if you were to be able to do coal gasification of coal and biomass, it lets you increase the scale of your facility considerably without extra biomass coming into the facility. And so you gain the scale economies of the larger size.

And that's the primary benefit, in that you don't need to have quite such large quantities of biomass coming into a facility.

I'm not going to have time to go through the details of this here, but one idea we've been looking at is taking degraded grasslands in the midwest and great plains of the U.S. which are being discussed for restoration back to productive use, and you can grow native prairie grass -- this is an idea that Dave Tillman at the University of Minnesota has been working on -- with very low inputs as compared to switchgrass. And then harvest the biomass on an annual basis which would mimic the natural cycle of burning or dying and decaying of grasslands.

And so the system that I've shown here is taking -- these are mixed prairie grasses which also store some carbon in the soil if the soil has been depleted in carbon, as it is on most of the cropland in the U.S., in fact. And then the rest of this system is similar to the one that I showed you earlier. A biomass gasifier here; but in this case it's a coal gasifier up here. So we have two gasifiers feeding synthesis gas into a FT synthesis unit potentially with carbon capture and underground storage, as well.

And just to show you the sort of bottomline, some bottomline numbers on this kind of a system, this shows you the carbon emission, the greenhouse gas emissions for fuel production and use. So, for the full fuel cycle initially here is gasoline, and this is diesel from petroleum. That's roughly how much carbon emitted per gigajoule of fuel.

If you make FT liquids from coal and you don't do any carbon capture you roughly double the carbon emissions per unit of fuel. So from a greenhouse standpoint, that's not a good idea.

If you capture carbon in the process you come back to about the same level as petroleum fuels. And then finally, if you co-gasify some biomass and you capture the carbon, now you've taken carbon that's come through biomass. Some of it's captured and put below ground; that's essentially a negative carbon source. And that reduces your carbon emissions.

And depending on how much biomass and how much coal you put into the system you can get to the point where you're essentially at zero carbon emissions for liquid fuel. And using some coal and some biomass.

Last slide. So, this shows how much biomass you would need to make a unit of liquid fuel for the kind of system I just described, which is here. This is the amount of biomass. The rest of it would be coal. But, again, it's a zero carbon emission fuel.

These are the amount of biomass you would need to make the same amount of fuel if you were making cellulosic ethanol. This is current understanding of technology; this is what they project for 2015, and this is what they project for 2030. This kind of a system you could essentially do today or within a couple of years.

So, what this does, by combining it with coal, is let's your biomass research go much further than it can by itself without the combination with coal.

So, some of our reports are at this website if you want to dig up details. Thank you.

(Applause.)

MS. GILDART: Okay, our next speaker is from the National Renewable Energy Laboratory. Dr. David Dayton is a Senior Scientist in the National Bioenergy Center at NREL and has 13 years research experience in the field of biomass and black liquor thermochemical conversion.

His current responsibilities include his role as area leader for the USDOE Office of the Biomass Program Thermochemical Platform. And he's going to talk about some of the research being conducted there today.

DR. DAYTON: Thank you very much. What I want to do today is provide a little bit of a segue from Eric's process modeling to John's discussion of the overall program goals and the larger demonstration activities that are occurring. And kind of give you a little bit of a brief snapshot of what some of the R&D and technology developments are going on at the National Renewable Energy Lab. And along with our partners at other national labs in Idaho and Pacific Northwest national labs, as well as our industry partners.

So, for those of you who aren't familiar with NREL, I actually am housed in the National Bioenergy Center where we do biofuels research, looking at conversion technologies for taking biomass to liquid transportation fuels in support of the goals of the Office of Biomass Program in the U.S. Department of Energy.

My role as thermochemical area lead is to oversee all the technology development that's going on at the lab and elsewhere that's funded through the Department of Energy's biomass program in the area of thermochemical conversion.

So I'm going to touch a little bit on

some strategic analysis activities that have been going on in support of the President's biofuels initiative, and kind of give you a brief snapshot of both the biochemical and the thermochemical conversion platforms.

So, if there's any biochemists in the audience, please don't ask me any questions on that.

(Laughter.)

DR. DAYTON: I'll stick to the thermochem. Anyways, I want to acknowledge almost all the speakers that we've had today for providing kind of some backdrop for some of the things I'm going to talk about.

What we've done at NREL is look at the President's biofuel initiative, which we call our 30-30 vision, and that's demonstrating technologies that can produce 30 percent of motor gasoline in the year 2004 by 2030. Condensed down that means 60 billion gallons of ethanol equivalent by the year 2030.

And Mr. Pena this morning talked a little bit about the forest resources and the billion ton study. That was effectively the launching off point for this 30-30 scenario. And it addressed a long-standing question in the energy community, well, can biomass make a difference in transportation. And I think from the billion ton vision study, the answer is yes. And if we actually improve technologies to the point where we can optimize conversion efficiencies in various technologies, then we can have a significant impact on transportation fuel production.

The two platforms that we work on in terms of conversion are biochemical and thermochemical. I want to acknowledge my biochemical conversion platform, other, and Kelly Ibsen for pointing out basically that the difference between the two conversion technologies is the primary catalyst.

In biochemical conversion effectively use either a thermochemical pretreatment step followed by biochemical conversion fermentation step to ethanol. And then the thermochemical conversion pathway we use basically heat as a primary catalyst, and then look at downstream processing to convert it to liquid transportation fuels.

So, over the past about year and a half

with collaboration with a number of other researchers at other national labs that participate in the National Bioenergy Center, Argon, Idaho National Labs, Pacific Northwest and a lot of co-authors from NREL, Tom Foust, who's my direct report, the biofuels program manager at NREL, kind of took the lead in authoring a 30-30 scenario to kind of encapture the goals of the biomass program and how we can proceed forward with our goals to reduce dependence on imported petroleum, and actually make an impact with biofuels production.

So, this report is available on a limited basis. If you email me or Tom Foust you can get a copy.

But I'm going to go through a little bit. It's basically a scenario model for ethanol production in order to achieve the President's initiative of reducing our dependence on foreign oil.

It's a systems dynamic model. It's based on something called the biomass scenario model that Eric mentioned. The RBAEF study, it was actually used as part of that study, as well. It has dynamic implications of how marketplace behaves in response to these new technologies that are being developed for biofuels. It looks at the behaviors of investors; farmers, in terms of how much input it's going to take for them to actually grow these crops, what sort of revenue return they're looking for.

Policymakers in developing specific policies to make these technologies once they become technically viable, actually to be able to be introduced into the marketplace.

And then look at different strategies to see what the successful achievement of our 30-30 goals is going to be.

And these drivers are either technology, price targets or policy incentives. The top graph shows the basic technology introduction, if you will, and market deployment of cellulosic ethanol technologies and how they're going to be implemented to achieve this 30-30 goal. And the overall model scenario is based on the high oil and reference oil, oil prices for the future.

And the five critical aspects that were identified in this overall study were that we need to continue rapid deployment of the starch-based ethanol technology as kind of the introductory technology to bring biofuels to the marketplace.

And then, in order to demonstrate the technologies needed for introducing cellulosic ethanol into the marketplace we need to achieve what we're calling our $1.7 per gallon production target cost by 2012. And that's actually a cost target that we've built into our R&D plans. And all of our technical barriers and such for each of the platforms are to address how to overcome technology needs to achieve this cost target.

You can see the $1.7 per gallon is in quotes. I don't think our model has quite that level of precision, but what it does is it translates into cost competitive biofuels by 2012.

And we're looking to cost-share the deployment of these technologies once they're demonstrated in the laboratory with industry to reduce risk. However, once we achieve that $1.7 cost target, we really need to continue the technology push to get advanced technologies that will reduce the production cost even further so that we can actually meet these aggressive large volumetric targets by 2030, by overcoming additional technical barriers in the future.

