

ACCELERATED BIOFUELS DIVERSITY

CONFERENCE
BEFORE THE
COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
ONE HUNDRED TENTH CONGRESS
FIRST SESSION
TO
DISCUSS ACCELERATED BIOFUELS DIVERSITY

FEBRUARY 1, 2007



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ACCELERATED BIOFUELS DIVERSITY

THURSDAY, FEBRUARY 1, 2007

U.S. SENATE,
COMMITTEE ON ENERGY & NATURAL RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 9:38 a.m., in room SDG-50, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

The CHAIRMAN. Why don't we get started? Thank you all for coming. This has been billed as a transportation biofuels conference. Senator Domenici is on his way, and indicated we could go ahead and start and he'll be here shortly.

Let me just say in general I think you're going to see Senators coming and going during the day. We're scheduled for 3 hours of discussion this morning and 3 hours again this afternoon, so we have about 30 people lined up to make presentations, and so we're going to have to do our best to stay on schedule and keep things moving along. I'm sure there will be a lot of things people will still want to be saying after this is over with, and we'll be open to the idea of doing more in the future, but thank you all very much for being here.

We're focusing today on how we can fuel more of our transportation sector with renewable biomass. These homegrown fuel sources are currently our best hope of reversing the trend toward increased dependence on imported oil. We hope to learn about both the current state of the biofuels market and also about any policies that we need to be considering here in Congress to expand use of biofuels.

We have, I said 30, this says 33 experts who are going to be speaking in the 6 hours that we have devoted to this. We hope that we can keep this informal and allow people to make the main points they want to make. Obviously the full statements will be made a part of our record and we can review those, and everyone else can as well, since they will be on our web site for people to see.

I also want to particularly recognize Mr. George Sturzinger, who is from Silwa Gas in Atlanta, GA. He is also providing testimony to us today. He was not on one of the panels because of late information we got on that, but we very much appreciate his response to the various questions that we have laid out here, and appreciate

his being willing to come and observe what the others are saying as well.

So let me go ahead with the introduction of the first panel. I'll just introduce the five people on the panel and then have each of them take 2 or 3 minutes to describe who they are, what their involvement is, and if there's a few points that they want to make in that period, please do so. And then Senator Salazar and I will have questions, and others may be here by then as well.

Reid Detchon is the executive director of the Energy Future Coalition, and he is going to talk to us today about 25×25, as well as other issues, which we appreciate.

David Conover is counsel to the National Commission on Energy Policy, which notes that EPA's 2005 support for biofuels research was a start, but obviously we need to do a lot more.

Bob Dinneen, who is president and CEO of the Renewable Fuels Association, we very much appreciate him being here.

General Wald was a witness here in this very room, before our committee, about 2 weeks ago, I believe, on a somewhat different issue, more of the global issues affecting our energy security. He is with Securing America's Future Energy, Energy Security Leadership Council, and we appreciate him being here again.

Dr. Jonathan Pershing is director of the World Resources Institute, and we're very glad to have him here.

Why don't you each just go in that order and give us your presentations. After each of you is finished, or after all of you are finished, we'll have some questions.

**STATEMENT OF REID DETCHON, EXECUTIVE DIRECTOR,
ENERGY FUTURE COALITION**

Mr. DETCHON. Thank you, Mr. Chairman. Thank you for holding this session and inviting us to participate. I'll summarize briefly. I am Reid Detchon. I'm the executive director of the Energy Future Coalition.

For U.S. energy policy, two topics must be front and center—oil dependence and climate change. Both of these pose enormous risks to our economy, but if we deal with them together, the transition to cleaner, more secure energy technologies will create a new wave of economic growth and job creation, just as the computer and telecom revolutions did before.

It is that promise that led the bipartisan Energy Future Coalition, together with 400 other partners, to support the 25×25 initiative, which would set a national goal of producing 25 percent of America's energy from renewable resources by 2025. Senator Salazar is one of our champions, and we hope that Congress will adopt it early in this session.

With regard to energy security, our objective should be to minimize the role of oil in the economy so that the Nation is no longer hostage to a single commodity in its prices and politics. Alternative fuels must be the centerpiece of such a strategy.

The near-term options that address both oil dependence and climate change are biofuels and electricity, together with increased vehicle efficiency to make those fuels go further. Alternative fuels that improve energy security but make global warming worse, such as liquid fuels from coal, are a dead-end street.

Coal can become an important source of transport energy, but through electricity, not liquid fuels. Plug-in hybrid vehicles, operating first on clean electricity and second on biofuels, could all but eliminate the need for gasoline in light-duty vehicles, while reducing their global warming emissions by 90 percent.

We welcome the President's leadership in proposing a greatly strengthened standard for renewable fuels, and ask for your support as well. It would do much to strengthen the investor confidence that's needed to finance a new generation of biofuels technologies.

The Energy Policy Act of 2005 authorized many programs needed to advance biofuels, but it must be fully funded to be effective. We need to encourage the private sector to build multiple pioneer conversion plants, biorefineries, to demonstrate the use of different technologies on different feedstocks, because the technological competition remains quite unsettled. Not all of these will succeed, but those that do will create a new American industry.

To offset the cost of those investments, Congress should place tax incentives for both oil and alternative fuels on sliding scale, and phase them out as oil prices rise and Federal support is no longer needed. Such a step would save many billions of dollars if prices remain as high as EIA now forecasts.

Mr. Chairman, investments in energy efficiency and renewable energy can buy us time to develop more climate-friendly technologies and an energy future that plays to America's strengths. We look forward to the opportunity to work with you toward that end, and thank you for having us here today.

The CHAIRMAN. Thank you very much.
Mr. Conover.

**STATEMENT OF DAVID CONOVER, COUNSEL, NATIONAL
COMMISSION ON ENERGY POLICY**

Mr. CONOVER. Thank you, Mr. Chairman, and thank you for being here as well, Senator Salazar.

I am pleased to appear here today on behalf of the National Commission on Energy Policy, which is a diverse and bipartisan group of energy experts that first came together in 2002 with support from the Hewlett Foundation and several other leading philanthropies.

In December 2004, the commission released a report entitled "Ending the Energy Stalemate: A Bipartisan Strategy to Meet America's Energy Challenges." Two key biofuel recommendations in that report are still highly relevant today. We need to increase funding for biofuels R&D, and we need to provide early deployment incentives for new biofuels technologies like cellulosic ethanol. I'm in agreement with Reid on this point.

As you noted, Mr. Chairman, EPO Act 2005 contained several key provisions on this front, and we are pleased that some of these provisions, notably the Section 932 grant program and the DOE Title 17 loan guarantees, are contained in the joint funding resolution for fiscal year 2007.

At prevailing and projected petroleum prices, as Reid already mentioned, there are few economic challenges to the profitability of conventional corn ethanol. But the upper limit for conventional

corn ethanol, at most 15 billion gallons annually, is far below what would be a significant contribution to displacing petroleum.

Cellulosic material, on the other hand, whether derived from agriculture or other waste or produced from dedicated energy crops, holds the promise of providing sufficient feedstock to make a real dent in petroleum dependency while avoiding the food versus fuel debate we are hearing today. Deployment of cellulosic ethanol and other emerging biofuels faces significant economic challenges. We support the approach taken in EPAct 2005: reducing the costs of biomass and waste-derived fuel production through a combination of targeted support for research and development and by creating incentives for first-mover commercial production facilities.

Now, since the commission's report, we have come to several additional conclusions about biofuels policy. First—and I am again echoing Reid here—in light of EPAct's fuel mandates and the established nature of the corn ethanol industry, the commission believes that Congress should reevaluate and rationalize the current system of ethanol subsidies to direct a greater share of scarce public resources to more promising but not yet commercial options such as cellulosic ethanol and biobutanol.

Second, where Federal incentives are appropriate, the commission strongly believes that Congress should seek technology neutrality. As you'll hear later this morning, new biofuels are moving quickly along the research, development, and deployment continuum. Policies should be crafted that do not unintentionally exclude emerging biofuels, the very technologies most in need of Federal assistance. Incentives should be structured to encourage the most energy-efficient conversion technologies to produce the lowest carbon biofuels possible.

Finally, Government should partner with the biofuels, automotive, and refining sectors to seek flexible solutions to growing the biofuels market. For example, it may be the case that ethanol blends greater than E10 but less than E85 can be distributed through existing infrastructure and used in existing engines without major modifications to either.

I see my time is up. Thank you for your attention. I look forward to participating.

The CHAIRMAN. Thank you very much.

Mr. Dinneen.

**STATEMENT OF BOB DINNEEN, PRESIDENT AND CEO,
RENEWABLE FUELS ASSOCIATION**

Mr. DINNEEN. Thank you, Mr. Chairman, Senator Salazar. It's an honor for me to be here today on behalf of the Nation's ethanol industry.

I can tell you that Congress's effort to provide both a production push and a demand pull has created a very dynamic and growing renewable fuels industry that is reducing our dependence on oil, increasing rural economic development opportunities, and improving air quality in our Nation's cities. There are today 111 ethanol bio-refineries in operation, capable of producing about 5.5 billion gallons of ethanol from almost 2 billion bushels of grain. Ethanol today is blended in 45 percent of our Nation's fuel.

But we're not done yet. The industry is growing rapidly. There are today 78 plants that are under construction in all parts of the country. There are plants that are going up in California, in Arizona, in Texas, in the Northeast. The industry is changing. The industry is improving. The industry is becoming more efficient. The industry is looking at new technologies and new feedstocks. And I believe the industry will be unrecognizable 5 years from now, from what it is today, because of the efforts that this Congress has put in place to create a viable and growing renewable fuels industry.

Eighty-five percent of Americans, however, believe the Nation needs to do more to reduce our dependence on imported oil and to break the Nation's addiction to oil. And I would suggest that the industry believes the most important things to focus on is what has worked. Clearly, consistent and stable tax policy is going to be critical to ensuring the continued development of renewable fuels and ethanol, and to move the industry beyond traditional feedstocks to newer technologies.

Second, I would think that as the industry grows, as we're blend in 46 percent of the Nation's gasoline already, and with more than 6 billion gallons of ethanol production capacity in construction today, the time when we will saturate the blend market for gasoline is rapidly approaching; and thus, incentives for flexible fuel technology for E85 are going to be critical to provide markets for cellulosic ethanol when it is commercialized. And I would encourage the Congress not just to put out incentives but to make sure that those incentives encourage auto manufacturers to optimize the vehicles for the fuel that's going to be used, so that there isn't a mileage penalty and so the economics of using ethanol in those vehicles can be addressed through technology. It's certainly possible.

Finally, I would suggest that additional programs to encourage the commercialization of cellulosic ethanol are indeed going to be critical. The Congress has done a lot already through EPAct. Those programs do need to be fully funded, but Congress should look to other measures as well, so that we commercialize cellulosic ethanol as rapidly as possible.

I thank you, Mr. Chairman, Senator Salazar, for your leadership on these issues in the past, and I look forward to working with this Congress as we move this agenda forward.

The CHAIRMAN. Thank you very much.

General Wald, welcome back, and go right ahead.

**STATEMENT OF GENERAL CHARLES F. WALD, USAF (RET.)
REPRESENTING SECURING AMERICA'S FUTURE ENERGY,
ENERGY SECURITY LEADERSHIP COUNCIL**

General WALD. Thank you, Mr. Chairman. Nice to see you again. Senator Salazar, thank you.

The previous members all mentioned security and vulnerability. Obviously that's my expertise and interest, and how I got into this area was as the former deputy commander of the European Command, which includes 92 countries, mostly Europe, obviously; Russia; Africa; the Caucasus; as well as Israel.

In our review of the strategic mission we had post-9/11, and obviously with NATO not having the mission to counter the Soviet Union, it became apparent we had to review whether we needed

115,000 troops in Europe anymore. And during our review it became apparent that there are obviously threats that still exist, we know that: terrorism, the proliferation of WMD potentially.

But also it became apparent that energy security is a military mission. That's what we have been doing for years. In 1980, then-President Carter announced the Carter Doctrine that said that oil from the Middle East was a vital interest to the United States and we would use military force to ensure that flow if we needed to. And I think that became pretty much the standard and we made that acceptable. Unfortunately, that became the standard for the rest of the world.

About a year ago I was in Kazakhstan discussing critical infrastructure with several oil executives, and before we started to discuss where those vulnerabilities might be, one of them stood up and said, "I'd like to thank you, General Wald, and the U.S. military, for ensuring the free flow of oil around the world." And I thought that was a nice comment, but telling.

Ninety percent of all the oil in the world is owned by nationally-owned oil companies, most of those in unstable or unfriendly countries. And much of that oil that comes to the free world, fungible as it is, comes through very vulnerable straits. Matter of fact, almost 50 percent of all the oil in the world travels through places like the Straits of Hormuz, the Malaccan Straits, et cetera.

Now we're starting to be the benefactors of oil from the Caspian Sea, which is a good place, but vulnerable, as well as the west coast of Africa. And predictions are within the next 15 years we'll be importing 40 percent of our oil from the west coast of Africa. I've spent a lot of time there, and the west coast of Africa does not have the military capability to protect those assets.

\$100 billion of U.S. money from our industry will be invested in that area over the next 15 years. Again, the expectation I think will be that the U.S. military is ready and able to take up that mission of protection. I think that's a burden-sharing issue for the rest of the world.

In the interim, I believe alternatives—and reducing our addition has been mentioned—is critical, and I still think that will take 10 to 20 years. So I would first of all applaud your efforts and thank you for your efforts in this, reducing the vulnerability, and I look forward to answering any questions you may have. Thank you very much.

The CHAIRMAN. Thank you very much.

Dr. Pershing, with the World Resources Institute, thank you for being here.

**STATEMENT OF DR. JONATHAN PERSHING, DIRECTOR,
WORLD RESOURCES INSTITUTE**

Dr. PERSHING. Thank you very much, Senator. I appreciate very much the opportunity for the World Resources Institute to participate in this session. We are a research think tank which focuses on global environmental problems, and to that end also look for policy solutions that can be pragmatic and successful.

On the issue of biofuels, we believe that the biofuels offer enormous potential, but that our policies have to be carefully designed

if we are to contribute to meeting both our environmental and our energy security goals. I want to make just three points.

The first one is that we are not convinced that the current set of biofuels policies are being entirely correctly undertaken. For example, it's not clear we take account adequately of environmental damages, including water, fertilizer, soil, soil loss, erosion, diversity loss, in the design of the current programs. To a certain extent the focus on corn rather than cellulosic ethanol as a key feedstock creates some questions, but in other areas, things like our flexible dual fuel standards for vehicles, we create some perverse incentives around issues like efficiency.

The second point I would like to make is that there are ways that we think we could do it right, that would be consistent with policy objectives that we hold closely. We should actively pursue the commercialization of cellulosic solutions, but we need to be careful. Not all cellulosic options are the same. Not all feedstocks are equal.

We should invest in research to minimize the environmental impact of the crop choices. We should provide incentives for best management practice, such as conservation tillage. We should develop incentive policies that are based on the characteristics of the fuel that we want to encourage instead of the fuel itself. If we do these kinds of things, we would encourage what I would call good biofuel. We would meet both the energy and the greenhouse gas criteria that we hold, instead of developing a biofuel solution which meets neither.

The third point, biofuels have to be part of a set of wider priorities, a portfolio that in the transport sector includes modal shifts, vehicle technologies, and other fuel options. The climate emissions and the energy security that we have all spoken to should be the guiding principles that give us those criteria. If we adopt those points and frame our solutions in that manner, we can have a significant impact in both areas and allow this to be a very successful policy outcome instead of one that is not as manageable.

We look forward to participating with you and working with you as you work in this important area. Thank you.

The CHAIRMAN. Thank you very much. Let me ask a few questions and then defer to Senator Salazar, and then we'll do another round if others haven't arrived.

Let me start with this issue of too much focus on corn and not enough focus on cellulosic feedstocks. That seems to be a recurring theme in a lot of what I heard from you folks. We tried, in the EPAct 2005, at least at one place, to incentivize the development of cellulosic ethanol by saying that in reaching the goals for blending of ethanol into the fuels used in the country, we would give credit for cellulosic ethanol of 2.5 gallons for every gallon of grain-based ethanol.