And then, of course, the continued tax

incentives and renewable fuel standards will help deploy these technologies into the market.

So, the $1.7 cost competitive target effectively comes from the historic fuel ethanol prices that we see here. And for a fuel alcohol standard we're in that $1 to $1.25 range. So in terms of a starch-based ethanol process, we feel that lignocellulosic ethanol technologies need to achieve this $1.7 cost target to be market competitive in the future.

And what we've done with that $1.7 target then is to come up with two process scenarios. One based on a biochemical process, and the other based on a thermochemical process, that have a detailed process model with economic analysis to identify technical barrier areas that need to be overcome. And by the year 2012 overcome these technology barriers with advanced technology to achieve this cost competitive target by 2012.

So we've got a comparable process model for biochemical conversion. It's on NREL's website. If you search Aden, et al, 2002 design report for biochemical conversion, you can get a copy of that.

The thermochemical process design I'm told will be available now in two weeks. It's through the publications process. And it should be readily available on the website in a couple of weeks.

Both of these plant designs are based on 2000-ton-a-day systems. They are completely energy self sufficient, and they maximize ethanol as a fuel product.

So what it allows us to do is take these two companion technologies, put them on a comparable economic and technology basis and compare the overall costs, both capital and operating, as well as technical barriers that need to be overcome.

So, for the biochemical process we start off with the feedstock, as always. We're partnering with Idaho National Labs to look at the effect of feedstock variation, quality, distribution, storage and collection and harvesting.

Most of the work done at NREL inhouse is in pretreatment and conditioning. Once you get the biomass then you need to thermochemically pretreat it. There's a number of different technology options out there that are being explored. In the process model that NREL has designed, it's dilute sulfuric acid pretreatment process.

And in that case we're looking at optimizing cellulose yields from hemi cellulose degradation, and minimizing xylose degradation to keep the maximum amount of sugars in the liquor.

Increasing solids loading will then reduce capital and operating costs by reducing equipment sizes. And in the conditioning step we want to minimize the sugar losses to optimize the conversion to ethanol.

And in the next two steps the enzymatic hydrolysis, once the biomass has been pretreated; basically it unlocks or unzips the biopolymers in biomass so that it allows the enzymes to attack the substrate so that it can take that cellulose and further decompose it and hydrolyze it and optimize the glucose yields. And then co-ferment both the C5 and C6 sugars.

The enzyme costs are a very large cost component of the overall biochemical ethanol production. And as we heard this morning, Novozymes and Genencor are partners in that area.

Actually reduce those enzyme costs substantially. And will hopefully continue to do so in the future.

And then once we go through the enzymatic hydrolysis and fermentation step we have product recovery. And then heat and mass balance.

So a lot of the work that's done at NREL in the biochemical conversion platform, if you will, looks at studying, understanding and overcoming biomass recalcitrants. We've got advanced imaging technologies that we've just started using over the last couple of years to try and understand how enzymes attack biomass substrates; how pretreatment chemistries impact the deconstruction of biomass. And how cellulose can then be further hydrolyzed to maximize sugar yields.

We've got also pilot-scale pretreatment reactors where we can look at about a kilogram -- about a one-ton-a-day pretreatment processes where we can look at some more of the engineering challenges associated with this. Specifically in terms of sugar losses and degradation products.

We can also then take that pretreated biomass material, look at it under more specific imaging, and see how the biomass, itself, is starting to deconstruct; see how chemicals penetrate biomass so that we can optimize these pretreatment processes.

And then we can look at the enzymatic hydrolysis, the effect of enzymes and how they actually attack the cellulose substrate where you can see on the left-hand side, is a untreated corn stover sample; and on the opposite side is a treated corn stover sample. You can see that the enzymes prefer certain areas in the actual biomass structure where they're easier to deconstruct the cell walls.

As I mentioned, with our Danish partners, Novozymes and Genencor, in 2004 was the completion of a three-year project to reduce enzyme costs and a substantial reduction in cost was achieved. We were granted the R&D 100 award for that. And actually took great strides towards achieving this cost-competitive biochemical ethanol target.

And as John will mention, we just finished the solicitation process for partnering with industry to look for ethanologens. Those fermentative organisms that can ferment both C5 and C6 sugars with maximum yields. And I'll let John announce the winners for that.

Comparably, on the thermochemical platform we're looking at, again, thermochemical ethanol production through a gasification-based process with a mixed alcohol synthesis. As always, the technical barrier areas were designed and evaluated based on the process design that we have in looking at the different cost components for each technical barrier area.

We start again with a feedstock interface; somewhat different in the case of a thermochemical system. We're looking at size reduction, drawing and dewatering. From a gasification perspective obviously the things of interest are thermal efficiency, carbon conversion, ash chemistry from a variety of different biomass materials can prove problematic for operability in these systems at high temperatures.

And the effect of pressure, whether or not you use a pressurized oxygen blown system or an indirect atmospheric pressure system based on steam.

A lot of the work at NREl is focused on

gas -- conditioning, as it is the single largest cost component in the overall production cost for thermochemical ethanol.

The high cost of this step is a little misleading because it's really not a single box. It's actually multiple unit operations for particulate removal. A lot of what we do is looking at catalytic reforming of tars, light hydrocarbons and methane.

And then once you actually clean up the syngas, you need to remove CO2, as Eric pointed out, for optimizing your fuel synthesis process. And perhaps adjusting your hydrogen CO concentration in the syngas.

So, basically what we're trying to do in the thermochemical platform is develop cost competitive technologies that are technically and economically viable at the scales of biomass. And I think that was one of the issues mentioned earlier in Mr. Zalesky's talk about hydrogen. It's not necessarily making big things smaller, but actually looking for technology options that you can use to creatively and effectively achieve your R&D targets.

And then the fuel synthesis step, in our case, is a mixed alcohol process. In terms of the syngas processing available, it is the least commercial of the options. We can produce an ethanol rich product; methanol is recycled completely to extinction. And the higher alcohol byproducts are sold for their heating value effectively.

So, the thermochemical route to ethanol is shown here. Mostly what we have in terms of the tar reforming and scrubbing and syngas compression are additional conditioning steps that need to happen before the mixed alcohol synthesis. And then the preliminary separation to remove ethanol, and concentrate ethanol, and separate out the mixed alcohol products.

So, for the gasification R&D at NREL in collaboration with PNL, additionally, we're also looking at, like I said, primarily cleanup and conditioning. Looking for effective tar reforming catalysts to remove as many hydrocarbons as we can in a single unit operation.

We need to advance the productivity and performance of mixed alcohol synthesis catalysts, increasing their single pass conversion efficiency and improving selectivity to ethanol.

And then looking at the technical validation of utilizing a whole range of different biomass feedstocks, and how it impacts syngas quality, and how it impacts further downstream processing in additional unit operations for cleanup, conditioning and synthesis.

A little bit about mixed alcohol catalysts. There are a number of different catalyst families that are available. Some of them commercial, some precommercial. Methanol obviously is the goal from an alcohol synthesis perspective. They have very high yields and selectivities.

Unfortunately from a statistical perspective it's very difficult to get ethanol at those yields. So there are different catalyst families and modifiers that we can use that have both strengths and weaknesses.

Additionally, once you get to a syngas intermediate you can go to a number of different technology routes that are effectively already together, already developed or commercial. Or basically you can go through a methanol intermediate once you get to syngas, you can generate a methanol with very high selectivities and high yields.

And then for methanol you can either dehydrate to DME and go through a methanol olefins process to make hydrocarbons. You can take methanol and homologate it in a homogeneous catalytic reaction system to produce ethanol, as well. Or you can go basically to a methanol-to-gasoline process, which takes a methanol intermediate and runs it through a zlyte catalyst to make gasoline range hydrocarbons.

So, these are another basically other technology options that we can consider from a thermochemical perspective. Conversely, in the biochemical conversion process there are a number of different fermentative organisms that you can use to go to other different products, as well. Biobutinol, in particular, has gotten a lot of press lately.

So, what we've tried to do at NREL is come up with process scenarios that demonstrate that we can, once we achieve certain technology goals, that we can come up with cost-competitive processes for biofuels.

Now, whether or not these are the winning technologies is probably to be determined best by industry and not by the national labs. However, what we are trying to do is develop technologies that can be demonstrated at the pilot scale, that industry can then take and deploy in the commercial processes.

Final two slides, what I wanted to do is put in a plug for kind of research beyond 2012. Once we get to that $1.7 cost target, as I mentioned before, we're not done. What we really need to do is drive those production costs down even lower. And the only way we're going to do that is through advanced technologies.

DOE has their Genomes-to-Life program through the Office of Science that is working in collaboration with OVP. And we've come up with a bioenergy roadmap which is to look at ways of overcoming the barriers to cellulosic ethanol and some of the advanced technology needs. So this is available on DOE's website if you're interested in looking at that.

We've also done a complementary workshop and study for the thermochemical process. And that roadmap will be available very shortly.

And then ultimately, moving forward to achieve these very large, volumetric targets for biofuels for petroleum offset, we can think of more creative ways of combining different technology options and coming up with integrated processes, that we can actually maximize the biofuels production from biomass through advanced technologies.

So, with that, I will close and take questions later.

MS. GILDART: Thank you very much.

(Applause.)

MS. GILDART: Our next speaker is with the U.S. Department of Energy. John Ferrell is with the energy efficiency and renewable energy group, working in their biomass program. And he's currently the team leader for feedstock and biotechnology.

He is also on the California Biomass Collaborative's Executive Board. He's been very active on that. He will be speaking today on the results of the Department of Energy's biorefinery solicitation. John.

MR. FERRELL: Good afternoon. I think this is probably the first time I've ever been on a panel with three thermochemical conversion experts. But somehow I'll manage to get through.

And I know certainly if there are questions in that area, I'll know plenty of people to move them toward.

So, kind of moving toward the end of the day. Certainly do want to thank the Collaborative for inviting me here to speak a little bit on the DOE and DOE perspective. And I will get to that 932 award winners that I know you all want to hear about.

So, anyway, I think I'll just move right along here. This is really kind of our current Department of Energy organizational chart. There are a couple of things that I wanted to mention on this.

We have a new Assistant Secretary who is really very bullish on biomass, biofuels and all the different applications. One of the things he did form was sort of this E-85 infrastructure team that combined the biomass program, the fuel cell vehicle team, the Clean Cities program in the Federal Energy Management program.

This is the first time we've really kind of of gotten together on this. It does show kind of a push toward work on the vehicle side to get the fuel out there in larger volumes than maybe what you thought in the past.

The biomass R&D board, which was talked about at the beginning of the day a little bit, is sort of -- was created out of the Biomass R&D Act of 2000. The Department of Energy and Agriculture do co-chair that. There are a number of different other agencies involved, National Science Foundation, Interior Department, Office of Science Technology and Policy, Department of Transportation, the Office of the Federal Environmental Executive, with DOD and others coming on.

And kind of similar, I guess, to your interagency working group here, only on the federal level. The intent is really to do strategic planning across the federal agencies. I'll come back to them a little bit later on a group that they put together.

The biomass R&D technical advisory committee is a group of 30 people; experts from outside of the federal world, that advise the Secretaries of Agriculture and Energy, in particular on biomass-related issues. And they do try to, I guess, advise in terms of making course corrections, in terms of program direction, that sort of thing. As well as overseeing, to some degree, the joint solicitation between DOE and USDA.

We work primarily at the project level, through the project management center at the Golden Field Office. We have a fairly large group of folks that work there. They help administer the contracts for us.

In terms of core technology development we rely heavily on the National Renewable Energy Laboratory and other laboratories listed there. Through our solicitations we work and partner with industry and academia. I think the one thing you don't see on that chart very strongly is our link to the states. And it's probably an area that really we do need to strengthen in the future.

But we have partnered with the California Energy Commission and others on various projects from time to time. And it looks like that's going to continue again in the future, at least on one project.

So, anyway, that's sort of how we're organized. I guess in terms -- you've seen enough scenarios and plans and whatever, but I have to give you one more here.

So in the state of the union, kind of this year's marching orders, you know, from the President of the United States, President Bush set forward this 20-in-10 goal, which was really raising the bar from the year before, really even beyond the 30-by-30, even beyond making, quote, cellulosic ethanol cost competitive in 2012, this idea that in ten years, and it was broadened to create this alternative fuels standard, instead of just a renewable fuels standard. But to get 15 percent of gasoline consumption in 2017, in ten years, through these alternative fuels. And then 5 percent additional improvements in terms of gasoline consumption coming on the energy efficiency side of the equation.

So that's really a very challenging proposition. And there is a group meeting, I guess Thursday, to help define what biofuels' role in that might be.

But that's, you know, that's kind of the bar and that's kind of the overall push at the moment as to what we're trying to do.

So we talked quite a bit about this in collaboration, this is a collaborative forum in the state. We do believe in collaborative R&D.

We are supporting integrated biorefineries through the Energy Policy Act and through other activities. I'm going to talk about that.

And certainly it is, as a number of speakers talked about earlier, a combination of policy, markets and R&D federal assistance where it's needed in order to get this thing moving and continually moving forward.

So, that's kind of our overall strategy mission in terms of moving forward with this technology. At least from the DOE standpoint. And it does show, you know, biofuels, biopower, bioproducts all part of the picture. And really, if we're talking about even displacing barrel of oil, obviously, you know, oil is used in many different markets. And so while we may have a focus on fuels, it's not like we've totally abandoned all other options. And we certainly think those are important parts of the biorefinery of the future.

So back to this biomass R&D board. Basically they have commissioned the development of a national biofuels action plan. We've had workshops with other federal agencies really looking at this longer term volumetric goal that

Dan talked about earlier, this 30-by-30 or 60 billion gallons of whatever fuel it is. How do we go about that; what are the different agencies and getting them involved. And, you know, getting them to kind of sign up for what their responsibility is within this overall world.

This was commissioned by the biomass R&D board. There is a working draft, a summary of that workshop which is due later this month. And so this is a big effort in terms of coordination.

And I see it, you know, leading to such things as, you know, basically teams put together in various key areas, be they feedstock, infrastructure, thermochemical conversion, biochemical conversion. But also, you know, the idea of scientist exchange. The idea of trying to work across agencies and take the best. And move them around. I think that's going to be part of this, as well.

But time will tell how important this is to the future. But, certainly it's a big push right now to get this NBA plan, as we call it, March Madness, whatever, off and running.

So, in terms of the 932 solicitation and what Bryan wanted me to talk about today, this was out of section 932 of the Energy Policy Act of 2005. It was for some small commercial biorefinery demonstration projects leading to cellulosic ethanol production.

There were some qualifiers in there in terms of 700 metric dry tons per day; about that size of facility. It did have a very hefty non-DOE, nonfederal cost share, 60 percent. And it was looking at sort of like this three- to four-year time period.

And so the winners of the solicitation, and there were six winners, and the commitment from DOE was up to $385 million over this four-year period. And there was, I think, one of the pleasant outcomes, at least in my mind, was that there were a number of different feedstocks, a number of different conversion technologies and a number of projects in different regions of the country.