Now, that became sort of a dead letter because obviously the development of ethanol generally has been so substantial that it looks like these goals are not a real concern of anybody. We're going to blow right past them. What else could be done, what else needs to be done to be sure we've got enough focus on development of these cellulosic feedstocks and don't get into a circumstance where we're putting all of our investment into corn-based ethanol?

Now, Mr. Dinneen, I know this is an issue near and dear to your heart. Why don't you give us your view?

Mr. DINNEEN. Thank you, Mr. Chairman. First of all, I'd like to reject the notion that there are good biofuels and bad biofuels. I mean, biofuels in general are going to be better than gasoline, and I don't think that there's ever going to be a situation where cellulosic ethanol replaces corn-derived ethanol.

Corn is going to continue to be an important domestic market for farmers. The corn ethanol industry today is revitalizing rural communities. When I go to an ethanol plant opening, and I have to go to them quite frequently these days, I look at 1,000 farmers that are gathered celebrating the opening of a new business, perhaps the first new business that has come to that community in 20 years. And it's a facility that they invested in, and they recognize that it is going to provide a tremendous economic stimulus to their area, that's a very positive thing.

That's one of the reasons this policy has been so successful. To try to demonize corn-derived ethanol I think misses the bigger picture, which is that we need to be doing everything possible to promote all biofuels. Corn ethanol will certainly have a role. Corn ethanol can't do it all, but it's going to be a part of the future. There are limitations to what we're going to be able to produce from grain, and that's why there isn't a corn ethanol producer that I represent that doesn't have a cellulose-to-ethanol research program underway, because they know that that is a part of the future.

The CHAIRMAN. To push back a little bit, I agree with you that there are not good biofuels and bad biofuels, but would you agree that there are good biofuels and better biofuels from the perspective of getting our energy needs met?

Mr. DINNEEN. I'm not in a position to disagree with you vehemently. How's that?

The CHAIRMAN. All right. All right. Mr. Conover?

Mr. CONOVER. Thank you, sir. I want to say that I would subscribe to much of what Dr. Pershing said. And I think the way to think about this, as you put it, is good biofuels and better biofuels. In addition to the ability to make a dent in our dependency issue, you've also got life cycle greenhouse gas emissions issues.

There's a real possibility with cellulosic ethanol that you will have negative emissions on a life cycle basis, given the fact that you could use the lignan that is a byproduct of the process to actually power the plants themselves. So there are clearly better biofuels from an environmental standpoint.

The point—and I certainly don't want to demonize corn ethanol because, as Mr. Dinneen points out, it is better than gasoline. There's no question about that. But one of my jobs in government was the director of the Climate Change Technology Program, and the issue for—it's sort of a philosophical issue—Federal subsidies really ought to be targeted at what a lot of people in the R&D community call the "valley of death."

And that is where you've got a technology that has been brought to the near-commercial stage through research, development, and demonstration, and it needs to get out into the commercial marketplace to see if it will survive or not, see if it will be able to compete. That's where cellulosic ethanol is today. It can compete, but it can't

compete on a level playing field with corn ethanol. Corn ethanol profitability is extremely high.

Yes, there are issues of natural gas prices, there are issues of corn prices, but from a fiscal conservative perspective, you ought to consider directing the subsidies where they are needed the most. And the only downside to the current system is whether the fact that we are providing very generous subsidies to an established, mature industry is preventing us from providing the assistance we need to give to the emerging biofuels. It's not a matter of demonizing corn. It's a matter of where do you need to spend the Federal dollars.

The CHAIRMAN. Dr. Pershing.

Dr. PERSHING. Just one short comment about it. I don't at all mean to demonize corn. What I'm suggesting is that we're looking at a significant expansion in the total market, and as we expand in that market, if we are to stay with corn, the question is where are we going to put it? Where are we going to grow it?

Well, the place we grow it is by moving away from other crops. The place that we grow it is by moving away into conservation-reserved areas. The place that we grow it is moving into marginal lands. In all of those cases there are potential environmental consequences that we have to be careful about, we have to manage.

It doesn't mean that corn is bad. It means we have to think about designing policies that let us move forward appropriately as we expand the market. Cellulosic ethanol offers different choices, an expanded set of choices which, on balance, seem to have more positives than expansion, simply thinking about the corn structure as it exists today.

The CHAIRMAN. Yes, Mr. Detchon.

Mr. DETCHON. Mr. Chairman, I would just say I think that corn can be produced well or it could be produced badly, and cellulose can be produced well or it can be produced badly. We are trying to move toward better biofuels, but more importantly, more biofuels.

And I think that if you think about how to incentivize that—you noted that the RFS has had little effect because the industry has way overshot the targets. But there is a general consensus, that I think Bob would agree with, that the corn industry is going to be limited to somewhere in the neighborhood of 15 billion gallons.

If the Congress embraces the President's goal of 35 billion gallons by 2017 and puts that into a predictable ramp-up, now you are creating the investor confidence to make the next generation of technologies move forward, and that's the most important thing. There's a lot of money moving into this area in the private sector, but the need is to have some assurances to have a market. So the reverse auction that was contained in EPAct was a useful tool. And a higher RFS, too, that would go beyond the reasonable expectations of corn supply, will also drive us toward the cellulosic future.

The CHAIRMAN. Let me call on Senator Salazar for his questions.

Senator SALAZAR. Thank you very much, Chairman Bingaman, and thank you for putting the spotlight on biofuels and the importance of biofuels with respect to our energy future.

I also want to just say thank you to the members of the panel who are here, who are interested in this issue, and to the members

of the audience who are here. I saw my good friend Dan Arvizo, the director of the National Renewable Energy Lab, who is going to be on a panel later on this afternoon. We very much look forward to his vision on what the possibilities are of some of the things that we are talking about here.

To the Energy Future Coalition and to all of you who have been involved in the 25×25 effort with Senator Grassley and myself, I appreciate that very much. At this point we have, I think, 25 original cosponsors of that legislation, and I think it will continue to grow in terms of the kind of support that it has.

I have a couple of questions for you. We probably have—I've not counted the bills, but certainly there are dozens of bills that deal with energy. I think there is a general recognition here in this capital that energy is one of the top two or three signature issues of the 21st century.

And I guess the first question that I would ask of you is, how far do you think we can go? Is the expectation, as set forth in our vision, of producing 25 percent of our energy from renewable energy resources by the year 2025, doable? Is it too modest and insufficient a goal? Could we do better? If we could do better, how could we do better? So I would ask you to all respond to that question very briefly.

And the second question that I would ask you to respond to is a continuation to the set of questions by Senator Bingaman, and that is that there has been a lot of focus on corn and ethanol. In my State I see four plants today functioning that weren't there 2 years ago. I very much am a supporter and the No. 1 cheerleader of that effort, but I also know that as we transition from corn over to cellulosic ethanol, that there are some challenges before we can make cellulosic ethanol commercially available out there in the market, the way that we now use corn ethanol. And I would ask each of you to give, in a very short way, what your top two recommendations would be, to this committee and to this Congress, as we move forward, to try to incentivize and to encourage bringing onto the menu of renewable energies cellulosic ethanol.

So why don't we start with you, Reid, and we'll just go down the table.

Mr. DETCHON. Thank you, Senator Salazar, and thank you again for your leadership on 25×25.

With regard to the doable question, I think that 25×25 is clearly doable. I'm sure you are all familiar with the Oak Ridge so-called billion ton study that indicated that we could easily harvest more than a billion tons of biomass from America's lands without disadvantaging food, feed, and export markets. So the biomass is there.

And on the electricity side, we have a range of alternatives, including solar, wind, geothermal, and hydroelectric. Just with respect to wind, for example, as I'm sure you also know, the administration set a target of 20 percent of our electricity coming from wind. If you can get that much from wind, getting the next 5 percent is already a done deal. So 25×25 is not a problem.

But when you think about this in a context—and I'll give you the example on the transportation side—we're moving, in my opinion, toward electricity as being the fuel of choice for vehicles. The Chev-

rolet Volt, that concept vehicle they just had out in Detroit, is sort of the first edge of that. Built on an electric platform, so you don't have a conventional drive train, and using liquid fuels to recharge the battery as you're going along, so you have the range that you need.

If you go that path, and you get clean electricity from the grid, supplemented by clean biofuels, petroleum is out of the picture completely and your greenhouse gas profile is very good. So that's a very attractive package to look at incentivizing. And toward that end, efforts to improve battery performance for those kinds of cars, I think, are the highest priority.

With regard to what we need to do, I think that the loan guarantees providing in EPAct are a very important first start. As Dave said, it's very important that that got covered in the CR, and we're very pleased about that. We think the reverse auction is a very attractive mechanism for early entry fuels, and again, EPAct authorized that but we don't have appropriations to it.

And then, last—and I think a lot of you have been thinking about this—probably the slowest-moving piece of this puzzle is the availability of fuel to consumers. It would be natural for the existing petroleum-based infrastructure to be less than enthusiastic about marketing an alternative product on their sites, but this is a problem that needs further attention.

How do we get high-blend ethanol and other biofuels more available in the market to consumers? We now have more than 6 million flexible-fuel vehicles out on the road today. Where are they going to get fueled? That's an important problem for further review.

Senator SALAZAR. So you would say that one of the things that we could do in this Congress is to move forward to incentivize a change of the infrastructure so that these alternative fuels are in fact available to consumers all across the country, moving from a limited availability now to a much broader availability?

Mr. DETCHON. Yes, sir.

Senator SALAZAR. OK. David.

Mr. CONOVER. Thank you, sir. I again agree with much of what Reid said. The commission doesn't take a position on what a specific goal should be in terms of the use of renewable fuels, and in fact the commission is perhaps more concerned with the issue of zero-emitting sources of energy. And so, as Reid talks about plug-in hybrids, if a plug-in hybrid is being fueled by an IGCC coal plant that's fully sequestered and there are no emissions associated with it, that addresses the climate change and the international dependency issue as well as some of these other questions.

So with respect to the most important things that this Congress can do, and staff hates to hear this, but yes, fund the things that this committee authorized. This committee did an outstanding job in crafting energy legislation that was signed into law in 2005. The Appropriations Committee needs to follow suit, and they need to fund those programs that you authorize. That will perhaps make the largest difference of all.

I think an issue that maybe you won't hear a lot about today, that will also be important as we grow the ethanol industry, is consumer preference. Due to the lower energy density that ethanol has

as opposed to gasoline, you will end up taking more trips to the gas station if our vehicle efficiency stays stable. And so one of the important things that this Congress can do is pass, reform, and strengthen a CAFE system that will in turn make ethanol fuel more attractive to consumers by increasing the range of the vehicles that are fueled by it.

Senator SALAZAR. Bob.

Mr. DINNEEN. Thank you, Senator. I would say that if you go the route of looking at an additional standard, don't be shy about giving a big, bold number. When we had the debate over the renewable fuels standard 2 years ago, there were a lot of people that said, "7.5 billion gallons, that's an awful lot of ethanol. How are we doing to get there?" And there were a lot of doubters that the industry would be able to respond by 2012.

Well, responding to the marketplace signal that was given, we're going to have 7.5 billion gallons by July 4 of this year, not 2012, and we're looking at a time when we will have 14 or 15 billion gallons of ethanol from grain, but we do need to go beyond that.

And indeed what the President established when he gave his State of the Union speech and he talked about a 35 billion gallon goal, that's a very aggressive goal, but one that would be eminently achievable if the right tools are in place to assure that the marketplace can respond. It is a goal that will indeed incentivize cellulosic ethanol and make sure that the marketplace responds with the necessary R&D—

Senator SALAZAR. Is that goal high enough, Bob, or would 50 billion be something that would be achievable? Would 60 billion? What's the right goal?

Mr. DINNEEN. I'm not sure that I've seen a goal yet that I would say isn't high enough.

Senator SALAZAR. So your point is, be bold with our goals?

Mr. DINNEEN. Yes.

Senator SALAZAR. Be bold, then.

General Wald.

General WALD. Senator, I'm not a scientist and I'm not an expert on biofuels, other than I know we need energy. And I would say that a couple things come to my mind as I hear—the solutions I think are all admirable but, as was mentioned earlier, it's going to be multifaceted.

But the thing that strikes me most of all is that even if we were to have an epiphany of commitment today by all the different types of alternate fuels, it would take us—as you point out in your support of the 25×25 initiative—until 2025 to get there, and then it's only 25 percent of what we use.

So we're always going to have some dependency on oil, it appears. In my time in Europe or overseas, which was 15 years, I went to 125 countries and I've seen many things, but it's striking how vulnerable some of the places that much of the energy that we're dependent upon are to disruption or lack of security—in Georgia, in Azerbaijan, off the coast of Africa.

I am encouraged by the fact that we have a commitment by Senators like yourself, and this country is mobilized now to address the problem, but it's going to be multifaceted. It's going to take huge national leadership, and I think we need to do this in the

very near future, because what oil has become to this country is basically an asymmetric threat somewhat similar to terrorism. I don't want to be alarmist or overembellish this, but the fact that countries can now direct or drive what our foreign policy is is something we're not necessarily used to, and we're going to become more and more vulnerable to that in the future unless we take broad and immediate action.

So thank you.

Senator SALAZAR. Thank you, General Wald.

Seeing that my colleagues are here and we only have about 15 minutes left on the panel, I'll take your answer privately, Dr. Pershing, later on.

I'll go ahead and yield, Mr. Chairman.

The CHAIRMAN. Let me call on Senator Corker to ask his questions. He was the next here.

Senator CORKER. I'll yield to more senior members.

The CHAIRMAN. Let me then call on Senator Domenici. He was right after you.

Senator DOMENICI. Thank you very much, and thank you, Senator. You don't have to do that. There is no precedent here. If you have questions, you should go ahead and take them, but I'm most appreciative.

I want to explain to my chairman and to all of you why I was late. I think what I say will apply to Senator Craig. We both were at the National Prayer Breakfast over here at the Hilton Hotel on—what is it?

Senator CRAIG. Florida and Connecticut.

Senator DOMENICI. Yes, Florida and Connecticut. And we got caught in traffic, I got caught in local traffic down here, and we apologize for being late, but not for where we went. It was a very outstanding place. We even had a gigantic scientist of our day speak as a believer, which was rather interesting. Usually you can't get anybody in the science community to talk as a believer, but he was the speaker and was very glad to do it.

And he's a geneticist besides, one who works on genes and how it affects us, which is good.

I'm going to try to be brief. I don't know what has gone on so far, or what is more appropriate elsewhere. You can tell me, Senator. How quickly could flex-fuel vehicles be introduced into the Nation's fleet of automobiles?

And I'll just piggyback on that, the CAFE standards, as written, allow automobile manufacturers to receive credit for flex-fuel vehicles toward their CAFE obligations even if these vehicles never actually ran on biofuels. Should we eliminate this flex-fuel loophole, or is it a useful way to encourage the manufacturing of flex-fuel automobiles? I don't know, whomever is best at it.

Mr. DETCHON. Senator Domenici, one thing you missed by being absent was a fair amount of praise for the Appropriations Committee for including the loan guarantees in the continuing resolution, and I want to particularly recognize your leadership on that. It is much appreciated and it's going to be very important.

Senator DOMENICI. You mean in the CR?

Mr. DETCHON. In the CR.

Senator DOMENICI. We got \$4 billion. Senator Bingaman and I have looked it over and we have seen how broad its application is, and we think they missed a zero. We think it should be \$40 billion. We'll be working on that.

[Laughter.]

Mr. DETCHON. That's what I would call an aspirational target.

Senator DOMENICI. We'll get a lot more than \$4 billion before the year is out.

Mr. DINNEEN. Needs more prayer.

[Laughter.]

Senator DOMENICI. We'll get that, too. Dr. Pershing should answer my question.

Dr. PERSHING. Thank you, Senator. I would like to echo the comments made about the importance of the work you've been doing historically to move all of these issues forward. It makes a great deal of difference.

The question you have asked strikes me as a critical one, and it comes down to the issue about where standards are set and how to make sure that we don't create loopholes that are unintentional. In this particular circumstance, what has ended up happening is that a trivial, small fraction of the vehicles that are labeled as flex-fuel vehicles use any form of biofuel. The vast majority are in areas where there is no gasoline station that sells ethanol.

The consequence of that is that we have in fact lowered the standards, because those vehicles do not get the kind of efficiency that a gasoline vehicle would get. It seems to us, as we look at that, that as you develop your policy you want to create incentives that avoid that kind of perverse outcome, and there are ways to do it: Set up standards that are manageable across the board; think about things that move you to incentives that are life-cycle-based, not just ones that are exclusive to one technology; open up the doors so that when you look at these life-cycle questions, those issues don't contradict areas in other policy that we're seeking to move.

I would highlight narrowly the question of efficiency. I think all the people on the panel have spoken about this being one part of our solution. Clearly we can get to a much higher level, to answer Senator Bingaman's question, a much higher level than a 25 percent share. We can much more easily do it if we have cut the total consumption in half through efficiency programs. Then it's actually a matter merely of moving the technologies we've all spoken to into the market, and those are the policies you're working on.

Senator DOMENICI. Very good.

Mr. DINNEEN. Senator, if I could just briefly add to that. I agree with much of what Dr. Pershing just said, but I do think some credit needs to be given to the domestic auto manufacturers for the commitments that they have made in the production of flexible-fuel vehicles. A couple of months ago they made a commitment in the White House to produce as much as 50 percent of their vehicles, beginning in 2012, as flexible fuel.

There are 6 million FFVs on the road today. That's a small fraction of the total number of vehicles that are on the road. There are only about 1,000 E85 refueling stations across the country, a small fraction of the number of gasoline stations that there are.

But you need three components to make the E85 market work: You need more vehicles, you need more infrastructure, and you need more ethanol. If you're going to be able to satisfy that market, you really do have to be able to produce significantly more volumes of ethanol that can be used to satisfy the blend market today, so you need to crack the code to be able to produce ethanol from cellulose.

All of this is happening, but it really doesn't serve much of a purpose to criticize how little is happening today, because the marketplace is evolving, there are more vehicles coming on-line, and there are more stations all the time. We are working as hard as we possibly can to crack the code to produce ethanol from cellulose. It's not going to happen tomorrow, it's not going to happen next year, but in 7 years, in 10 years, you can indeed have a meaningful E85 market and be making a real dent in this.

Mr. CONOVER. Senator, if I could on this, I agree with much of what Bob has said. The vehicle issue is less of a challenge. It's only roughly \$100 to modify engines to be flex-fuel cells. Obviously when you multiply that by the number of vehicles out there, that's a big number, but it is not a big burden.

The infrastructure issue is a bigger challenge, and one of the recommendations that we are making today is that we not be wedded to E85 as the next step. We don't have to go from E10 to E85 to grow this market. If we can go from E10 to E20, and if there are fewer impacts on existing infrastructure and delivery systems, then that will more quickly grow this market at a lower cost to consumers, at a much greater ease of technological sophistication. So we would urge this committee to examine that issue. What will it take to get us from E10 to E20 in a very near time?

Mr. DETCHON. A brief word in support of the existing CAFE credit. If you think about the problem of trying to introduce a high-blend ethanol into the market, it would be foolhardy to develop a major production industry and have no cars that can run on it. This has been an effective tool to get ahead of that problem, since we do have 6 million cars on the road and the automakers are willing to ramp up production very rapidly. What they feel constrained by is lack of demand for ethanol, just as everybody is concerned here. Let's address that problem by dealing with the infrastructure issues, and not figure out ways to penalize the automakers for doing the right thing.

Senator DOMENICI. Thank you very much.

Senator Bingaman, I might be prepared to yield, and you can go with whoever you think is next, but I was going to say to all of the Senators, but in particular you, if we are going to be continuously burdened by having a low level of numbers for our loans, for our guaranteed loans, and things like \$4 billion get eaten up like nothing but they go to the wrong places, and it seems to be even \$10 billion or \$12 billion would go to the wrong places, it does make sense, it would seem, for some of us to ask the Secretary to work on the supply that he has so as to have dual purpose, so as to develop the technology but also put the technology that's most needed in the infrastructure arena, but that first. Otherwise, we could dot all over the place and still not do maximum infrastructure development with a short supply of loan guarantees.

I talked to Larry, and I don't speak for him, but I think he agrees that the Government doesn't understand what we're talking about. The Government doesn't get hurt by these loans. They don't even lose any money. Why they can't just have a giant portfolio of them and watch them carefully, I don't quite understand. So we'll have to work. And if you agree with me, we just have to work on that.

Thank you very much.

The CHAIRMAN. Well, thank you very much. Let me just alert everybody. We're within 4 or 5 minutes of having to finish this panel, unfortunately, if we're going to stay somewhat on time. We have two other Senators who indicated they have questions. Let me call on each of them, and they can ask a question or two, and if we could get quick answers, that would sure help us a lot.

Senator Cantwell.

Senator CANTWELL. Well, thank you, Mr. Chairman. I think Senator Craig walked in before I did.

The CHAIRMAN. Oh, did he? OK.

Senator Craig.

Senator CRAIG. Well, all right.

The CHAIRMAN. It makes no difference if we—

Senator CRAIG. I will be brief. I have one question. Prior to asking that, General Wald, thank you for your message on the sense of urgency as it relates to security and energy. I started speaking out about petronationalism early last year, trying, at least to my audience, to say we have a very real problem here and it's getting worse, not better, and it will change the character of our foreign policy and our Nation if we're not helpful. Thank you for your message. I hope it's getting out. I think it is. I think people are beginning to listen.

My question is for all of you, and you can answer it quickly and individually. DOE, because of its failure in coal to liquids, is scared to death of loan guarantees, and they are nitpicking and doing something that is frustrating to all of us, and I think Pete just referenced that. So is USDA a better place for this than DOE? They have been in that business for a long while. They seem to be able to handle it.

We have a farm bill coming up, and we have an opportunity. Should we move exclusively or substantially in that direction, and away from an agency which has not done this well or is fearful? I don't see any losers here, but I will tell you we're missing windows of opportunity and at a time, in my opinion, that is critical to our country.

Anyone want to respond to that observation?

Mr. CONOVER. Well, sir, as a relatively recent refugee from DOE, I am going to say that there are a lot of folks over in that building that want to make that program work. And I think that there is room in this—as Senator Domenici pointed out, there is room in this market for a proliferation of loan guarantee programs, so I would very much encourage the Congress to beef up USDA abilities in this regard, as well as DOE's abilities in this regard.

Senator CRAIG. General.

General WALD. Senator, first of all, I am not an expert on bureaucracy, so whether it's in USDA or DOE, I would—

Senator CRAIG. Neither am I, but I don't want to be a victim of it, either.

General WALD. I agree, but I will say that I think you've asked the right question. That is one of the serious issues I think our country needs to face, how are we going to take advantage of coal. And I know it's a serious issue on climate, and I understand that, but from a security aspect, we have a huge opportunity to take advantage of coal.

I had the opportunity to briefly discuss this with Senator Cantwell the other day by the train, and I mentioned that she asked during the last hearing why we don't help China with coal technology, from a climate aspect, and I think there's some benefit there.

But my point would be that I think—as Senator Domenici mentioned, I think it becomes a governmental issue now on how are we going to assure that we can produce clean coal. The benefit of that asset would be hugely important to getting off this dependency on imported oil, and I think when the standards and regulations are established that say this is what the standard for that coal is, we're going to make a huge step forward in getting off that dependency. So thank you for that.

Mr. DINNEEN. Senator, if I could just add really quickly, DOE has had some reluctance, it seems, to move forward with their loan guarantee authority. I do think that that attitude is changing, and I do think they are certainly capable of doing it and they seem to have a new commitment to it. But I believe that USDA has had some expertise in this. They are enthusiastic about building a renewable fuels industry, and from my perspective, all the better.

There are companies that have been waiting for years, literally, for a loan guarantee program to finally hit the streets, because they are ready with technology. All they need, as a first supplier of this new technology, is a loan guarantee from the Federal Government. So as soon as somebody hits the street with it, you are going to see commercial cellulosic ethanol facilities built, and it can't happen fast enough.

Senator CRAIG. Thank you. I concur.

The CHAIRMAN. Dr. Pershing, why don't you give us your view, and then we'll call on Senator Cantwell.

Dr. PERSHING. Just two very brief points. It strikes me—as you design your loan guarantee program, I personally believe that this will become a commercial technology. The loan guarantee program does not have to be permanent. It can be phased down over time.

The second point is, with regard to the comment made by General Wald, I agree that we have to think about how we do a clean coal system. I do not believe that coal-to-liquids needs to be part of the transport infrastructure to do that. The effectiveness of a capture and storage program under the liquids solution is not very promising. We can use alternative technologies like the ethanol structure, like cellulose, like efficiency, like plug-in hybrids, which would allow us perhaps to use coal on the electricity side.

The CHAIRMAN. OK. Thank you.

Senator Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman, and thank you, gentlemen, for the discussion this morning on what at times seems

to be the chicken-or-egg discussion of which to do first to jump start this market to a full run.

In the Northwest we certainly have developed a great deal of use for biodiesel—that is, public school buses, military vehicles, our ferry fleet, more cars per capita than just about anyplace else—so it's no surprise that we also sold out of all the biodiesel that we had, and that the largest biodiesel facility in the country didn't produce 100 million gallons all last year, and this facility will now produce that, because that market was there and demonstrating that capacity.

So my question is on infrastructure. What should we either incent or mandate as it relates to the distribution of alternative fuels? And, second, do any of you think, given what you have already said this morning on the cap-out of U.S. production of ethanol, that we need to do something to further establish that market by getting other sources of ethanol?

Mr. DETCHON. Senator Cantwell, I think with regard to infrastructure, the—

Senator CANTWELL. And specifically mandates or incentives, if you could.

Mr. DETCHON. Yes. I think probably it's a combination. I would rather not make that choice. I think that I would recommend a dialog with the auto manufacturers who would like to partner up and identify areas where they have already sold substantial numbers of flexible-fuel vehicles. And maybe, once you reach a certain trigger level, there would be a mandate in that region for a certain percentage of refueling stations to be present. I think that there are flexible ways to do this.

And I think that, in terms of biodiesel, the only thing I wanted to suggest there is that I think that the infrastructure for using and producing biodiesel from vegetable and animal fats is pretty well established, but there is a very large opportunity to use a wide range of organic material through gasification and conversion to liquid fuels, and I think that's an area we have underinvested in historically.

Senator CANTWELL. Thank you.

Mr. CONOVER. Let me just quickly add, because I don't believe you were able to be here when I made the point earlier, the biggest mandate that's missing—and it was part of the commission's 2004 report—is fuel economy for vehicles. Given the lower energy density of ethanol, there's going to be consumer reaction, the more we grow this market, to the reduced range that they get in driving their vehicles with greater blends of ethanol. So increasing the Corporate Average Fuel Economy standards is one of the single most important steps this Congress can take to reducing our dependency on foreign oil.

Senator CANTWELL. I actually did catch that part of your comments. So do you support mandates or incentives for other infrastructure, or do you think we should just pass on that and focus on CAFE?

Mr. CONOVER. Both have a place, mandates and incentives, but you've got strong elements of each of those in the Energy Policy Act of 2005, and the greater challenge there is ensuring that the Ap-

appropriations Committees on both sides of the Hill fund the programs you have authorized.

Senator CANTWELL. What mandates on infrastructure do you think are there, that say this is how many alternative fuel stations and infrastructure should be built?

Mr. CONOVER. I think—this is not a commission policy, but I think it's instructive to look at Security America's Future Energy and their Energy Security Leadership Council's recommendations that came out recently, where they call for mandates on a growing percentage of fueling infrastructure at stations that are part of the branded family of stations. You don't want to put a mandate on the small mom-and-pop gas station, but for the larger businesses, a mandate may be an appropriate way to go.

Senator CANTWELL. Thank you.

Mr. DINNEEN. Senator, I think I have just a couple of quick points. One, I think the infrastructure that exists today is certainly capable of handling the market that is there today in terms of ethanol and biodiesel as a blend component in gasoline and diesel fuel. Ethanol today is blended in 46 percent of the Nation's fuel, and we are shipping coast to coast and border to border, and that infrastructure is there.

When you start talking about much greater volumes of ethanol or other biofuels, if you're meeting a vision of 35 or 60 billion gallons, then different infrastructure challenges certainly develop. But I think we're going to be a lot smarter because I think that we may not know as yet just what those infrastructure challenges are.

As the ethanol industry is building, we're building far beyond the Grain Belt. We're building plants in Washington, in California, in the Southwest and the Southeast and the Northeast. Our industry is developing with smaller production centers all across the country. It's going to be a much different infrastructure challenge than what you have today, where much of our petroleum infrastructure is based off of a production center in the Gulf Coast.

Senator CANTWELL. So just to be clear—because I want to move on, because I want to get, Mr. Chairman, to have the next panel called—you are agnostic about mandates or incentives, or you're just wait and see what happens?

Mr. DINNEEN. There are different elements of this question. Are you talking about pumps—

Senator CANTWELL. I'm talking about infrastructure. I'm talking about the delivery system. I'm talking about ensuring for the producers that the delivery system exists.

Mr. DINNEEN. I think we need to understand how the market is going to develop, to understand what the needs are, to get the product from the production facility to the marketplace. There are incentives in place at the gasoline retail level that I think are sufficient and will develop further as the marketplace develops.

Senator CANTWELL. Dr. Pershing.

The CHAIRMAN. Yes, Dr. Pershing, why don't you give us the final word, and then we'll go on to the next panel. Thank you.

Dr. PERSHING. Thank you very much, Senator. I wanted to only answer briefly the last of your questions about the international part of the community. It strikes me, as we look at the develop-

ment of both cellulosic and corn and other forms of starch-based ethanol, we have significant environmental questions.

As Brazil moves into expanding its reach, it's mostly doing so by moving into rain forest. As Indonesia moves into detropha, it mostly does so by cutting down the rain forest. As we look at China, which has proposed not to have any additional starch-based ethanol because it runs into food problems, they're looking now at cellulosic. If we could develop that technology, we could be an exporter of the technology and an importer of a much cleaner source of fuel without getting into these other environmental constraints that we should worry about.

Senator CANTWELL. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, and thanks to this panel. I think it's been very useful testimony.

Why don't we have the second panel come forward. Could the witnesses please be seated, and we'll put the signs where you sit.

Let me go ahead and introduce the panel, and then we'll have each of them take 2 to 3 minutes and give us the main points they think we need to understand, and then we'll go to some questions.

First, we have Larry Mitchell, who is the CEO of the American Corn Growers Association. Second, Richard Moskowitz of the American Trucking Association. We appreciate both of them being here. David Terry, with the Governors Ethanol Coalition. Dr. Robert Fraley, who is the executive vice president and chief technology officer with Monsanto Company. Toby Bostwick, who is president of New Mexico Sorghum Producers. And Ken McCauley, who is president of the National Corn Growers Association.

So we're glad to have all of you here. Why don't we just go across the table from our left to our right, please.

**STATEMENT OF LARRY MITCHELL, CEO, AMERICAN CORN
GROWERS ASSOCIATION**

Mr. MITCHELL. Thank you, Chairman, members of the committee. My name is Larry Mitchell. I'm with the American Corn Growers Association, but I'll tell you right off the bat, representing the corn producers, we will be the first to tell you that we think that ethanol must be much bigger than just corn and much bigger than just Midwestern. We believe that we can make ethanol out of just about anything in every State, and the key to this entire process is to decentralize and get diversity in the field stocks that we use. And to see where we're going, we need to sort of do a quick review of where we came from.