So, Abengoa, building a plant in Kansas primarily on the bioconversion side, enzymatic hydrolysis, fermentation-type of development. Also on the thermal side, looking at displacing natural gas as sort of the thermal host to the plant.

You'll see in each of these that there are a number of partners that are brought into the project. This is also a very important piece of the action.

Alico, which is really built off of the Jim Getty technology, former professor, University of Arkansas, which really had a gasification fermentation process. Alico is a major landholding company in Florida. And so technology in Florida for this project has been licensed to them. They have the advantage of, you know, a captive kind of feedstock.

And in each of these I think what the companies were trying to look at was sort of what is the low-hanging fruit. What can we do, given the amount of resources that we're required to put up in order to make these things work in a fairly quick time with our very sizeable investment. That's what I think, anyway.

So, BlueFire, I'm not going to steal Necy's thunder. She's back there. And concentrated asset fermentation process. She's going to be talking to the group tomorrow about that project.

I must also say that we are in

negotiations with each of these six winners, so I can't really tell a whole lot about what they are and what they want to do beyond what's been publicly released. But I'm sure in time more details will come out as negotiations move forward and results are known.

Broin, which was -- can't remember, we've had so many speakers -- was talked about this morning in terms of a corn dry mill builder/operator/owner of plants in the midwest, was the fourth winner. And they're planning a plant in Iowa. They're working with Novozymes, and they're also working with du Pont. And so they are working on an enzymatic hydrolysis, working with zymomonas, actually, as the fermentative organism here.

One of their pushes is really on the corn cob side, utilizing corn cobs. And I think that that's probably -- we talked about second generation technology, and I think that's very important. And in many cases I think part of the expansion of the industry, at least in the midwest, in the corn states, will be the cellulosic into the existing corn-to-ethanol infrastructure that does help in terms of, quote, the energy balance. Or at least what I would prefer to describe it as the amount of fossil energy used in kind of the wells-to-wheels kind of procedure. So that's an important piece there. And Broin is a major partner.

Iogen, our friends to the north, they ar a small enzyme company. They have had a one million gallon per year commercial demonstration project in Ottowa. They are planning a facility near Idaho Falls; primary feedstock being wheat straw. Goldman Sachs, Royal Dutch Shell are part of the team here. So that's another major sort of in the upper midwest.

Rangefields, which is formerly Kergy of Bloomfield, Colorado, is actually looking at forest waste, forest residues in Georgia. And that is a gasification catalytic process. Kosala Ventures, you know, Sun Microsystems founder, is one of the backers of this project in terms of funds.

So, those are the six that were announced, again I don't know if it was -- I guess it was earlier this month.

So the other point, the other one, I know that I now can talk about the ethanologen solicitation. It was actually announced this morning in Washington, D.C. The winners to this particular solicitation by Assistant Secretary Andy Karsner -- this was at that, you know, biofuel deals conference that Secretary Johanns was a keynote for, and Andy Karsner talked. Actually heard that, you know, I don't know, that Governor Schwarzenegger was going to be there, as well. So I don't know if that's true or not.

But anyway, this ethanologen solicitation on the biochemical conversion side was, you know, as Dan mentioned earlier, one of the challenges is being able to co-ferment C5 and C6 sugars. The solicitation was really set up, you know, topic one, topic two. Depending on how far a company was along as to whether it really got down to which stage of development they were, and how much cost share would be required. The farther along you are the more cost share you have to come up with. That's just sort of the name of the game at the moment.

And so the winners of that solicitation in terms of the 50 percent cost share was one Cargill, and really, it was their subsidiary, wholly owned, NatureWorks, which is working on developing a yeast technology, yeast fermentation organism.

Mascoma, which is really the Lee Lynd company in Hanover, New Hampshire. And the Purdue University, which is really Nancy Ho working in Indiana. So these are all, I think, organisms that have been known in the industry for some time, but still really need, you know, need a push in order to get them going forward.

More in the R&D stage, one of the winners was du Pont, and they are working, to some degree, with NREL on zymomonas and developing advanced organisms, fermentation organisms for that.

And Celunol Corporation and working in Florida with Lonnie Ingraham at the University of Florida, to work on his E.coli organism, as well.

So, those are the announcements for today.

And this is the last announcement I'm going to make, is the other solicitation, which I thought might be of interest to this particular audience is that one of the solicitations that we're going out with, the other kind of major one, is this 10 percent commercial scale validation solicitation. Which basically means that at 10 percent commercial scale, that's what the award would be made.

So, you know, for example, if 700 dry metric tons per day is commercial, then this would be at, I'd say, 70, 50 -- 50 to 100 tons per day. It will be for a broader range of fuels, I believe, than what the last solicitation was. It'll be a little bit less money.

It will, I think, try to encourage a number of cellulosic feedstocks. It will, I think, provide an impetus to sort of do the integrated approach, strong systems engineering component. And it will be announced before April 11th when Assistant Secretary Karsner is going to be testifying. So I think that's the plan for that one.

Just a couple more points before I move on. Basically that, you know, the wave is up, as Jim Boyd mentioned this morning, surf is up, whatever. In terms of our '07 requests, we requested 149 million; after the State of the Union we got 199 million. We got a $50 million plus-up. And a lot of that money would go to support these kind of deployment type solicitations.

Last month Secretary Bodman once again reaffirmed the support for the two or more, actually, bioenergy centers through the Office of Science. This, again, is $375 million; and that solicitation is closed, but about to enter into the, you know, the awarding process.

The other, the last thing I'll say is, you know, the other provision in the Energy Policy Act, which has a lot of interest, I believe, is in the area of the loan guarantees in terms of this overall industry. And there is a -- there was a sort of feasibility stage, an early stage development that was done. The Secretary talks about trying to support a program up to $4 billion in loan guarantees.

Of the proposals they've received so far, about half of them were in the biomass, bioenergy area. So that's a pretty strong indication of the level of support for this particular technology.

And that solicitation included, you know, coal -- basically you had to have two criteria. One was innovative technology and the second was greenhouse gas reduction. And so it included gasification, fermentation, coal-to-liquids, all different types of technologies.

So that's a -- the other, I guess, major thing that DOE is doing, obviously the farm bill will also have implications in this area. I know that there are certainly provisions being talked about for cellulosic ethanol loan guarantees there.

So, with that I'll thank you very much.

(Applause.)

MS. GILDART: Thank you very much, John.

(Pause.)

MS. GILDART: Our next speaker is with Universal Oil Products, Honeywell Corporation. Dr. Amar Anumakonda leads business development efforts for the renewable energies and chemicals business unit of UOP. He has been active in the areas of alternative energy, fuel cells, distributed hydrogen and hydrogen fuel processing for power applications. And he holds six patents in the areas related to catalytic partial oxidation of hydrocarbons for fuel cell applications.

So, please welcome Dr. Amar.

(Applause.)

DR. ANUMAKONDA: Good evening. First

I'll tell you about UOP. UOP is a company that provides technology licensing. Doesn't make the end product. So biodiesel or green diesel, going to talk about, is not a product we sell. But we help refineries basically, some technologies for refineries.

So, basically we are a leading supplier and licensor, both in the gasoline markets and also the detergent markets, all petrochemical processing areas. UOP has been there since the dawn of the petrochemical industry; all the gas companies, bp, Chevron, all of them are customers for us. So we have an eye on the market and we have an eye on the end customer, which are using applications, so the GMs of the world, right. So we have look at them and the technology pathways to that and make the (inaudible). That's our focus, really.

We have over 3400 employees worldwide. UOP was originally a joint venture between Allied Signal and Union Carbide back then. And then it became Dow and Honeywell's joint venture. But last year Honeywell fully bought UOP. So it's now a part of special materials group of Honeywell.

Honeywell is about $25 billion company.