I'm a fifth generation farmer from Texas, but I'm only the second generation to start out farming using petroleum as my energy source. A hundred years ago most U.S. farms used half of what they produced to fuel that farm, because we had a huge use of people power and, more importantly, horsepower. Also, a large percentage of the other half of what we produced also went for the local economy. So going to a local-based, farm-based renewable energy system certainly isn't something new. It's something that we're finally returning to after 100 years of the petroleum age, an age that may well be half over.

Also, a review. It was mentioned this morning about national security and international security, we are about to start our fifth year of a war in Iraq that is a war and we are there for many, many reasons. And one of those reasons of course is the liberty of the Iraqi people, but the other is the liberty of Americans and the liberty of our lifestyle and our energy systems.

And so if we look back at previous conflicts, and realize that when FDR was building his arsenal of democracy to defeat the evil people at that time, he reached out to some very, very good people, his dollar-a-year men as he called them, and other folks such as Henry Kaiser, who figured out how to float a Liberty ship on a pretty regular basis. In fact, in 1943 he floated three of them a day. Now, any nation that can launch three Liberty ships a day surely can figure out how to launch a liberty fuel refinery each week.

You see, if we work to expand our 100 ethanol plants to 1,000 ethanol plants scattered all across the Nation, each of them producing about 60 million gallons apiece, we're at that 60 billion gallon level, which doesn't alleviate our need for importing petroleum but it does alleviate our need to import petroleum from the Middle East. I think that that is a noble endeavor that we should pursue.

A couple of things while I've got just another moment here, things to look at in the farm bill to help us get there. We need a national strategic grain reserve, just as we have a national strategic petroleum reserve. That reserve should be not only for national food security but now national energy security, and for international famine relief. We need a national cellulosic reserve similar to, but apart from, the Conservation Reserve Program, to help farmers have the incentive to move to those new energy crops that we're going to need in the future. And we need to retain and expand the energy title of the farm bill.

Some other areas we need to look at. The tax incentives that are in place are very critical. We need some longer-term extensions of those so that we have more continuity for the people that are financing this new industry, and that would be for ethanol, biodiesel, and on a side issue, wind. The American Corn Growers has worked very hard for 6 or 7 years now on expanding wind understanding and application for farmers, because it's also a part of this overall goal.

We need to expand and extend the renewable fuel standard. I was very pleased to find yesterday that the President has abandoned his move to eliminate the ethanol import tariff. I think that he has made a good decision in abandoning that course of action. And we need to extend the ethanol import tariff because, if for no other reason, that tariff pays for the ethanol splash blend incentive that we have.

Given that, I will yield the rest of my time to my friends down the table.

The CHAIRMAN. All right.

Mr. Terry, welcome.

**STATEMENT OF DAVID TERRY, GOVERNORS ETHANOL
COALITION**

Mr. TERRY. Thank you, Mr. Chairman, Senators. I appreciate, on behalf of the Governors Ethanol Coalition, the opportunity to be

here this morning. The coalition includes 37 Governors across the country, in all regions, from the coasts, and obviously, the center of the country as well. We focus on expanding ethanol production and use policies in the States to achieve those goals, to bring the benefits of ethanol from an environmental, economic, and security perspective to all regions of the Nation.

I just want to take a few moments to summarize the Governors' policy recommendations that were recently adopted by the Governors and released. The first among those is an expansion of the Renewable Fuels Standard to 12 billion gallons beginning in 2010, expanding on a Btu basis to 15 percent at 2015 and 25 percent of the transportation fuel base in 2025, equal to about 60 billion gallons.

The second policy recommendation the Governors have adopted is establishing a timetable for infrastructure, E85 infrastructure, focusing in particular on regional approaches, perhaps providing competitive cost-shared incentives to the private sector and State and local governments, focused on metropolitan areas, expanding infrastructure in particular regions or metro areas that it makes the most sense. Also providing incentives for ethanol production, particularly cellulosic ethanol production, monetizing the current Renewable Fuels Standard cellulosic ethanol credit in particular.

And, finally, providing elevated and stable funding for research and development and demonstration programs. In particular we cite the Department of Energy's biomass R&D program; the genomics effort, also at the Department of Energy; the USDA program, the biomass research and development program. And expanded funding for infrastructure, some of the infrastructure policies that we have highlighted, we feel that's a particularly important area.

I would just like to thank, on behalf of the coalition, the Senators for support of these issues, both in the Energy Policy Act, but more recently in the CR as well, with regard to the loan guarantees, as was previously mentioned. Thank you.

The CHAIRMAN. Thank you very much.

Dr. Fraley, thank you for being here.

STATEMENT OF DR. ROBERT FRALEY, EXECUTIVE VICE PRESIDENT AND CHIEF TECHNOLOGY OFFICER, MONSANTO COMPANY

Dr. FRALEY. Mr. Chairman and the committee, it's a great pleasure.

As I sit here today, I just remind you that we are probably in the midst of the most remarkable technology revolution in the history of agriculture. Biotechnology will have the same impact on crop production, food production, as what we saw in the 1960's with computers and electronics that have changed our world today. This technology promises to increase yields and productivity in very remarkable ways.

Many of the crops across the United States are benefiting from these tools, but I think the advances, particularly in corn, have been very remarkable. We're seeing tremendous yield gains that I think assure us of meeting both the opportunities that we see with corn for feed, for food, and for fuel.

In fact, I fully expect that corn grain itself can provide 10 percent of the Nation's gasoline requirements by 2015 and 40 percent of the Nation's gasoline requirements by 2030. And I remind you that in addition to the grain, that corn is also, through its stems and leaves, the stover, an excellent source of biomass for cellulosic ethanol production.

And to put this in context, when my dad was farming 40 years ago, the average yield for corn in this country was 75 bushels per acre. In 40 years, we've doubled that. The average today is 150 bushels per acre. With these new technologies, based on knowledge of the corn genome and using molecular breeding tools, using biotechnology to introduce new genes into corn that can allow the corn plant to literally resist insects, resist weeds, provide drought tolerance, better fertilizer efficiency, we see the opportunity to double corn yields in the next 20 years, going from an average today of 150 bushels per acre to as much as 300 bushels per acre by 2030.

I think it's important that there are lots of tools and technologies involved. There's lots of research going on in companies and government labs. We work with institutions like Sandia and others to bring these tools together in an integrated way. And I remind you that it's the knowledge, the sophistication, and the dedication of our farmers that make all of this possible as we bring these tools to the farm.

We think these tools can not only increase yields, but they can allow for agriculture to have an even more benign effect in terms of its environmental impact by reducing the amounts of fuels and fertilizers and pesticides that are used for production. And of course by increasing farm productivity, we are increasing farmer profitability, and that is absolutely key.

This country has had a great history of improving crop yield, as I said, having doubled corn yields in the last 40 years. Using these new tools that are available, I fully expect that we will double that again in the next 20. Thank you very much.

The CHAIRMAN. Thank you very much.

Mr. McCauley, we welcome you. Thank you.

**STATEMENT OF KEN McCAULEY, PRESIDENT, NATIONAL
CORN GROWERS ASSOCIATION**

Mr. McCAULEY. Thank you, Mr. Chairman, members of the committee. It's a privilege to be here today speaking for the National Corn Growers.

I'm a farmer from White Cloud, KS. I represent the National Corn Growers Association as their president. It's truly a privilege to be here today.

I represent the producers who produce the feedstock for the ethanol industry today and the future. At NCGA we have a mission statement that says "to create and increase opportunities for corn growers." That's what we're doing with the ethanol industry. I represent 33,000 dues-paying members and I represent 300,000 corn growers across the country.

At NCGA, over 2 years ago, we had a vision of 15 billion bushels of corn produced going into 15 billion gallons of ethanol. Also, when we get through with the ethanol production, we still have 10 billion

bushels of corn left to do the things we're doing today, to satisfy our markets of food and feed in the livestock industry.

NCGA would like to see the continuation of the ethanol incentives that we have today and also the ethanol tariff, just because we don't feel like we're mainstream yet. We feel like we will be. Also, research into potential cellulose feedstocks, such as corn stover and fiber, will be very vital to increasing the ethanol production in the future.

Specifically, NCGA sees incremental acreage shifts from the cropland we have today and the advances in biotechnology, looking at the yield curves that we have today and in the future. These will all be key components in getting to the 15 billion bushels that we're projecting. The National Corn Growers Association believes that we can continue to satisfy the markets we have today of food and feed, and look forward to the tremendous opportunities that we have for rural development, new farm income, and opportunities for young people in the addition of fuel to our mix of products that we produce for.

I look forward to answering any questions that you have, and thank you for the opportunity to be here today.

The CHAIRMAN. Thank you very much.

Next is Toby Bostwick, who is the president of New Mexico Sorghum Producers. Thank you for being here. We're glad to have New Mexico represented on this panel.

STATEMENT OF TOBY BOSTWICK, PRESIDENT, NEW MEXICO SORGHUM PRODUCERS

Mr. BOSTWICK. Thank you, Mr. Chairman and Senator Domenici, especially for all your work in the past in renewable energy.

We typically raise 3,000 acres of sorghum on our family farming operation. I plant sorghum because New Mexico, like most of the Sorghum Belt, is in the semi-arid region of the United States. That means we receive less than 21 inches of rainfall a year. Sorghum is one of the most drought-tolerant crops in the country, and is an integral part of our farming system.

The sorghum industry believes that New Mexico can be a leader in the renewable fuels industry despite its semi-arid climate. Because of its diverse plant genetics, sorghum can play an important role in the renewable fuels industry and the farming operations.

There are several ways in which ethanol can be produced from sorghum: from starch sources, such as grain sorghum or corn; from sugar produced from sweet sorghum or sugarcane; or from new technologies like cellulosic ethanol, which uses biomass from many sources. Sorghum is truly unique in that it can play a role in all three of these different ethanol schemes, which distinguishes it from any other crop being researched for ethanol production.

Regarding the starch industry, the Abengoa plant in Portales has used sorghum solely as its feedstock for the past 18 years. In fact, one bushel of sorghum is equivalent to one bushel of corn in ethanol production. Sweet sorghums are a crop that we could be using now, along with grain, to produce ethanol.

China and India have robust programs that convert the high-sugar juices extracted from sweet sorghum into ethanol. Though most people grow these specialty crops in sorghums for molasses,

sweet sorghum can be grown from Florida to Virginia and would also grow well in New Mexico.

Forage sorghums and sorghum-sudan grasses have the potential to produce a tremendous amount of biomass. Sorghums with the brown midrib trait could potentially convert more biomass to ethanol per acre, but more importantly, forage sorghums make good use of the limited natural resources—for instance water—while still producing high yields.

DOE has stated that the ideal crop for ethanol would be drought-tolerant, have low lignan, high cellulosic composition, require limited inputs, have a seed industry that can supply the needed seed, have known agronomics, and have a genome that will be sequenced. We raise that crop, Mr. Chairman. It's sorghum. It meets these requirements and needs little modification to work in a robust, diverse ethanol industry. We just need a stronger commitment to research.

In conclusion, my neighbors and I want to make sure that the renewable fuels industry does not pass by the semi-arid regions like New Mexico and the Sorghum Belt. We see the potential economic development that goes with the local ethanol plant with local feedstock. We want to be a part of the solution, and produce local ethanol that will benefit the State and give us real security for my family, my country, and for generations to come. Thank you.

The CHAIRMAN. Thank you very much.

Our final witness on this panel is Charles "Shorty" Whittington, who is with Integrity Biofuels, representing the American Trucking Association. Thank you for being here.

STATEMENT OF CHARLES WHITTINGTON, PRESIDENT, GRAMMER INDUSTRIES, REPRESENTING THE AMERICAN TRUCKING ASSOCIATION

Mr. WHITTINGTON. Thank you very much, Mr. Chairman and members of the committee, and thank you for inviting me to share the information on the subject of transportation of biofuels. My name is Charles "Shorty" Whittington. I'm the president of Grammer Industries, a for-hire trucking company headquartered in Grammer, IN, which is in central Indiana. I also own Integrity Biofuels, a 10 million gallon per year biodiesel production facility located in Morristown, IN.

I'm here today as the vice-chairman of the American Trucking Association, and past chairman of the Agricultural and Food Transporters Conference, a component of the ATA. My remarks are directed to the production, distribution, and use of biodiesel, which may be used as an additive to extend our supply of diesel fuel.

As the owner of both a biodiesel plant and a trucking company, I'm interested in promoting the use of biodiesel while making sure biodiesel does not create operational problems for the end user. The increased voluntary use of biodiesel is an acceptable means to extend the supply of diesel fuel, reduce diesel particulate emissions, and lessen our dependence on foreign sources of oil.

As the largest consumer of diesel fuel, however, the trucking industry is concerned over the absence of federally-enforced biodiesel quality standards. I can tell you firsthand that while biodiesel is relatively simple to manufacture, high quality biodiesel is very dif-

difficult to produce consistently. States are not doing an adequate job of ensuring biodiesel quality. For this reason, any program to expand the use of biodiesel must include a Federal component that ensures that only high-quality fuel enters the marketplace.

The trucking industry is also concerned with the growing proliferation of State-implemented renewable fuel mandates which distort the market, limit competition, and result in higher cost to consumers. A Federal approach to increased biodiesel use is far superior to a patchwork quilt of State boutique biodiesel mandates.

While the trucking industry supports the use of biodiesel as a means to extend the diesel supply, we remain concerned over the higher costs associated with biodiesel use and operational challenges that biodiesel blends of more than 5 percent create for the trucking industry. These include cold weather performance and lower fuel economy.

In summary, we believe that the Federal Government has a role to play in ensuring the growth of the biodiesel industry: first, to ensure that all biodiesel entering the marketplace meets acceptable minimal quality standards; second, ensure that biodiesel is used as part of a single national fuel standard, preempting State boutique biodiesel mandates; third, enact appropriate financial incentives to ensure that the cost of using biodiesel is comparable to the cost of using petroleum-based diesel, and that these incentives not reduce the amount of money needed to support and expand the Nation's highway infrastructure; and, last, ensure that biodiesel blends are appropriately labeled so that the end user may make an informed decision on usage.

Thank you again for the invitation to attend today's conference and I'll be happy to respond to any questions. Thank you very much.

The CHAIRMAN. Thank you very much. Let me go ahead with Senator Domenici and then Senator Craig, and we'll take as many questions as people have here.

Senator DOMENICI. Thank you, Mr. Chairman. I'll try to be brief. Mr. Whittington.

Mr. WHITTINGTON. Yes, sir.

Senator DOMENICI. How does the choice of an energy crop, whether it's corn or switchgrass or wood chips, for example, affect the environmental impact of ethanol production?

Mr. WHITTINGTON. The new technology that's in the marketplace today is going to change that, the results of that question, on a daily basis, I believe. If you look at the technology in the ethanol industry today versus 5 years ago, it has changed rapidly, and the conversion tables are much greater now than what they used to be.

The use of cellulose and switchgrass and all those things I think is a good possibility as we move forward in the future. But once again, the cost compared to—it's sad to say, the American people are interested in what the cost of the products that they use on a daily basis might be, and until we come up with some new energy efficiency conversions of some of these things, it will be some time before we get to that degree.

Senator DOMENICI. It seems that there is a real need for greater quality control in biodiesel.

Mr. WHITTINGTON. Very much so. That's a real problem in the industry that we have today. The biodiesel industry is the small baby in this equation today. Ethanol has approximately 18 to 20 years on the biodiesel industry. Up until a year ago we didn't have a Federal standard.

In 2004 there was only 25 million gallons produced on a yearly basis, with about 50 producers. Today, in 2006, that number has jumped to almost 175 to 200 million, depending on what you look at, and the capability out there to produce biodiesel today has already reached 800 million gallons. But we don't have anybody checking what the quality standards are in certain locations, which is a real problem to a trucking industry that can consume over 700 million gallons of biodiesel. But if the trucks won't run on it, why buy it?

Senator DOMENICI. Are loan guarantees more appropriate for the cellulose ethanol refineries?

Mr. WHITTINGTON. I would say that loan guarantees are important, but we in this country have been very competitive and very, very active in gathering money to make products that make other people money. I think that we have to be careful of how we spend the money. Your group in the Senate has been very good in appropriating money, but as we take that money and put it down the line, having different agencies to distribute that money in the way that they see that you want it spent has been a real problem in the biodiesel, industry as we look at it today.

Senator DOMENICI. Could I ask our New Mexico witness these questions, if he has answers, and then I'll yield to Senator Craig.

Some analysts predict a glut in the ethanol market, saying that we have increased biorefinery capacity too quickly. Do you believe this is the case?

Mr. BOSTWICK. No, sir, I don't I think there will be demand throughout the next 10 years. I know they're saying in 2008, 2009 that glut will happen, but I don't believe that the production will meet the demands.

Senator DOMENICI. If we are headed for a glut in the ethanol market, could we alleviate the problem by increasing the percent of the ethanol blended into gasoline?

Mr. BOSTWICK. You bet. I truly believe if we went to an E15 or even an E20 mark, I don't think infrastructure-wise or elsewhere there would be any problems.

Senator DOMENICI. Is this projected glut truly national, or is it regional? In other words, could we address this problem by building infrastructure to serve additional regions of the country rather than considering it to be national?

Mr. BOSTWICK. Yes, sir, I think we could increase our infrastructure to supply additional regions with ethanol, and that would be a big bonus to the problem.

Senator DOMENICI. Well, I want to say to you, from a New Mexico standpoint, because we have a drought kind of climate, your sorghum development is much welcomed. We hope to work with you, and we hope that it can do all the things you are hoping it will do, because of its condition, which has changed drastically. That is, the product has changed by working with the university and others who are working in that field. I thank you for that.

Mr. BOSTWICK. Thank you, Senator Domenici.

Senator DOMENICI. I think you wanted to go, Senator Craig.

Senator CRAIG. Gentlemen, thank you all for participating, and the insight and thoughts you bring to this committee.

So we have gone from \$2.06 corn to, let's see, \$4.08 now a bushel? And my cowboys are screaming, but Monsanto is going to fix that.

And how long will it take, and what is our trade deficit going to be when we diminish the export of our No. 1 export commodity, corn, and blend it all or consume it largely in the domestic market of both ethanol and the human food chain? Corn producers, talk to us about that. We're about to write a farm bill, and there's going to be great pressure from other interests to limit your use of corn in the ethanol market.

Mr. MITCHELL. It's an excellent question, Senator. Corn drives the price of almost all of the other commodities. Corn has been underpriced for way too long. Corn farmers have been losing money on every bushel they have produced for the last decade.

In the area that we're in now it's getting close to our cost of production. Prior to this crop year, which saw a 26 percent increase in the farmer's expense just for energy, prior to that, the cost of raising corn was around \$3.20, so we're in the cost of production area. This is going to present some challenges for the livestock industry.

That's why in this next farm bill we should probably work toward establishing a floor price at about the levels we're looking at now, to help us on the downside of prices for corn farmers and other farmers, but also establish a national strategic grain reserve, to have the reserve in place to help damper what could be \$8, \$9, and \$10 corn. But the other silver lining here is, as I mentioned, corn has been dramatically underpriced for way too long, and I think at \$3.50 and \$4 corn there's still profitability in the ethanol industry for corn-based ethanol, but it also gives more incentive to move toward cellulosic ethanol production.

Senator CRAIG. Good points. Ken.

Dr. FRALEY. I'd just like to make the point that the United States enjoys this position because of many years of investments by universities and the Government in the basic technology that is now opening the door for tremendous and vast improvements in crop productivity. We are certainly sensitive to the pricing issues that you talked about, and I think the key is to be able to drive yields, as we both are selective, as we expand the acreage of the crop, but also take full advantage of the technology that is now possible, that is driving and fueling the productivity of our production acres.

Senator CRAIG. Thank you.

Mr. MCCAULEY. Thank you, Senator. We at National Corn Growers feel that the market prices will prevail if we let the market work. The livestock industry understands cycles. They understand the way this high-priced corn will usually lead to low-priced corn, and how the corn prices, feed prices, fit into their cycles. But one thing that we really have looked at hard is the trend line yields and the accelerated trend line yields that we have today, due to the seed companies and the biotechnology, that have really improved our yields.

One other thing that we really feel you can't measure is the profitability out there on the farm, how that gets your attention. If the farmer, looking at \$1.50 corn and higher government payments, just really didn't get with it, buy the high quality seed, get out of bed in the morning, really get after it. I guarantee you the wives of the country are looking at this price and saying, "Let's get going," because it's a real factor when you start looking at the profitability of the farm.

So we think those factors really will make a difference and we can produce enough corn for the export market as well. Because if you look at the 5 billion bushel number going into 15 billion gallons, you still have more corn than we had to deal with even a year ago. So that's really important to remember when you hear the livestock industry talking.

And one thing that's really important at this stage of the game is, we now do something to affect the producer's decision for this year's crop, because the prices are calling and showing the profit potential for corn to be grown. We think that's very important.

Senator CRAIG. Yes?

Mr. WHITTINGTON. Senator, I grew up on a farm. We do farm also, besides having a trucking company. And I think that one of the things, as we look at value added for an agricultural commodity, is we build wealth throughout the United States on value added from a production crop. The other thing is that some of the offal of the ethanol plant can be used to produce biodiesel. Some of the offal of an ethanol plant can be used to cheapen the ration for a cattle feed operation.

And as we look at other opportunities of some of the waste products coming off of these renewable energy places, it certainly enhances and reduces some costs. In the pharmaceutical industry, the glycerine price alone has dropped from 90 cents a pound down to 20 cents a pound because of the availability of the waste coming out of these things. So we have a really neat circle going on out here if it's handled in the right way.

Senator CRAIG. Well, I don't disagree with any of you. I grew up farming and ranching, although cattle was our dominant income. And I do agree markets level out and profitability is a phenomenal incentive out on the farm or ranch to do things better, differently, and even get greater levels of production. So I do believe it will level out and adjust accordingly, and we ought not get too busy about fouling up the marketplace. Some would argue we already have by the incentives we're creating that are making these changes. At the same time, that kind of diversity is important.

Thank you all.

Senator DOMENICI. Mr. Chairman, what is your pleasure regarding the schedule?

The CHAIRMAN. Well, I was going to ask these folks two or three questions and then bring on the third and final panel for this morning, and hear from them and ask questions to the extent we have questions, and then adjourn for lunch and come back at maybe 2:15 or so. So we're going to have one more panel right now after I ask this panel some questions, and then have three panels this afternoon.

Senator DOMENICI. Well, Mr. Chairman, I want to try to be with you on all of them, so I would like to ask you if I could make an observation and then leave for the rest of this panel and come back for the next one.

The CHAIRMAN. Go right ahead.

Senator DOMENICI. I want to say to all of you, starting back about 5 or 6 years ago, when we started a little tiny bit of a move toward ethanol, and then it grew each year and it got pretty much a big, big swell, it seemed to me that for one Senator and a number of Governors that I read about, they had focused their attention on trying to build back some life, economic life, into their rural communities.

If you know my State, you have Albuquerque and the Rio Grande Valley with another couple of cities, and you have the State split by that, and the rest of it is rural New Mexico like you've never seen it, long distances between cities. You can't get industry started, and you just work like the devil to get one or two new job-producing companies.

But it's quite obvious that while we're not the best agricultural State, one of the solutions is that this rural part of my State, much less every rural State, has a chance of capitalizing on the new economic regeneration that's going to come from ethanol and related products being grown out on the rural plains and in the rural areas in my State and other rural areas. I believe it is the second crop which will revitalize rural America, if those looking at it and watching it will get with it and watch it and participate.

I don't want to waste your time. Our chairman is moving rapidly, and I share his concern. But I am quite sure from listening to your testimony that subject to your own conditions, you would agree with what I have said, that ethanol, methanol, diesel, and bio can be the regeneration of rural America in ways we could never do by economic development, EDA, and farm programs that tried to generate economic life into rural America.

That's what I think of it, and I think we need to help, at the origin, with loan guarantees to get technology and new plants built, and we'll see within 10 years a rather dramatic change. Thank you for giving me this time, and thank you for letting me bore you.

Dr. FRALEY. Senator, I would very much echo your comments. I've been in the ag industry for 26 years, and I travel extensively across the country, speaking with farmers, and I would tell you that this has probably been the best input to ag policy that these growers have ever seen.

The CHAIRMAN. Let me just follow up on that one and ask one question. Then we'll move to the next panel.

But, Dr. Fraley, obviously we have a lot of people out there growing corn. We have now finally come to the realization that we can use this corn to produce fuel, that as a feedstock it is very valuable, and you have indicated your company is in the process of substantially improving the productivity per acre of corn, and that's all very positive.

It strikes me, though, that long-term there may be other crops that are more productive from the perspective of being a feedstock for biofuels, and that the productivity per acre of those other crops will exceed the productivity per acre of corn, even if your company

is able to double the productivity of corn per acre. Do you agree with that, or disagree, or what are your thoughts?

Dr. FRALEY. I think all of us in the industry share the view that the more biofuels that are available, the better this country and all of our consumers are served.

What I believe as a scientist is that we will see, ultimately, the advances in the enzymes that enable the cellulosic sources. We will put in place the types of transportation, distribution, and storage infrastructure to take advantage of those other alternative sources of cellulose.

I think realistically, though, we all see that in the next 10 to 15 years the bulk of that need and opportunity will need to be addressed by corn and grain sorghums and other crops. And so I think we see this as being the start, the priming of the pump that enables the renewable fuel industry to really get off the ground and bring with it the necessary changes of infrastructure.

You know, my view is that we will reach the 10 percent ethanol goal with the capabilities that are in place today. The real question becomes, where do we go beyond that, both in terms of the next generation of cellulose, but also the infrastructural investments that it will take to ensure that we have the automotive engines that can take advantage of these renewable fuels, as well as the systems of tanks and pumps and distribution to ensure that we have access across the country.

The CHAIRMAN. Well, thank you all very much. We have been informed that there are going to be three votes starting at 11:45, which means that we need to go ahead and move to the next panel and hear from them, and then hopefully we will have some time for a few questions of them before we have to leave for those votes. So thank you all very much.

Thank you all for being here. Let me introduce this panel, and then we'll go ahead and hear from each of you.

Chris Standlee, thank you for being here. He is vice president of Abengoa Biotechnologies, which has a plant in our State—we're very glad to have them there—and I understand also has a demonstration cellulosic ethanol plant under construction in Spain. So we're glad to have you here.

Mr. STANDLEE. Thank you, Senator.

The CHAIRMAN. John Melo of Amyris, thank you for being here, another industry leader in cellulosic ethanol production. Mr. John Pierce with DuPont. Of course DuPont has been working in partnership with our Department of Energy to do a great many things in this area. We appreciate your willingness to testify. Jeff Passmore is the executive vice president of Iogen. Thank you for being here. Mr. Niles Hushka is with KLJ Solutions, which plans and develops renewable fuels plants in North Dakota. Thank you for being here. And Lori Perine is with the American Forest and Paper Association, which supports private-public investments in forest product biorefineries. Thank you very much.

Why don't each of you give us 2 or 3 minutes of your views as to what we need to be doing by way of Federal policy in this area. We appreciate your willingness to testify.

**STATEMENT OF CHRIS STANDLEE, EXECUTIVE VICE
PRESIDENT, ABENGOA BIOTECHNOLOGIES**

Mr. STANDLEE. Thank you very much, Mr. Chairman. My name is Chris Standlee. As you indicated, I am the executive vice president of Abengoa Bioenergy. We appreciate the opportunity to be here today.

We are one of the world's largest producers of ethanol, with six operating grain ethanol facilities in both the United States and Europe, two more under construction, and several more in a development stage. Our Portales plant has been producing starch-based ethanol for 18 years, and we're very proud of our renewable fuels economic footprint in the State of New Mexico.

More importantly for the purposes of this committee, Abengoa Bioenergy is a world leader in research and development related to renewable fuels, and particularly ethanol. For example, the company has two ongoing cost share projects with the Department of Energy, which were competitively awarded projects and have resulted in our company committing to spend over \$150 million on research and development of ethanol technologies, particularly focusing on cellulosic ethanol technologies.

We have almost completed construction of a cellulosic pilot plant in Nebraska, as well as simultaneously working on and almost completing construction of the world's first commercial demonstration cellulosic plant in Salamanca, Spain. Those completions are expected by midyear. Actually the plant in Nebraska should be finished within the next 2 months.

Additionally, we have submitted an application most recently in response to the Department of Energy's demonstration cellulosic plant solicitation. We have high hopes for that grant, and believe that the funding of those grants is one of the most important steps that Congress can take to support this cellulosic effort within the States.

We've heard a lot of talk about loan guarantees, and we certainly appreciate the efforts of this committee and of the Congress on loan guarantees. We think they're an excellent tool to expand the implementation of technology after some level of development. But we believe that the funding of the grants such as the DOE's cellulosic demonstration plant projects are critical initial steps to establish that technology.

Additionally, our company encourages this committee to ensure funding for the programs that this committee has already authorized, such as the prior Energy Policy Act; certainly, as I mentioned, the DOE's cellulosic demonstration plants and loan guarantee programs. I think, also, a key priority has to be extending the existing ethanol tax credits, and providing independent incentives to develop both ethanol from the standpoint of promoting the development of cellulosic feedstocks and promoting the development of cellulosic production.

Thanks for the opportunity.

The CHAIRMAN. Thank you very much.

Mr. Melo.

**STATEMENT OF JOHN MELO, CHIEF EXECUTIVE, AMYRIS
BIOTECHNOLOGIES**

Mr. MELO. Good morning, Mr. Chairman, and thank you for the opportunity. My name is John Melo, and I am the chief executive of Amyris Biotechnologies. Climate change and energy security are two of the most important issues facing our country and the world. We believe that innovation can help to address these problems and that our company can play a role in these efforts.

Innovation often comes from very unpredictable places. Until recently, Amyris was completely dedicated to solving another significant global problem, the malaria problem that plagues many of the children in the world today. With funds from the Bill and Melinda Gates Foundation, we have spent the past several years developing technology to reduce the cost of the world's most effective malaria drug by an order of magnitude, so that it can be made available and affordable to those in the developing world that need it the most. Based on our success to date, we expect this drug will be available to these individuals in 2010.

The same innovation which enables this low-cost antimalarial is now being applied to create high-performance, low-cost biofuels that could significantly reduce our petroleum consumption. While corn ethanol and conventional biodiesel have provided an important and necessary start for biofuels in the United States, neither is sufficient to adequately address climate change and energy security. The global supply and demand challenges that must be overcome to meaningfully impact climate change and energy security must and can be addressed through innovation in two areas.

Feedstock innovation will increase the potential scale, decrease the cost, and improve the greenhouse gas benefit of biofuels. Product innovation that results in improved biofuel properties will increase customer demand and largely eliminate the need for infrastructure investments that are necessitated by ethanol and conventional biodiesel. Innovation in both areas can dramatically and synergistically decrease soil, water, and air pollution while improving energy security.

Amyris is developing a gasoline substitute that contains more energy than ethanol, will result in lower-cost-and-less-pollution biofuel blends, and is fully compatible with today's infrastructure in our petroleum system and also with today's vehicles. We are also developing a diesel substitute that can achieve lower costs and much greater scale than vegetable-oil-based biodiesels. Our next generation biodiesel is inherently stable in cold temperatures and does not break down during storage and transport.

Both our gasoline substitute and our diesel substitute will be made from the same feedstocks and production plants that are used today to make ethanol, and thus add value to the investments that have been made by America's farm community. I was so struck by the potential of Amyris's technology that I left an executive position in the oil industry, where I was leader of one of the world's largest petroleum marketing, trading, and transport businesses.

The cost and risk for America to achieve any penetration target for renewables beyond 2010 will be significantly reduced if alternative biodiesels and feedstocks are allowed to compete fairly with

corn ethanol and conventional biodiesel. Existing incentives, such as State mandates and Federal tax credits, unfairly advantage ethanol and conventional biodiesel solely because they happen to be first to market. As such, existing incentives actually make it more difficult for better alternatives to emerge in a timely manner.