Specialty materials is about a third of that and 1.6 billion of sales. Most of the revenues come from licensing. And a little bit of the products, you know, (inaudible) and stuff.

So we have this strong relationship with leading refineries and petrochemicals and provide a lot of technology in the field. And our expertise is finding innovative technologies and bringing it to the marketplace.

So UOP's perspective of how the market is, you know, shaping and how we can add value is that we see a lot of things happening in the additive stage, biodiesel and ethanol coming as B-20 and we have B-50 blends. And so UOP's perspective is to go with fuels directly to go into the infrastructure, to leverage the existing infrastructures.

So what do you want to leverage? You want to leverage the capital investments, because this is a huge, like you talked about earlier in the day. So we want to use the capital investments in the ground from the refiner's perspective, and also from the perspective of infrastructure existing in the system. We want to minimize value chain disruptions and provide technology easily adopted by the end market.

So we are working on both first generation products, which are, of course, using the vegetable oils and greases, kind of the biodiesel part, but it's difference from green diesel, and I talk about that. And we also focused on next generation technologies that John talked about right now. And our end goal is to take this and make them adaptable so they can enter the marketplace.

So this is how we see the global picture as well as the U.S. picture. Currently the focus of, you know, infrastructure of transportation fuels is coming from gasoline and diesel. But we see a huge potential coming up with the cellulosic waste and that's where we want to be. But the whole focus is to make the application easier, so we will have technology to transition into the technology going into the next generation going forward.

So here's how we're differentiating the products that UOP is currently providing commercially to industry. On the biodiesel I think most of us are familiar with the product used methanol, along with vegetable oil trans-esterification process, where the byproduct is glycerol.

But UOP's technologies is in catalytic cracking of both the biofeedstocks into the lower end products called green gasoline and green olefins. And specifically what I'm going to talk about is green diesel, which is using hydrogenation rather than trans-esterification. And use hydroprocessing to make that product which, as you'll see, is very very close to existing petro diesel, but yet uses biofeedstocks. So, again, this is a first-generation technology, as we see. And we see that as a bridge to an adaptation, makes all the issues with, you know, the growing pains of adaptation, you know, much easier to adapt -- to overcome.

So, what's green diesel? On the left-hand side, the biodiesel gets trans-esterification process, you know, where you basically use -- you get a FAME product using methanol and ethanol, or ethanol and vegetable oil, and you get glycerol byproduct. Low value, and then you got to build it up.

In contrast the green diesel process uses hydrogen, so this is not a distributed source. It has to be tied to the refinery's infrastructure but it -- as green diesel, which is (inaudible) properties-wise is very close to the diesel that's coming out. And the byproduct from this is propane, again, a high value product and going to the refinery infrastructure and make high value added products.

So, what is it you're trying to do here is first of all, make -- green diesel is kind of, we describe, very close to the end product, the petro diesel, but has much better qualities. A little bit on -- properties, too. But you're leveraging the existing infrastructure in terms of the technology -- in terms of the on-ground technology on the refinery site. And have the end application in your site, too.

So the big process perspective of this scheme is it's not very deep, but basically you take the vegetable oil. You get hydrogen, use some extra hydrogen coming from the plant, but you also recycle the hydrogen in the process. The product is then, you get two, there are two coproducts, because water, and then you take out the CO2. You remove that with acid gas removal process. Recycle your hydrogen. And your end product can now (inaudible) distillation, so you basically have a good green diesel product. You have the light ends, which can also adjust your naphtha or the jet oil range in the process.

So the product is actually, it'll show you on the next slide, it'll have the properties very close to the end product, petro diesel.

So we started; the feed is basically oil or grease or animal fats or seed oils. We need about 1.5-to-2, like 2 is about the midrange of that, how much oil to hydrogen we need. And we can make a cut essentially almost all green diesel or also naphtha, depending on the demand in the refineries.

The key thing here is it's got a sulfur level that's much -- that meets the (inaudible) sulfur specifications and high cetane number, which is what distinguishes it to the existing petro diesel products.

So, here are comparing the properties of the green diesel that you make from this process with existing petro diesel. First of all, the NOx levels are very low, compared to the baseline of petro diesel, so we think that solve the NOx problem that in the biodiesels with these green diesels here.

The cloud point is what, the temperature issue. So there was a point raised about whether the cold climates are applicable to this biodiesels. The green diesel is actually much lower cloud point, which means it doesn't thicken. In fact, if you see the density, the density of green diesel is much lesser than the petro diesels. In fact, also lesser than the biodiesels.

So what you end up with is a high cetane product, basically high (inaudible) with less density, so you can blend it with stocks coming out of the refinery. So higher diesel, heavier diesels can be actually made lighter and more palatable to the end market.

We also have, because of the nature of the way the process is made, we have very little aromaticity, almost no aromaticity in the product, which means they are light straight -- hydrocarbons in the green diesel.

So, to make sure that the green diesel actually makes sense, we looked at the well-to-wheels recreation and also the lifecycle analysis. And here we're comparing the total amount of CO produced by the green diesel process, starting with hydrogen in the plant process and using animal fats. And so green diesel is actually very competitive or beats the competition in terms of both petro and biodiesel.

What is showing here on this well-to-wheel analysis is actually an optimal point, which is amount of CO_2 produced, which is the energy that's captured in say a certain amount of the product. So to travel one kilometer from a standard rate, carry this as a standard, you see that the lighter, the ethanols and the FAME products actually less CO_2 emissions, but they don't give as much energy density. Whereas the green diesel is both lower in amount of energy needs to make the green diesel product, as well as provide a low CO_2 output.

So, in other words, it's an optimal transition product to take the market towards the bio-steps. And to actually make it ready for the next generation biofuels.

So, in summary, what UOP's technology is trying to provide is a way to make vegetable oil, grease and pyrolysis oils available to market penetration. And it allows the incorporation of biofeedstocks in existing fuel supply chains.

So, in the near term we are providing this green diesel as a potential fuel that has a blending capability with the existing petro diesels, overcomes the problems of the biodiesel industry, and kind of takes you into the biofuels marketplace.

In the longer term we will again us the existing technologies that come out of R&D to provide that same technology path to the companies to make bio transition smoother.

So, in closing basically I want to say that we will try to meet existing and pending biofuels mandates. Make it easier for our customers, which are the refineries, and also the end customers, which are the application users, like the automotive industry. -- biofeedstocks and also explore new biofeedstocks and make the transition smoother.

We also focus on the end product and try to make very high quality products so it makes adaptation easier. And at the same time, trying to maximize the use of existing assets both from the production side, the refinery side, and also the infrastructure on the automotive side.

So, at the end of the day our role is to facilitate more adoption of these biofuels. Thanks.

(Applause.)

MS. GILDART: Well, thanks for the last slide. This is exactly what we're doing.

Now we have some time for questions. Anyone have questions of this panel members, or if there are any of the members from the second panel in the morning, we might actually have them up, too.

Okay, this gentleman here in the front, and then we'll work our way back a bit.

MR. MILES: Tom Miles. A question for Dave, I guess. Both you and Eric identified the mix I'll call synthesis as being kind of a weak link. And you showed us a number of things that you're working on.

Is private industry, and are the recipients of the grant awards and some, are they working on catalysts for the mixed alcohol synthesis, as well?

DR. DAYTON: To the best of my knowledge, yeah; the actual Rangefields is a mixed alcohol process. And I guess -- the mixed alcohol catalyst is a gap because in order to achieve the yields that we hope to achieve to get that cost-competitive biofuels by 2012, we need substantial improvements in the catalysts.

So, I mean Dow actually did a pre-commercial demonstration of mixed alcohol catalyst process back in the late '80s. So it can be done, you know. We'd just like it to be done better.