In order to realize the potential benefits of new biofuels technologies, Congress must ensure that mandates or financial incentives follow the model that EPA established in their RFS rule-making by focusing on desired attributes and performance standards as opposed to chemical formulas. Furthermore, it's critical that mandates or incentives established by Congress be of sufficient duration to encourage private sector investment into research and development.

Finally, we recommend that incentives be inversely proportional to global oil prices. In such an environment, we are confident that the innovations in feedstock and product being carried out in our labs and many others will help America achieve energy security.

My last thought for you is, remember that looking at cellulosic ethanol and calling it under the same name is like calling a computer the Microsoft computer. We have feedstocks and we have products, and we have a significant opportunity in the next 2 to 3 years to have significantly new products that actually use all the current farm infrastructure, ethanol infrastructure, and petroleum infrastructure to really make a difference in the environment and the adoption of biofuels throughout our country and the world.

The CHAIRMAN. Thank you very much.

Mr. Pierce.

**STATEMENT OF JOHN PIERCE, VICE PRESIDENT OF
RESEARCH AND DEVELOPMENT, DUPONT**

Mr. PIERCE. Thank you, Mr. Chairman. My name is John Pierce, and I lead the group of researchers at DuPont who are actively engaged in bringing high-performance biofuels technology to the marketplace. We are leveraging our technology and science across the entire biofuels value chains, from almost 150 pioneer high fermentable starch corn varieties that are sold into ethanol production markets, to advanced cellulosic technology primarily focused on corn stover presently, as well as next generation biofuels such as biobutanol.

We had the pleasure of hosting the President in Wilmington last week, and I would like to share a few thoughts I told him while he was there. We first demonstrated and developed our biotechnology capabilities and know-how by commercializing a high-end polymer called Sorona from cost-competitive corn-based feedstock, and we won the Presidential Green Chemistry Award for that effort. There are many similarities to this type of effort in the production of biofuels, and we are taking that metabolic engineering expertise gained from developing this feedstock and applying it to biofuels.

Working with the DOE and others, we have developed a cellulosic ethanol technology that employs corn stover, using the corn plant rather than the grain to produce ethanol, and we hope to demonstrate that technology at commercial scale soon, with the Broin Companies, under a cellulosic biorefinery grant from DOE.

With this Broin partnership and assistance from the DOE, we plan to build and operate an economical commercial-scale cellulosic ethanol facility in a few short years.

We're also developing a next generation, high-performance biofuel in partnership with BP, called biobutanol. Biobutanol is one of what I believe, as the previous speaker mentioned, are a number of future fuels that will come to bear that are renewable and have interesting properties for use.

Biobutanol itself is fully compatible with ethanol, comes from the same feedstocks, has some significant performance benefits either as a cold blend with ethanol or on its own. It has a higher energy density, better mileage, keeps fuel volatility low, and butanol-gasoline blends can be distributed using existing gasoline infrastructure, including pipelines. It improves the properties of ethanol-gasoline blends.

Now, to ensure companies like DuPont and Amyris continue to dedicate the resources to bring these technologies and products to market, I'd like to echo the comments of the previous speaker and encourage that incentives be scaled to desired performance, such as lower carbon footprint or higher energy density, and that you also keep in mind that this matter of innovation and bringing multiple technologies and integrated science to bear is not some linear process that stops with research and then moves to development and then moves to commercialization. These occur all the time, right up to the end. There is continuing innovation right at the start of this biotechnology revolution, and R&D funds need to continue to be made available on a matching grant basis to develop those technologies to commercial reality.

With that, I would like to thank you for the opportunity to participate, and look forward to discussion.

The CHAIRMAN. Thank you very much.

Mr. Passmore, thank you for being here.

**STATEMENT OF JEFF PASSMORE, EXECUTIVE VICE
PRESIDENT, IOGEN**

Mr. PASSMORE. Thank you, Mr. Chairman, and thank you so much for the invitation. It's a privilege to be here.

As I was thinking, looking over the panel this morning at all of the distinguished supporters of cellulose ethanol, I was wondering what I might be able to say that would be useful, and I thought I would just tell a little bit of the Iogen story, starting with the fact that yesterday, when I drove to the airport, I drove in my Chevy Impala, cellulose-powered, E85. We have a whole fleet of 12 cellulose E85 vehicles. We also power two Government of Canada fleets, the Natural Resources and the Agriculture Departments.

The reason I'm telling you this story, Chairman, is that we have been producing cellulose ethanol from our demonstration plant for the last 3 years, started in the spring of 2004. We have spent about \$40 million on that demo plant, and we're ready to go. We're ready to go commercial. We've got 320-some farmers signed up for straw contracts for a facility in southeast Idaho, and in fact we have taken the options on the land there.

So what's the problem? Why aren't we just getting going, if we're that close to getting going? Well, there's three legs to this stool.

One of course is the technology leg. The other two legs are financing and government.

So the technology leg, in our estimation, is ready to go. The financing leg, you cannot get lenders, if you're imagining doing a conventional project finance with a combination of equity and debt. We have the equity players at the table. You probably know that our partners are Shell and Goldman Sachs. But if you're going to do debt financing, lenders will not take the technology risk. Lenders simply do not lend to technology that has not been built at that scale before, unless that debt is guaranteed by a strong credit rating, such as the Government. And that's where the Government role comes in.

So you have the technology leg, the financing leg. You're going to do the equity, you're going to do the debt. Well, the Government's role is to guarantee the debt financing, and indeed, in EPAct 2005, this committee recognized that was a role for government. You recognized that market failure and put in place loan guarantees for emerging technologies, not just cellulose ethanol but, the next generation of nuclear and coal-to-liquids and so on. And so as part of that process, the DOE issued, in addition to the grant applications that the previous speakers have talked about, the loan guarantee preapplications.

And what I would urge this committee, going forward, is not to lose that momentum. You have an important oversight role to play to make sure that commercialization doesn't get delayed.

The other comment I would make in terms of a possible role for this committee is that beyond initial commercialization there needs to be assurances in the market, some type of market signal that there's going to be a significant market share there or a market for cellulose ethanol.

Let me explain what I mean by that. I think we've heard from previous speakers that there's a huge potential for corn; and indeed, corn could potentially meet the E10 market. You could get 15 billion gallons from corn, and 15 billion gallons would be 100 percent market penetration of E10 across the United States. So the committee needs to be thinking about increasing the RFS too, whether it's an E20 or an E30, or if all vehicles can take E85, and you gradually, gradually ratchet it up. But the market is going to want to know that there's going to be an opportunity there to achieve that, whether it's a 30 billion or 35 billion gallon target of the President's or some other target.

And I guess my last comment would be, please, Chairman, there are three flights a day from Dulles to Ottawa. If your committee wants to come up and tour a functioning demonstration plant and see these 1,000-pound square bales of wheat straw coming in through the facility, we invite you to come for a tour.

I would agree with the previous two speakers. Abengoa commented on funds that the committee has already authorized. I certainly echo that. And I also want to echo the comment from DuPont that this is not a linear process. People say, "Well, how much more research needs to be done?" We're ready to go commercial now, but we'll never stop doing research. Research is—listen, we've all been driving cars since the early 1900's but we still are improving vehicle technology, so it's not a linear process.

The CHAIRMAN. Thank you very much.
Mr. Hushka.

STATEMENT OF NILES HUSHKA, CEO, KLJ SOLUTIONS

Mr. HUSHKA. I thank you. I lead a regional firm that envisions, engineers, and constructs conventional alternative-energy projects, facilities that provide financial returns acceptable to investors. We also design sustainable-value chains to produce biofuels. Today's emerging biofuels technologies can spur energy independence, but parallel system improvements at the macro level of the value chain are required.

Development processes require 12 to 18 months of narrowing options as we customize input streams and output markets. Investors require that risks be tolerable, and we create investor security through production guarantees. A 50 million gallon a year plant must produce 50 million gallons. Each new process integration needs a guarantor, an entity that will invest continuously until guaranteed delivery rates are met. Underwriting risk is required.

Ensuring input streams is difficult today because farmers have many options. Our average farmer is near 60, and does not see the same opportunity that I do to change his business model, to begin again to pay off the new equipment for the new crops. High-energy grasses require 2 to 3 years to mature, which is a long time to expect no revenue in a very hot farm market. It is difficult to build processing plants with no assurance of input crops. Farmers will require emerging technology to supply input markets.

In the heartland, our transportation systems are historically focused on moving low-priced, bulky commodities. These systems were designed to move raw commodities whenever the railroad had capacity. Products are not processed here generally, just grown. Today we are in the midst of a crisis, and the bulk commodities are now locally converted to high-dollar consumables requiring just-in-time delivery. We are asking overloaded transportation systems to double their output, to first ship the liquid portion, the biofuels, and then the solids, the animal feed. New transportation corridors using emerging technologies are essential.

Our public focus is primarily product output, but project feasibility always lies with secondary product utilization. We are presented with the opportunity to create a very new system of both efficient food and a biofuel production model—America's energy island, where livestock are fed oilseed meals, adjacent to vertically integrated crushing and biofuels plants. Manure from livestock will be biodigested, creating methane, firing boilers to firm wind energy and produce heat for the biofuels utilization.

Utilizing waste, heat, and captured CO₂, we can grow oil-producing algae and send that back through our crushers to produce biodiesel. Revenue streams from secondary plant outputs ensure sustainable biofuel markets. Emphasis must be placed on emerging technologies for the secondary product market, also.

Emerging technologies at the primary plant level create significant stresses within existing markets. Groups that utilize existing technologies are today working to eliminate emerging technologies from the market through legislative controls. The Government should not select winning technologies, but rather encourage inno-

vation. Moving forward, we must revamp inefficient systems as we integrate emerging technologies into America's energy island.

Thank you.

The CHAIRMAN. Thank you very much.

Ms. Perine, you're the final witness on this panel. Please go ahead.

STATEMENT OF LORI PERINE, EXECUTIVE DIRECTOR, AGENDA 2020 TECHNOLOGY ALLIANCE, AMERICAN FOREST AND PAPER ASSOCIATION

Ms. PERINE. Thank you very much, Mr. Chairman, and thank you to the other members of the committee as well. As you know, I'm Lori Perine. I'm the executive director of the Agenda 2020 Technology Alliance with the forest products industry. This is an alliance of government and academia with the industry for collaborative and precompetitive research and development.

I am here because the forest products industry has an economic and strategic commitment to playing a strong role in establishing a domestic production capacity for renewable fuels. We can do this by transforming our existing manufacturing infrastructure into what we like to call integrated forest products biorefineries.

These integrated biorefineries are created by incorporating new emerging technologies into our existing infrastructure, thereby establishing geographically distributed facilities that can process both forest and agricultural materials and produce green liquid transportation fuels, as well as other bioenergy, such as renewable power, and has the potential to produce chemicals and other bioproducts as well. If these technologies are fully realized, there are significant energy and environmental benefits as well as economic benefits for the industry and for the Nation as a whole.

We are conservatively estimating at the moment that the industry has the potential to produce up to 2 billion gallons of cellulosic ethanol each year, another 10 billion gallons of other renewable transportation fuels, and some coproduction of 20,000 megawatts of renewable power. This is possible using the wood that we already use in production of our pulp and paper products and our wood products, so it's not inconceivable to think that the actual production capacity of this industry could be double or even triple the estimates that I've given you here today.

Now, the technologies that we have been using are a combination of some of the technologies that you have heard from some of the previous speakers on the panel. Like our colleagues, who are looking at corn stover and switchgrass, we have a fermentation platform or a fermentation pathway that we are pursuing as well.

This involves us taking the wood chips that would normally go into pulp and paper manufacturing, actually processing those first to pull out a material called hemicellulose. That is a complex sugar that can then be fermented into fuel-grade ethanol. But what that does is it then allows us to take those extracted chips and put those back into the manufacturing process, and so we're getting two very good products for the price of one, ethanol and pulp and paper out of the same batch of chips.

That's a technology set that we are actually developing along with CleanTech Partners in Wisconsin, a couple of enzyme compa-

nies, the national labs, with support from the Department of Energy. We would like to see more of those types of technologies in development, because they will help not only the forest products industry but our agricultural colleagues as well.

A second technology area that we're very strong in is gasification. And you've heard quite a bit about gasification from some of the other panels, I'm sure. In our case we're looking at gasifying both residuals and waste materials from our mills, the idea being that we're trying to create new value out of materials that previously have had no economic value.

In doing that, we're finding that we have a synthetic gas that can provide a variety of products, some of them in use in transportation markets, such as converting the syngas through a Fischer-Tropsch process to motor gasoline, distillate fuel, or waxes. We can also be using techniques to create ethanol, methanol, dimethyl ether, that can be used to produce diesel or LPG, or going into production of synthetic natural gas and supporting other applications as well.

What is key for us is making sure that there is continued and sustained funding for the research and development, and demonstration, in particular, that is needed to make sure that these technologies actually come into use. But also important for us is the fact that we need to understand—and it's important to understand—that the biomass resources that we're all talking about here today actually have competing uses.

That is all the more true in the forest products industry, where the very wood that we're looking at for renewable fuel production is going into production of our pulp and paper, wood and composite products. Thus, we are hoping that Congress will work with us to find market-based ways to promote biofuels and biofuel conversion, but at the same time make sure that wood and other biomass materials are not drawn into biofuel markets at the disadvantage of the existing manufacturing industry. It's actually rather ironic, because this potential that I have outlined for you today is not possible unless we've got the existing manufacturing infrastructure in place.

So I thank you, Mr. Chairman, for this opportunity to speak.

The CHAIRMAN. Thank you. Thank you very much.

We unfortunately have three votes starting up, we're told, pretty much right away. So let me just call first on Senator Tester, if he has a question to put to the group. And if we have time, we'll have every Senator ask a question.

Senator TESTER. I apologize for not being here earlier to hear the first two speakers speak, so I'll just direct this to anybody who wants to answer it.

There has been some debate on ethanol using some grain products and energy out of the net, sometimes even a net loss in energy. Cellulosic ethanol, is it a net energy gain in the end?

Mr. PIERCE. Senator, let me take a stab at that. There has been a lot of debate about that. In my opinion the debate is settled, however, and all forms of grain-based and cellulosic-based energy production are positive. And if you compare them to fossil fuel energy inputs, if you compare them to petroleum inputs, they're dramati-

cally positive. Cellulosics, based on petroleum inputs, is off the charts.

Senator TESTER. The byproduct from the cellulosic ethanol, does it have a value as a feedstuff, or is there some other value?

Mr. PIERCE. There's a joke about lignan, which is some of the glue that holds all the plants together, helps them stand up. There's a joke that says you can make anything from lignan—except money. But one thing you really can do with lignan, it's very high energy content, and very much of the cellulosic-based processes depend on having the lignan as a separate component which is then burned—you make steam. That drives the energy to make the plant run.

Mr. PASSMORE. If you would construct a biorefinery, Senator, that would have a whole host of associated coproducts, so you would have ethanol, power, heat and steam from the lignan, other associated coproducts, fertilizer, CO₂, acetic acid.

Senator TESTER. Good, good. It wouldn't be associated—at least in my mind, it seemed like some of the stuff from the grain ethanol is used as animal feedstuff. The cellulosic is not in that same line, though. It's more of a direct energy for steam or whatever.

Mr. PASSMORE. Correct.

Senator TESTER. In my neck of the woods in Montana we've got an incredible amount of acreage of CRP that has all sorts of different grasses in it, none of which is to my knowledge called switchgrass, unless switchgrass is generic to all grasses. I mean you've got wheatgrass, you've got all sorts, with a little alfalfa mixed in some of it. I hear a lot about cellulosic ethanol made from switchgrass. Is it cost-effective to make cellulosic ethanol from grass of all sorts of different varieties that might be in a CRP mix?

Mr. PASSMORE. As long as it's high in cellulose content, then you can make cellulose ethanol out of it. I mean, switchgrass is a native prairie grass that used to grow back in the days when the buffalo roamed. And I think what's going to happen is that farmers are going to be more comfortable initially—rather than planting a bunch of switchgrass or even going with a CRP, they're going to want to see ag residues used first. Then, once they're comfortable with the technology and everybody is convinced that it works and there's a market there for the product, then they might start switching over to switchgrass.

Senator TESTER. OK. And the cellulose residue is just—it's a fiber product, right? So it's basically dry biomass, this cellulosic product, right?

Mr. PASSMORE. I mean, what's in wheat and barley after you harvest the grain, the straw is cellulose.

Senator TESTER. Right.

Mr. PASSMORE. Or cobs and stalks and leaves, commonly referred to as corn stover, that's cellulose. And somebody referred earlier to hemicellulose. I mean, both of those are in fiber.

Senator TESTER. The last question, and I think it was Mr. Passmore that talked about marketing the product once you get it done. Are you talking about a market that is a market that has our automobiles capable of accepting the product, or are you talking about a market that's driven more at the pump, where we have an energy portfolio perspective—anybody can answer this, by the

way—an energy portfolio perspective where we’re going to require a certain percentage of renewable energy in our petroleum energy?

Mr. PASSMORE. I was talking about increasing the RFS so, if you can get—different numbers are out there, but you will hear that you could get possibly 15 billion gallons from corn, you could get another 15 billion gallons from ag residues and another 15 billion gallons from switchgrass. And I’m not even talking about the forest residues that Lori spoke about. So the question is, where is all that ethanol going to go? And I think the market pool needs to be created through a more aggressive RFS.

Senator TESTER. And what’s RFS?

Mr. PASSMORE. Sorry. Renewable Fuels Standard. Right now it’s set at 7.5 billion gallons, and I think that’s—I mean, people argue that’s a floor, not a ceiling, but the investors, before they invest in a plant, want to know that there’s going to be a market there for the product.

Senator TESTER. OK. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Domenici.

Senator DOMENICI. I pass.

The CHAIRMAN. Let me call on Senator Dorgan—who came first? Bob? Bob, why don’t you go ahead. I think you were here before Senator Dorgan.

Senator MENENDEZ. Thank you, Mr. Chairman.

I want to thank the panel.

I want to ask Mr. Pierce, I think you talked a little bit about butanol, and that there are some advantages to butanol over ethanol. Could you give us a sense of what those are?

Mr. PIERCE. Right. Butanol is an alcohol-like ethanol. It’s got four carbons instead of two carbons. It has a higher energy density, so you get more energy per gallon. That means for a certain gallon you can drive more miles. It doesn’t absorb water as well as ethanol, so it’s more compatible with existing infrastructures. And there are a variety of other differences.

But the point I wanted to make is that this thing with ethanol and butanol, sometimes it gets framed as an either/or type of thing. It’s absolutely not. I mean, ethanol is there today because it could be made by yeast, that we have known to make bread and beer for years and years. New biotechnologies will bring newer fuels that are also useful, and all of these fuels will coexist and find their place in the right niches of our fuel infrastructure.

Senator MENENDEZ. Is there a downside to butanol?

Mr. PIERCE. The downside right now is that we can’t make it cost-competitively with ethanol because we don’t have the kind of experience that we have with the ethanol game, so we’re pushing very hard to get to that point.

Senator MENENDEZ. Is it the experience or the incentives, the way in which we treat incentives for ethanol?

Mr. PIERCE. Well, I frankly am not as up to speed on all the various policies and incentives as many people in this room. I would say, however, that it seems logical to me that however you structure incentives, they ought to be structured on what you want.

So, for instance, if you have a very highly energetic fuel that gets you further miles per gallon, having incentives on a gallon basis is

a little bit odd, because if you get further on a gallon then that ought to count. So again I would suggest that incentives be structured on what Congress and the country is looking for, that is to say, low carbon and replacement of various petroleum fuels.

Senator MENENDEZ. If that's the case, if you're saying we'll meet the goals that we want and this particular energy source has higher output, then it seems to me that we should be looking at how we incentivize this within a mix.

Mr. PIERCE. I agree with you, and I would say that butanol is the example we're talking about now. I tell you there will be others. We are on the opening gambit of biofuels. So if you do it on an energy basis, in the case of butanol, I can't remember the numbers, maybe 12 percent or 15 percent more energetic than ethanol. If you did it on an energy basis, it would attract an incentive approximately that much higher.

Senator MENENDEZ. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Dorgan hasn't had a chance to ask questions. Why don't you go ahead, and then we'll probably have to adjourn after that to go make these three votes.

Senator DORGAN. Mr. Chairman, thank you very much. I regret I have not been able to listen to the presentations. I've been over in the Commerce Committee, and was just able to leave there.

But let me thank Mr. Hushka, Niles Hushka from North Dakota, for coming and participating. He has a vast knowledge of all of these issues and is involved in virtually every facet of them.

I want to ask a question that I raised in North Dakota with those that are interested in biofuels. I was involved in the 7.5 billion gallon renewable fuels standard that we now have. We created a 7.5 billion gallon standard by 2012. It looks like we'll be producing 10 billion gallons by 2010. Just guessing, but that's where it looks like we're headed. People talk about 35 billion gallons or more.

We use 140 billion gallons of fuel in this country. If you blend 10 percent ethanol or biofuels with every gallon, you've got a market for 14 billion gallons. It seems to me that unless you find ways to put E85 in gas tanks or have blend pumps at 20, 30, 40, 50 percent, we're going to build a bunch of biofuels plants and then we're going to find at some point we're going to have a supply that far exceeds demand, unless we find a way to require those fuels to go in at a much greater rate than 10 percent.

In my State, for example, we have 16,000 flex-fuel vehicles and 24 pumps. In a State 10 times the size of Massachusetts, 24 pumps where you can pump E85. Think of it, 16,000 vehicles, 24 places, in a State 10 times the size of Massachusetts, where you can get E85. Well, clearly that's not working, is it?

And so I'm wondering if any of you have the same concerns I do. Are we going to produce and produce—and nobody is a bigger fan of producing biofuels than I am—but are we going to produce and produce and produce, only to discover that because there are no E85 pumps out there, there's no incentive, in fact there's a disincentive for the major branded stations to put them in, and there's no blend pumps. Are we going to find we've got a real problem? Who wants to tackle that? Niles, do you want to?

Mr. HUSHKA. Senator, I think that you are hitting on something that's extremely important, not only at that level but at other infrastructure levels. As you know, today in our State we have one source to get our fuel to the market, and that's a single railroad, and they are already overloaded.

As we produce more and more fuels in the heartland, we have to put infrastructure systems in place that allow for the adequate distribution of those fuels into the population markets, and I think that that will become one of the major criteria for how we can easily and readily make access with fungible fuels.

There are also new technologies that I believe are important, especially in our cold technologies, cold locations. There are generation-two biodiesels that are coming out. Neste Oil, for instance, in Finland will begin producing 55 million gallons a day of the product which has cold flow capabilities down into the negative 30 degree range instead of negative 5.

Those are the types of technologies that can be integrated more readily. This is a fungible fuel, so it can be used in existing pumps. It can be used in existing vehicles without any modifications. I think our emphasis should be placed on fungibility, and I do not believe that we will have to worry about levels at that point.

Senator DORGAN. Just on that point, I ran into a young man about 20, 22 years old, in Valley City, ND. He said he had been living on the West Coast. He said, "I just came back to North Dakota driving a pickup truck with vegetable oil, using vegetable oil as fuel." He's a young man very interested in alternative fuels. I said, "Well, how did it go?" He said, "It was fine until I reached Montana. Then it was too cold." The vegetable oil coagulated, I guess. Does that happen? So there are a lot of people out there looking at alternative fuels, and vegetable oil is a portion of it, but it's the issue you raised with respect to at what temperature can you use it.

Mr. PASSMORE. Senator, you touched on a question that I raised in my opening remarks, and I think it's a very real one. I think the committee should look at it from two perspectives, low-level blends and then flex-fuel E85s. So how high can we push the low-level blends? In Brazil they run, apparently, cars that run on up to E24 in the low-level blends, so you need to talk to the car companies about that and find out how much protest you would get.

But imagine a situation where all the vehicles gradually were flex fuel. Then you would have vehicles that could take E15, E20, E30, E40, because they can take up to E85. But definitely our investors want to be assured that there's going to be a market for ethanol beyond 15 billion gallons.

Senator DORGAN. Thank you very much.

The CHAIRMAN. Thank you very much.

Senator CRAIG, you have a final question, I was told?

Senator CRAIG. Well, thank you very much, because I'm not going to be able to return after the vote, and I did want to ask Jeff Passmore of Iogen a couple of questions, because from what we've heard from other panels this morning, ethanol, corn-based, is moving very rapidly now into production, the competitive nature and the importance of cellulosic, and of course the research and the work that Iogen has done.

Jeff, I understand you have applied for a loan with DOE?

Mr. PASSMORE. Yes. There are two programs. There was the grant application process and then the loan guarantee pre-app. We have submitted under both of those with DOE.

Senator CRAIG. And that occurred when?

Mr. PASSMORE. Well, the closing for the loan guarantee pre-app was December 31, and the grant application was back in the summer of 2006.

Senator CRAIG. OK. The reason I'm establishing this timeframe for the committee is, we passed EPAct in August 2005. If you had a loan guarantee today, how soon would it take you to build a commercial production facility?

Mr. PASSMORE. We had hoped to get the shovel in the ground on the facility in the spring or fall of this year, so starting in 2007. There has been a slight delay in the appropriations for the loan guarantee authorization, so it appears that—though I was encouraged by the fact that the House passed the bill yesterday, and we're certainly looking forward to being able to charge forward, Senator, I'm not sure how many months we've lost. We may not be able to go with the fall of 2007 but slip to the spring of 2008.

We'll see how fast this—when you were out of the room, Senator, my encouragement to the Chairman was that this committee make sure that we don't lose any momentum with the DOE with respect to the implementation of the intent of Congress.

Senator CRAIG. What were you going to build, sir?

Mr. PASSMORE. We're going to build a cellulose ethanol plant based on barley straw and wheat straw. Again, in my opening remarks I mentioned that we already have 320 farmers signed up for straw supply for a facility in southeast Idaho, and we're ready to go. We've taken options on land and just want to get going.

Mr. STANDLEE. Senator, Chris Standlee with Abengoa. I would like to point out that our company also, as with Iogen and others, is one of the companies that has submitted a response and a proposal in connection with the DOE solicitation. Again, we're in pretty much the same boat. We have demonstration facilities under construction now, pilot plant facilities in operation, and our estimation is that once the grants are funded, as we certainly hope that they will be soon, we certainly could have cellulose production in effect by 2008 for sure.

Senator CRAIG. It's also my understanding that once the money is made available, we're still looking at potentially a 6-month window in DOE to get their process refined and ready. Are you hearing that?

Mr. PASSMORE. Well, we understand they're going to go to regulations, which is apparently—according to the bill in the House yesterday, they have been told to get that in place within 6 months. But, Senator, if concurrent with that they were reviewing the loan guarantee pre-apps that have already been submitted, then if those could move forward concurrently—as I understand the DOE process, they are then going to review the pre-apps and invite actual applications for loan guarantees, and those actual applications could be submitted while they're developing the regs.

Senator CRAIG. For both of you, to bring plants into production, what type—

The CHAIRMAN. Let me just interrupt to say I think I'm going to go to make these three votes.

Senator CRAIG. I think we should.

The CHAIRMAN. If you wanted to stay and ask—

Senator CRAIG. I'll ask one last question, and then I'll shut the committee down, if you want me to.

The CHAIRMAN. OK. Why don't we do that. Let me thank all of you for testifying, and Senator Craig can close the hearing. We'll start again about 2:15.

Senator CRAIG [presiding]. Thank you. In relation to the capacity that we're offering through this CR—and Senator Domenici prompted me to ask a question I think appropriate—in relation to the loan guarantees we're looking at, what size are you looking for in guarantee? I'm asking that of both of you. If you were awarded this kind of guarantee, based on what we have provided, are we building enough capacity into the system to assure these kinds of new production facilities coming on line in both commercial and experimental—

Mr. PASSMORE. As I understand it, the proposed cap is \$4 billion, and certainly that has enough room in it for several cellulose ethanol plants. I mean, we might be looking for something in the \$350 million range.

Mr. STANDLEE. Senator, I think the loan guarantee program, as I mentioned in my opening remarks, is an excellent program to help further the implementation of the technology after development, but frankly I think the initial step that's even more sorely needed is the funding of the grants for the biomass demonstration facilities that the DOE has proposed and solicited. So I think that's probably the most important first step.

Senator CRAIG. Thank you.

To all of you, again, thank you very much. I'm going to miss a vote. They're not holding them these days, so they're prompting us to be a little more attentive. Gentlemen, thank you all, and Lori, thank you for your testimony.

The committee will stand in recess.

[Recess.]

The CHAIRMAN. OK, I think we'll startup. As I understand it, Senator Domenici is delayed with another meeting, but Senator Cantwell and I will go ahead.

This is the fourth panel, and we have six witnesses. Let me just briefly introduce them, and then we'll just go from our left to our right and hear your points of view. Again, if you could do that in about 3 minutes, we would sure appreciate it.

Edmund Burke is representing the Coalition of E85 Retailers, and we appreciate you being here. Lou Burk, who manages alternative fuels for ConocoPhillips, is here, and we appreciate your presence. I think they're getting you a name tag. Robert Brown is the director of vehicle environmental engineering for Ford Motor Company. Thank you for coming. John Plaza of Imperium, this is the Nation's largest biodiesel refinery. Thank you very much for being here. Mike Mears, who is the vice president of transportation at Magellan Midstream, thank you very much. And Charles Drevna, Charles is the executive vice president of the National Pe-

trochemical and Refiners Association. We very much appreciate you being here.

Why don't you start, Mr. Burke, and we'll be glad to hear from all of you.

STATEMENT OF EDMUND BURKE, CHAIRMAN, DENNIS K. BURKE, INC., REPRESENTING THE COALITION OF E85 RETAILERS

Mr. BURKE. Good afternoon. Thank you very much for inviting me, Senator. I appreciate it. My name is Ed Burke. I'm chairman of the board of Dennis K. Burke, Inc. We're a very large, family-owned distributor in New England, just outside of Boston—Chelsea, MA. We have distributed biodiesel for 10 years now, and we are just starting up on E85 and trying to retail it, but I do have the capability of loading it on trucks, and along with General Motors, I've filled a lot of vehicles that are going to various fairs, demonstrating the vehicles.

The Coalition of E85 Retailers is relatively new, just formed to try to solve some of the issues involved. Some of them are fire safety—and don't get me wrong, some of my problems are not really complaints. Health and safety is certainly a priority, and we need the UL certification or similar on some of the equipment.

But I wanted to address, we have some conflicts, like EPA has recommended that States give waivers for Stage II, which is a vapor recovery phenomenon, but all the flex-fuel vehicles are equipped to handle vapors. It's \$20,000 and a lot of time for one little pump. I'm $\frac{1}{10}$ the size of North Dakota, which was referenced earlier. Massachusetts is $\frac{1}{10}$ the size of North Dakota, and to my knowledge I'll be the first retail outlet running in the Northeast, never mind just Massachusetts.

And I own an E85 Chevy Impala. We have an Avalanche on loan from General Motors. So there's a lot of frustration. Again, it's a harder turnkey operation than was biodiesel because we're dealing with a much more flammable product that has various mechanical issues as well as the health and safety issues.

Mostly I would be pro some kind of incentives. I liked the discussion earlier on the loan guarantee kinds of things, as opposed to individual mandates. I've had peers that want to have one standard for biodiesel blends across the country, and it's just fundamentally crazy, because south of the Mason-Dixon Line, cold weather is much less of an issue that it is in half the States that are represented in this room.

And I would save the rest of the time for questions and dialog. Thank you very much again.

The CHAIRMAN. Thank you very much.

Mr. Burk, go ahead.

STATEMENT OF LOU BURK, MANAGER, ALTERNATIVE ENERGY AND PROGRAMS GROUP, CONOCOPHILLIPS

Mr. BURK. Thank you, Mr. Chairman and committee members. My name is Lou Burk. I run the Alternative Energy and Programs Group at ConocoPhillips. My group focuses on all forms of future energy and also biofuels.