MR. NORWOOD: My question is also for Dave. Regarding -- My name is Zack Norwood from Livermore and UC Berkeley.

My question is regarding the 2038 plan or the 30-30 plan I guess you call it. I'm a little concerned about the idea of increasing starch-based ethanol conversion processes in the near term. Just in terms of competition with food, and we're seeing in Mexico corn prices are elevated due to that.

Can you comment on that, and what the considerations were in addressing that issue?

DR. DAYTON: Sure. Actually in the -- probably didn't do the report as much justice as I should have, but it's about a ten-chapter document. And each chapter has various components, of which starch-based ethanol processing is one. And the lignocellulosics is another. So there's a lot of considerations in terms of feedstock and others.

We did actually take the estimates from the National Corn Growers Association as the maximum potential for corn-based ethanol. And I believe it topped out around 12- to 15-billion gallons per year. And at that level, yeah, it does not impact food feed or fiber.

So if the 20-in-10 goal that John had mentioned, if we were to achieve the entire 35 billion gallons of ethanol required for that with starch-based ethanol, there would definitely be impacts on food feed and fiber.

MR. FERRELL: Let me just add on the 20-in-10, that is a whole range, as I kind of indicated, that's a whole range of technologies and fuels. And we don't really know yet what that, you know, what would happen.

The 15 billion to 20 billion gallons is a number that seems to be bandied around on the starch-based system. I would say that there's close to 12 billion gallons that are already kind of either built or in the pipeline over the next couple of years.

So, beyond that it's not a huge stretch, I don't think. But, we'll see. I think, you know, you run against land constraints, those kind of things; you also, at some point, you know, the quality of the soil that you need in order to produce the crop also becomes limiting.

I think you will see a move toward say sorghum or other types of feedstocks still on an annual basis offer. So, I guess we'll have to see, you know, policywise, how that all shakes out.

DR. DAYTON: And I think, bottomline, we did address that in the report, yeah. So, it's taken under consideration.

DR. NAND: My question to Amar is it's very exciting to know that you're going to produce, or you can produce green diesel, because the real --, in fact, as we were discussing in the other session, the biodiesel, also when you use, we are concerned that NOx (inaudible) emissions are higher. So if you can produce green diesel, you know, which is better than the regular is great news.

But only one drawback which I am seeing is that probably you can do this close to a refinery where you have got hydrogen available (inaudible) in the facility, you have to produce hydrogen actually for the reformer. That's a drawback.

And also I was interested in the costwise, how much -- what is the cost differential if you don't use your process with the convention what people are doing, what are the cost differential?

DR. ANUMAKONDA: Right. So, the cost is not just a cost, because that's critical. The cost is actually cheaper than biodiesel, but cannot be stand-alone without a subsidy. So they're somewhere between the, you know, stand-alone self sufficient and competing with diesel.

On the subject of hydrogen it is true, we need hydrogen, which is in the refinery. So it is a solution. I think like the gentleman mentioned earlier the marketplace is so big, that a lot of factors are at play. So there's a place for distributed hydrogen, or distributed production of biodiesel, and there's also a place for infrastructure related to synergies -- and here that's where we are basically proposing a solution.

MR. JUDAK: Hans Judak from Energy Visions. I have also a question to you. Have you estimated the equipment costs for let's say a $10 million per year -- 10 million gallon per year facility?

DR. ANUMAKONDA: Right, yeah. Both on the capital cost, I can't show you those numbers exactly because they -- both on the capital cost and on the operating cost we are significantly below the biodiesel product cost on capital costs. Mainly because, like we say, the many years of construction that are involved in the biodiesel in the front-end fabrication of processing of the feed. It's not -- solution, and so that's where the synergies and advantages of this technology come in strongly.

DR. JENKINS: Before we proceed to the questions maybe in the interest of time, because we have many questions, this is great. If you have a question maybe we could just line up here and we'll just ask them right down the line there.

(Pause.)

MR. MAZANEC: I actually have a question -- Frank Mazanec -- related to the second panel this morning, to the PG&E representative, if he happens to be here.

MR. LaFLASH: Right here.

DR. JENKINS: All you have to do is turn around.

MR. MAZANEC: I was under the impression prior to maybe a few weeks ago that biogas was not allowed to be introduced to the gas distribution system. That's come up many times with many of the investor-owned utilities. I think I heard, actually a buddy of mine during a golf game had mentioned the project that you were referring to, where biogas is now able to be introduced, at least on a particular-project basis.

So, I have a question. Is that the case? Can biogas be put into PG&E's gas distribution system? And if it is the case, what type of testing protocols and what are all of the constraints associated with that?

MR. LaFLASH: If I answer this can I ask them a question?

DR. JENKINS: Yes.

MR. LaFLASH: Biogas, we only put in the transmission system, the high pressure, because it mixes with the other gas that's in there. So it's not a perfect match, it'll blend in with it. If you put it in the distribution system the next guy down the line is going to get that gas and it may not be suitable for individual combustion.

But if you blend it in with the other gases it's a much better product.

MR. MAZANEC: So that that -- on a systematic basis now with --

MR. LaFLASH: We -- yes, in the transmission system. I can get you the contacts to the right people. But certain pressure requirements, so you have a certain volume that it's going into to blend with.

MR. MAZANEC: Is that the same with the other IOUs now?

MR. LaFLASH: I don't know if the other IOUs are there yet.

MR. MAZANEC: Is that a regulatory process --

MR. LaFLASH: No.

MR. MAZANEC: -- that allowed that?

MR. LaFLASH: No. It's internal. The question was if the other investor-owned utilities are doing that, whether the regulators caused that or not. And it's an internal decision we made.

I wanted to actually, good segue from

that is we're interested in putting methane made from cellulose into the pipeline. Now, the whole discussion here, the thermochemical experts could probably weigh in on this, is what's your opinion on methane from biomass? Is the catalyst as good, or not there yet? Is the cost an issue? You know, is the methane not worth as much as the ethanol is so it's not getting as much attention? What are the thoughts on that from the thermochemical people?

DR. LARSON: I'll take the first shot at it. I haven't looked at it in detail but given recent gas prices I think the SNG route is probably a better one to go in the near term than liquid fuels for biomass. That's my gut feeling.

MR. LaFLASH: Any other thoughts?

DR. DAYTON: I'd agree, too. You know, depending on the gasification process you can actually have very high levels of methane in your syngas. So that's a good starting point.

And there's a lot of, at least from an ethanol production business, there's a lot of people looking at syngas as a natural gas offset. So, it's another viable technology option, I think, for the near future.

I haven't looked at, you know, the catalytic performance, the methanation catalyst for our syngas derived from biomass. But it's certainly another technology option and we could explore that in the future, sure.

MR. LaFLASH: Good. Thank you.

MR. YANG: My question to --

DR. JENKINS: Could you please identify yourself for the record?

MR. YANG: Okay. Bin Yang from University of California at Riverside.

The last slide, last chart he showed, did it concern about the (inaudible) generate, the gasification to generate steam or electricity, or to use for -- gas in the production at least for future model?

DR. LARSON: I didn't quite get the question. Can you --

MR. YANG: Okay, my question is the last chart showed energy consumption, gas consumption compared gasification, gasification biomass with the coal. Coal, right? You compared with lignin, gas in the production.

DR. LARSON: I compared with?

MR. YANG: -- gas in the production --

DR. LARSON: Yeah, right, okay.

MR. YANG: Did you concern using lignin to generate electricity steam, a gas lignin used to production as a model? At least for future model.

DR. LARSON: Yeah, in those ethanol numbers it was a stand-alone facility that was producing ethanol and meeting all of its own internal needs. It was based on the NREL design studies that they've done. So those were stand-alone, using lignin in some fashion to provide process heat.

MR. BENET: Reed Benet, UC Davis. I would posit that the 800-pound gorilla in this room being unspoken is the farm lobby, god love them, and their very powerful position in the Senate.

And thus I kind of want to ask the thermochemical people, and all due respect to Mary Beth over there, and I understand in-place infrastructure and the desire to get as quickly as possible to percentage displacements of petroleum. But I'd ask the thermochemical people if you're in the business of creating syngas and you're creating this beautiful syngas, why would you put it into kind of the imperfect form of ethanol as perhaps something that's already proven, which is Fischer Tropsch diesel, and with ethanol's issues about pipeline and mixing and everything else?

DR. LARSON: That was one of the points I was trying to get across in my presentation, that the technology for Fischer Tropsch is already there. And it's being pursued very aggressively by the fossil fuel industry. But it's not taking hold, for whatever reasons, in the biomass community.

And I think it's an issue that needs to get discussed a little bit more and brought up. So, I agree with your -- the implied answer to your own question.

(Laughter.)

DR. DAYTON: I think I can echo that, as well. You know, part of the rationale for focusing, at least from a thermochemical perspective, on ethanol is that now we have two technology options for looking at cellulosic ethanol.

Now, if anyone reads the paper or listens to the news, when you hear lignocellulosic ethanol, what comes to mind? Biochemical conversion.

However, there is another technology option which adds robustness to this technology push for the future. And I think from a thermochemical perspective we've demonstrated with the same fuel, the same feedstock that we have a cost-competitive process thermochemically.

Now, from a fuel perspective, I think the yields are a little bit higher with the mixed alcohol products, so we're actually targeting our 30-30 volumetric targets, which are quite vast, you can get slightly higher yields of ethanol because you actually capture some of the oxygen in the fuel.

From an immediate distribution and infrastructure perspective, hydrocarbon fuels obviously are easier to put in the pipeline, so to speak.

So, I'm not trying to advocate any one fuel or another, but we do have technology options and I think it's up to industry to make whatever they want from the syngas we can give them.

MR. BENET: In terms of the volumetric you mentioned in your talk about at a 70 percent Btu per gallon discount.

DR. DAYTON: Correct.

MR. BENET: And then on top of it not factoring in the potential increased efficiencies of diesel.

DR. DAYTON: Correct.

MR. BENET: So, most --

DR. DAYTON: So, yeah, --

MR. BENET: -- people would view gallon as the important thing.

DR. DAYTON: Um-hum.

MR. BENET: And understand it on that basis, but not, you know, the important. Perhaps the important thing is really what we're trying to achieve in the long run.

DR. DAYTON: Right. In the long run I think everything is in play. And I think the vehicle manufacturers, as GM mentioned, is going to come up with different ways of valuing, you know, E-85 vehicles.

Hydrocarbon fuels are certainly a staple and they will be for the near and long future of what's going on.

I think there's a lot of other factors other than just which fuel molecule we make. So, there are technology options, and I, you know, --

whatever fuel you want to pick, that's fine, but we're coming up with technologies in the laboratory that can be commercialized to produce a clean syngas that can go to whatever the market will bear.

MR. GUERRA: My name's Andy Guerra; I'm from Central Valley Biofuels.

The guy with the green diesel, you say that it's comparable to manufacturing equipment to biodiesel. Well, that's a really broad range. It goes from 30 cents a gallon to a buck-fifty a gallon for infrastructure and from facility.

Where is your ballpark of price? I mean, as a manufacturer, it would be very important to me to find out whether I should change my technology and go to the hydrogen blast, or stick with my alcohol.

DR. ANUMAKONDA: So, can you repeat the question? You're saying where's the price point or the cost of --

MR. GUERRA: Yeah, what's the price for equipment, basically a ballpark. Because the ballpark on biodiesel equipment is 30 cents a gallon to a buck-fifty a gallon for manufacturing for a year, for a processing unit.

So what would a processing unit that say does a million gallons a year of your technology, what would that cost?

DR. ANUMAKONDA: Yeah, I can't quote a cost number, but let me just say that when we scale up our costs it is to the infrastructure, existing infrastructure cost to the refinery. And so on that basis, it has a higher -- as compared to the stand-alone biodiesel units.

So, you're right, the range is huge; the application sizes are huge, right, and biodiesel, too, as the scale goes up, the cost comparison or the cost delta drops. The smaller you are the higher the cost.

MR. GUERRA: Okay, thank you.

MR. ALDAS: Rizaldo Aldas from UC Davis. I have two questions. First for Dr. Larson. I'm picking up from your comments regarding gasification being the only so far noncommercial part of the biorefineries. The question there is what do you think is holding the technology from jumping into the commercial stage.

And I guess the leading question there is what can you comment, what can you say about the status of the gas -- on bio technology.

The second question is for Dr. Dayton. There has been effort I guess in the U.S. and other parts of the world about bio oil or pyrolysis oil. Can you comment on that? Do you think it will play a role -- for biofuels?

DR. LARSON: I think on the question of why gasification hasn't made that step to commercial, it requires larger scale than biochemical conversion to be interesting commercially. And so there's more involved in doing a commercial demonstration, so there's more at risk, essentially. And I don't think the combination of the risk and the feedstock supply that has to be provided, which is not something to be underestimated, has held it back a bit.

As far as gas cleanup goes, again there's been work done on it over the past two decades, and there's a pretty good understanding of how to clean up various kinds of gases. But there, again, hasn't been the step to demonstrate it at a commercial scale.

Actually the Germans are trying a rather different approach to gas cleanup with their Choren Company in Germany, the one BTL plant that I mentioned. They're trying something that, once again, developed in the lab, but now they're actually taking into a larger scale. And so it will be interesting to watch how that one plays out.

But I think the issue is gasification systems in general want to be bigger than say biochemical systems for scale economy reasons. So that introduces more risk.

DR. DAYTON: And in regards to pyrolysis, yes, that's a technology option that we're considering for the future. In the five-year time horizon technologies haven't been commercially demonstrated to the point where we feel that it's going to demonstrate cost competitive biofuels technology. But it's certainly an option for the future.

And you can consider pyrolysis as sort of an intermediate step to perhaps largely partnering with UOP in trying to convert pyrolysis oils to fuel, one of the challenges is very high oxygen content, as was alluded to.

So I think coming up with novel and creative thermal transformations to at least expel oxygen in a useful or capture it in the fuel to optimize yields is going to be -- is certainly an advanced technology option. And what it looks like, you know, we'll see.

MS. MORGENTHALER-JONES: Lisa Morgenthaler-Jones of Live Fuels. At the conference I referred to last weekend in Florida, it came up that Conoco-Phillips is plugging palm oil directly into their refineries in the UK and Australia. Which has irritated the heck out of the biodiesel industry, because this is labeled renewable diesel. And then they lobby Congress for the subsidies.

But something I was told afterwards by an audience member is that it's not working well because they're trying to hydrocrack when what they need to do is hydrotreat. And the reason they're not doing it in this country is because it ain't working.

Would you talk about that?

DR. ANUMAKONDA: Yeah. It's all about using the synergies on the ground, but not overdoing it. So it is true in some European countries and elsewhere they are trying to mix biofeedstocks with the refinery oils.

It can be done to 80 percent, a couple of percent levels. But there are implications in the catalyst's life, and basically on the mainstream, that it's kind of not recommended, you know.

So, yeah, there is an attempt to kind of do that, but that's why I think, especially in the standard settings, and making sure that there is a standard processing and feasibility across the board; it's very important in this area.

So that's why the Europeans are into making it, sure that this is the right process, the right way to do it, the recommended way to do this and --

MR. THEROUX: Good afternoon. California, in particular, and many places in the states, we're finding that the socioeconomic driver of trying to do something with our solid waste. It is pushing forward the technologies that in the past that we have been striving so hard to get to work on biomass at the community scales.

But those community scale diversion systems, pyrolysis, gasification in particular, when you put them to municipal solid waste the syngas that you come up with is much more complex and much more difficult to manage than perhaps with strict biomass.

My question, then, and particularly I had this conversation with John Ashworth at NREL just recently, those that have the modular technologies that we're finding are clean on municipal solid waste, are reticent to take that syngas, that hot syngas, and try to do anything with it, either than combust it.

That makes it very difficult. It's a hard material to work with at those temperatures. And it's difficult to characterize.

So, if there is a choke point, if you will, in the management of moving from conversion of our waste products through the thermochemical processes into liquid fuels, right now the one that I see at the modular systems out in front, is just the fact that they don't have the experience, nor do many others, in managing at-temperature syngas characterization and conversion.

Can you comment on how we can move past that difficulty?

DR. DAYTON: Well, I think part of the issue with the high temperature syngas is that at some point if you going to fuel synthesis type, you're going to have to compress the gas.

So, by and large you're going to have to quench you down to a temperature where you can compress it up to synthesis pressures. And that varies depending on the process.

Using high temperature syngas obviously for power production at the inlet to a gas turbine, you know, the turbine inlet temperatures can accommodate those high temperatures so you don't have to take the thermodynamic penalty of cooling it down.

MR. THEROUX: Perhaps I can define what my temperature rate is; that might help a little bit. Most of the modular technologies that we see coming out of this due diligence that we're working on start around 650 C and move up into about 1250 C, somewhere in that range.

DR. DAYTON: That's, I mean that's standard gasification temperatures. And, again, you're going to have to -- if you compress the gas you're going to have to cool it to a certain extent.

And from municipal solid wastes, you know, obviously one of the solutions to hydrocarbon cleanup is temperature. One of the advantages of looking at coal gasification type technologies is that they run at very high temperatures, and tars are thermally conditioned very effectively.

Our challenge is to take advantage of things like biomass and MSW that are much more volatile and can be gasified at lower temperatures. However, then there's a tar problem. So it's chicken-and-egg one way or another.

MR. THEROUX: Yeah.

DR. DAYTON: So our goal is then to remove those tars catalytically so then you could take advantage of catalytic processes it out at lower temperatures.

But, by and large, at some point the gas will be quenched before it's compressed.

And now heat integration, obviously, is much more difficult at a smaller scale. And one of the things you have to be aware of is that, you know, to optimize that heat integration is going to be a challenge.

DR. LARSON: Can I just add to that that at above 600, 650, did you say C?

MR. THEROUX: Um-hum.

DR. LARSON: You have that alkaline

material is still in a vapor phase. And you probably have a lot of that stuff coming out of MSW, more so than biomass, even.

And that is going to create problems either in combustion or -- or it will create problems in combustion. You couldn't send it through a gas turbine, for example, and expect the gas turbine to survive very long.

MR. THEROUX: Correct. If we split the difference that follow along after Stockholm and the UK's definitions of what is conversion versus incineration, we're at that point. Can we take that material and do something with it, other than burn it directly at that time? And I would hope that we could learn to make that into fuels.

But, you're correct, we drop that temperature just a little below 650, we start tarring out. We're also dropping into the reforming window for dioxins, which makes it that much more difficult.

We're at that place of community scale due diligence in California in particular. And I would certainly encourage you, and both of you, to take part at the federal level in looking at the work that we're doing on MSW conversion from that particular perspective of assistance in managing that gas and turning it to fuels rather than directly to electricity.

Thank you.

DR. JENKINS: I want to take this opportunity to thank the panel on behalf of Martha and for myself, as well. We had some excellent presentations here, and let's give them a round of applause again.

(Applause.)

DR. JENKINS: We are now about three minutes to five. Before you go I actually do want to go through a little bit of synopsis here because I want to get some idea here of what we actually learned today. And I hope you'll bear with me because I appreciate your willingness to stay here this late, and to sit and participate in this.

And I do want to thank all of the speakers today. I found all the sessions excellent. We had some very good discussions on policy and resources in the morning session. Certainly Jim Boyd got us kicked off with a keynote here in which he sees continuing advances and commitment. But there is much more to be done. And I think we see here that there is, indeed, much more to be done. But we are making considerable progress, I hope.

We also see from Nathan's comments that there is commitment on the part of Congress,and of course, from John Ferrell's comments about the rest of the federal commitment to biofuels now with $385 million going into various biorefinery demonstrations. Six major projects with one in California, which we will hear about tomorrow. That's the BlueFire Ethanol project in southern California.

Major commitments to demonstration and we'll be looking to see what kind of information can come out of those demonstrations that will lead us on to commercialization of these approaches.

We've had perspectives from Europe; we've had perspectives from the Philippines. And I think we also see that there's a potential for some good international collaborations here, whether it's just from California or whether it's across the nation, internationally with more collaborations. I think that's something to look forward to in the future, as well.

And very good information coming from the industry on how we might see some integration, both from the electric and gas utilities like PG&E, for example; as well as from the other energy companies, oil companies, Chevron and with partners and affiliates such as UOP, as to how we're going to integrate biofuels -- better integrate biofuels into refinery processes and the utility systems, so as to provide for higher efficiency, lower cost, better reliability, just better overall management, perhaps, of some of these activities.

Not to rule out the remaining challenges for distributed systems, distributed generation, for example. Goals there in providing onsite power at lower cost, perhaps, than might be available otherwise. Better integrating waste management and environmental management practices into energy production operations.

And just generally providing for appropriate scales. And I think that's one thing I learned today out of all of the discussion is that there are different -- there are many different scales, but we need to pay attention, again, as we did in the '70s quite a bit, to appropriate technologies and appropriate scales.

What those appropriate scales are, I think, remains to be seen. Some of these things will be very large; some of them will be very small. And we need to be able to address the research and technology development, deployment and commercialization challenges at all of these scales.

And this is something that stands before us, as a Collaborative, to try to address in California. But, of course, globally this, I see, as a major issue.

With all of that I don't want to delay you from getting ready for the reception. I presume that all of you will be heading over to the Sheraton for the reception tonight. That runs from 5:30 to 7:30.

You may have seen Martha stuttering up the hill with her great burdens here, to get ready for that. And so she is over there preparing for that, and I hope you will attend.

It will give you an opportunity; I hope most of the speakers will be over there, at least some of you, anyway, be at the reception for some more informal discussions.

And in any case, we can attempt to identify the quality aspects of various types of fermentation products over there. So we'll at least engage in that.

(Laughter.)

DR. JENKINS: I would also make mention of tomorrow's forum.

We continue with a discussion on biofuels from municipal solid waste. Again, as I pointed out this morning, we are looking for comment here.

The Waste Management Board, in particular, is looking for comment from the public and various experts in different fields on how to design their research and commercialization plans. So please do plan on attending the forum tomorrow.

That is largely sponsored by the Integrated Waste Management Board, and thank you very much for that.

And, again, as I mentioned, we are embarked on a major transition here. There is no going back, I think.

So I hope you take that message with you and act on that. And we'll see you over at the reception.

And thank you very much.

(Whereupon, at 5:02 p.m., day one of
the Fourth Annual Forum was adjourned,
to reconvene at 8:30 a.m., Wednesday,
March 28, 2007, at this same location.)

--o0o--

CERTIFICATE OF REPORTER

I, PETER PETTY, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Biomass Collaborative Fourth Annual Forum; 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 forum, nor in any way interested in outcome of said forum.

IN WITNESS WHEREOF, I have hereunto set my hand this 14th day of April, 2007.