Most of our work on biofuels is actually on technologies to look at ways to utilize existing infrastructure to better facilitate introduction of biofuels into the marketplace. We are one of the largest blenders of biofuels. We are a developer of biofuels technology, and we are a biofuels manufacturer in Europe with a technology called renewable diesel which we would like to introduce into the United States.

We are also extremely active in the industry groups that work on setting the standards that Mr. Burke next to me was talking about, working with UL on pump standards, working with ASTM on quality standards, and all the things that we need to do to make sure the fuels that are in the marketplace, whether or not they have renewable content, meet the customers' expectations.

We're looking at two general tracks for biofuels development. The first one is, are there ways that we can broaden the feedstocks we use in our existing infrastructure to make gasoline and diesel fuel that are renewable in their contents. Some of this is thermochemical conversion, some of this is using different feedstocks into existing equipment, and those are very interesting and exciting opportunities for us.

The other thing we look at are novel, out-of-the-box technologies, whether that be cellulosic ethanol, whether that be biomass-to-liquids, and those sorts of technologies as well. We think that modifying existing refineries to process a variety of renewable feedstocks that will utilize the existing infrastructure, because it will make gasoline and diesel fuel, will facilitate biofuels penetration much quicker.

As you contemplate how to create an environment that will encourage continued growth of renewable fuels, you have to make sure we don't pick winners and losers. With the aspirational goals that have been set and discussed, we don't know what the fuels will look like that best fit those. So we would, we say, let all flowers bloom. Make sure you don't pick winners and losers, and let the technologies go forward.

And, finally, we have to make sure that as we introduce these fuels, we do not backslide on the different environmental standards and climate goals that we have set or are setting. Backsliding in these areas should not be tolerated.

Again, I thank you for your invitation and look forward to your questions.

The CHAIRMAN. Thank you very much.

Mr. Brown, we're glad to have you here.

STATEMENT OF ROBERT BROWN, DIRECTOR, VEHICLE ENVIRONMENTAL ENGINEERING, FORD MOTOR COMPANY

Mr. BROWN. Thank you. Good afternoon, and thank you for providing me the opportunity to participate in this conference.

Diversifying our transportation energy supplies, and in particular expanding America's use of biofuels, is an important issue to Ford and the American people. The instability of the world's oil supply, the growing worldwide demand for oil, the fragility of our domestic infrastructure, and increasing political pressure on climate change, are all leading to renewed interest in finding alter-

natives to oil and in finding more efficient ways to use the oil we have.

At Ford, we recognize that we have a responsibility to do something to help address America's energy security needs, and we are accelerating our efforts to develop innovative solutions. We are bringing to the marketplace a range of advanced vehicle technologies that are increasing fuel efficiency and diversifying our vehicle fuels away from petroleum.

Ford Motor Company has been building flexible-fuel vehicles, or FFVs, for over a decade, and we are an industry leader in this technology. FFVs are a great alternative for our customers, because they provide an option to choose between E85 and gasoline, as desired. Last summer, Ford, along with GM and DaimlerChrysler, voluntarily committed to double the production of FFVs by 2010. In November, we expanded that commitment to include half of our vehicles produced each year, beginning in 2012, provided there are sufficient amounts of fuel and retail facilities to support customers.

But there is a limit to what we can achieve on our own. We believe that our Nation's energy challenges can only be properly addressed by an integrated approach, a partnership of all stakeholders, which includes the automotive industry, the fuel industry, government, and consumers. There is no silver bullet that will diversify our transportation fuels, and this is not a short-term problem.

Longer term, Ford has endorsed the 25x25 campaign, which sets the goal of getting 25 percent of U.S. energy needs from renewable sources by 2025. To achieve this level of biofuels in transportation, we need, first of all, to expand the ethanol feedstock diversity; second, increase ethanol production; and third, accelerate infrastructure development on a national scale. These are all critical building blocks that will lead to competitive E85 pricing and customer convenience.

The challenges are considerable, but not insurmountable, and there is an enormous amount we can achieve at a lower cost and in a shorter timeframe if we act together in an integrated manner. All of us have the opportunity to do something about energy diversity and independence.

Thank you again for the opportunity to participate.

The CHAIRMAN. Thank you very much.

Mr. Plaza, please go right ahead.

**STATEMENT OF JOHN PLAZA, PRESIDENT, IMPERIUM
RENEWABLES**

Mr. PLAZA. Mr. Chairman, I first want to convey my appreciation for the invitation to speak at this. This is a tremendous opportunity for a new industry such as ours. And then I have to give credit to Senator Cantwell, who has been just a tremendous leader in our State and in our Nation for renewable fuels, but biodiesel especially.

My name is John Plaza. I'm the president and founder of a company called Imperium Renewables. We're building the Nation's largest biodiesel plant in a pulp and paper town that's sort of decimated by the old timber industry, looking for new industry. We're building a 100 million gallon a year facility. It's about 6 months

into construction. It will be done in about 4 months. Using vegetable oil from around the world.

We started out in Seattle, with the recognition that Seattle has the highest per capita consumption of biodiesel. It's one of the easiest forms of alternative fuel to integrate in. It has a very good life cycle analysis balance, from the EPA point of view, of 3.2 to 1 unit of energy. It's one of the best renewable fuels, very low carbon. It's got a lot of benefits and integrates in quickly.

As recognized, the Pacific Northwest has huge demand. We decided to go forward with our business plan, mimic the petroleum industry to locate facilities that give us operational flexibility for logistics, transportation in and out, not be dependent on rail alone. We use marine logistics, barge logistics.

We're extremely well-funded. We've received more than \$100 million in equity into the company. We've had no direct subsidies or funding to the company from the Federal Government. We of course enjoy the tax credit of \$1 a gallon for biodiesel and methyl esters, which is critical to the long-term success of this industry.

As we have developed our company, we've seen a lot of interest in biodiesel, so we're excited about the opportunity. We think it can be a tremendous amount of renewable energy, due to the fact that 20 percent of America's petroleum usage is in diesel. Ninety-four percent of our goods that travel by truck, travel by diesel. It's a 5.4 billion gallon home heating oil market. There are a variety of different uses for diesel, and biodiesel integrates immediately and effectively right into that existing infrastructure, we believe.

We certainly think that the opportunity to grow this industry is tremendous. We have opportunity in alternate feedstocks other than soy. We can look at any different oil seed. Today we're just announcing the first and largest oil seed contract in the State of Washington, for about a million gallons of canola oil. Although it's only 1 percent of our facility, it's a tremendous sort of show of what direction this industry can take and bring new agricultural commodity business to the farming community that's solely dependent on wheat in the Pacific Northwest.

There's just a tremendous sort of path forward. There's a version of a crop that we can grow that's the equivalent of cellulosic, called algae. It has carbon sequestration, energy production, ethanol production, and biodiesel production available to us. So it's a tremendous opportunity, and I appreciate the chance to be here.

The CHAIRMAN. Thank you very much.

Mr. Mears.

**STATEMENT OF MIKE MEARS, VICE PRESIDENT FOR
TRANSPORTATION, MAGELLAN MIDSTREAM PARTNERS**

Mr. MEARS. Well, thank you, Mr. Chairman and members of the committee, for the opportunity to speak to you today. My name is Mike Mears. I'm vice president of transportation for Magellan Midstream Partners, headquartered in Tulsa, OK. I also currently serve as the chairman of the Association of Oil Pipelines, but I'm testifying today in my capacity as an officer of Magellan.

Magellan owns and operates the Nation's longest refined products pipeline system, as well as 81 refined products terminals. Our pipeline system stretches through the heart of the country, from

the Texas Gulf coast to Minnesota. In several Midwestern States we provide transportation and distribution services for the majority of gasoline and diesel fuel consumed.

We do not currently transport ethanol or ethanol blends in our pipeline system today, and in general, the industry has very limited experience in this area. We do have ethanol storage and blending capabilities at 26 of our terminals, and we have four more under construction in the State of Missouri. We have provided these ethanol blending services for customers since the early 1980's, and we have also recently, within the past year, invested in biodiesel blending infrastructure in many of our terminals in Minnesota, North Dakota, and Iowa.

I am here today to address the potential transportation of ethanol in our multiproducts or dedicated pipeline system. Pipeline is an efficient, safe, economic, and reliable way to transport large volumes of liquid fuels. However, there are a number of operational, technical, and economic issues associated with the potential transportation of ethanol in pipeline systems. These include the practices and equipment to minimize water content and impurities, compatibility of existing seals and gaskets used in the valves and pumps and the other equipment on the system, and the potential for stress corrosion cracking of pipelines and tanks.

Substantial research into the causes of and solutions for these items, particularly the stress corrosion cracking issue, is needed. It is our responsibility to prevent pipeline leaks and protect the environment, so a complete understanding of this issue will be necessary before we are comfortable in considering ethanol transportation by pipeline. Targeted industry research on this matter is already underway, and we have left some materials on that research on the table outside.

It is conceivable that limited opportunities to transport 10-percent ethanol blends in existing pipelines may prove to be technically feasible due to the low concentration of ethanol in the product. However, we believe the most likely opportunity to transport fuel-grade ethanol will be in a dedicated pipeline built for that specific purpose. This position is based on the assumption that the solutions to the operational and technical issues described earlier may be unachievable or cost-prohibitive on an existing multiproducts pipeline.

We face a number of economic and commercial variables when considering a dedicated pipeline for the transportation of ethanol. For example, a line from the Midwest to the East Coast could be a \$2 billion or more project. Key variables in a project of this nature would include the ability to develop secure long-term throughput commitments from ethanol producers or end users; the development of aggregation systems within the producing region, since it could take up to dozens of individual plants to baseload a pipeline; the development of distribution systems at the terminus of the pipeline; and the definition of regulatory authority associated with ethanol pipeline oversight. Since we have not conducted a study on these issues, we don't have the answers to all of these questions yet.

In closing, to address the major issues associated with ethanol and pipelines, we believe Congress should provide funding to study

the technical concerns related to pipelining ethanol. Second, Congress should pass the Ethanol Infrastructure Expansion Act of 2006. This bill focuses attention on existing barriers, market risks, regulatory issues, and financial incentives, using a range of ethanol production levels.

Thanks again for the opportunity to speak here today, and I look forward to your questions.

The CHAIRMAN. Thank you very much.

Mr. Drevna, go right ahead.

STATEMENT OF CHARLIE DREVNA, EXECUTIVE VICE PRESIDENT, NATIONAL PETROCHEMICALS AND REFINERS ASSOCIATION

Mr. DREVNA. Chairman Bingaman, Senator Cantwell, Senator Thomas, good afternoon. I am Charlie Drevna, executive vice president of NPRA, the National Petrochemical and Refiners Association. We are a national trade association with over 450 members, including those who own or operate virtually all U.S. refining capacity, as well as most of the Nation's petrochemical manufacturers with processes similar to those of refiners.

There is no doubt that biofuels is a growing—and will be a growing—component of the Nation's transportation fuel mix. And let me unequivocally state that NPRA does not oppose the use of biofuels. What we do oppose, however, is the mandated use of biofuels. And in saying that, what we do support is the sensible and workable integration of biofuels into the marketplace based upon market demands.

So during my time today, I would like to walk you through some of the challenges that we face as refiners using biofuels. First, as relatively new biofuels enter the market, increased transportation and logistical issues are likely to arise, and some of the folks here on the panel have already gone through some of those.

As Mr. Mears said, ethanol is not distributed through pipelines because of problems with water contamination and corrosion. So because of this, ethanol must be blended with gasoline or the appropriate blendstock at the terminal or as close to the final consumer as possible. This makes the delivery and distribution of ethanol expensive because it requires more expensive transportation modes such as truck, rail car, barge, or even ship.

Ultimately, mandating biofuels costs consumers. One example is—I want to talk about E85 for a second. E85 has a substantially lower energy content per gallon than gasoline, only about approximately 70 percent of the gasoline's energy content, which translates into a significant fuel economy penalty.

So in order for the retail customer to cover the same distance they would get using gasoline at the same cost, the retail price of E85 would need to be approximately 25 to 30 percent less than that of gasoline. As reported by the EIA, similar results for biodiesel show that they have a lower fuel economy than regular petroleum diesel.

Now, mandates will not cure that. Mandates will exacerbate that problem—not the technical problem but the cost problem—because if every drop that is produced is mandated, there is no reason for the marketplace to decide how best to use the product.

Second, we believe that Congress should preempt State biofuel mandates. The present enthusiasm for renewable fuels has resulted in several States and even municipalities adopting mandates. Local mandates will impose additional requirements on the ethanol distribution system and increase costs for shipping and storage. The existing Renewable Fuels Standard, or RFS, mandate, with its credit-trading provisions, contains a degree of freedom that allows the distribution system to operate at a low-cost optimum by avoiding infrastructure bottlenecks such as lack of storage or rail capacity. Mandating ethanol or other biofuel usage in specific areas will force a distribution pattern that is less flexible and therefore has less capability to minimize cost. Again, these additional costs will be borne by the consumers.

Third, biofuels should be developed with the full realization of their impact on air quality. Congress should defer any support for an additional renewable fuel mandate until it completes an analysis of the ozone impacts of ethanol's additional summer volatile organic compound, or VOC, emissions and the potential impacts on maintaining attainment with the 8-hour ozone national ambient air quality standards, or the NAAQS.

If, however, Congress decides to continue its support for a renewable fuels mandate after completion of these additional studies, the EPA should, one, announce the list of ground-level ozone insensitive areas to the country, where the increased use of gasohol would be environmentally safe, and two, for such areas, list how additional gasohol could be used without causing additional respiratory problems or contributing to other ozone-related kind of problems.

In closing, NPRA recommends that Congress avoid mandating increased volumes of biofuels or a hastened implementation schedule for biofuels beyond that of the existing Federal RFS. The goals of the biofuels industry, including corn-based and/or cellulosic or biodiesel, should be economic parity or better with that of refined products, while not adversely contributing to air quality or the manifestation of other unintended consequences.

Again, thank you for the opportunity to appear today, and I look forward to hopefully answering any questions you may have.

The CHAIRMAN. Well, thank you all very much for your testimony. Let me ask a few questions, and then I'll defer to Senator Thomas and then to Senator Cantwell here. Senator Domenici just came in. We'll defer to him first, before the other two.

Let me just ask, on this issue of standards for biodiesel, some of the earlier testimony, as I understood it this morning, was that one of the advantages of ethanol is that there's a consistent standard that is present for ethanol. And there's no question as to performance and that sort of thing. Nothing similar exists with regard to biodiesel at this point. I took the testimony to suggest that the Government needed to step in and do something to bring that about.

Now I gather, Mr. Burke, you said that obviously you have concerns because of different weather in different parts of the country. You don't think one size fits all. I guess the other question, though, is even if that is true, should there be a standard in your region of the country, perhaps a somewhat different standard somewhere else, or should we just let it go the way it is?

Mr. BURKE. It's very much a matter of experience and common sense. The previous speaker, when he alluded to economics, said don't forget the cooking grease phenomenon. There are a lot of places across this country that are converting cooking grease, and the cost—people can do it their back yard for 70 cents a gallon.

But to answer your question, in May, ASTM revised 6751. They revised it again in August. It's getting there. There's a few funky things, without getting into the chemistry of it, monoglycerides, triglycerides. It's kind of like you going to the doctor. But the issues are being solved.

My point is that if you're south of the Mason-Dixon Line, in January, you may be very successful using a B10 or even a B20, but if you're up in Minnesota or Wyoming or somewhere where it's cold, you drop down to a lower percentage. In my case, my company, we avoid B20, with a few exceptions where some grant deals are involved. We sell B5 from Halloween to St. Patrick's Day, but we won't do B20. The people who are on B20, we drop them down to B5, which is 5 percent biodiesel.

But the specs are being—it's not fair to put people's feet to the fire on the specs. They are evolving and they're learning as they go. It's a very new business. In Hawaii, you would be interested to know, they had a problem with the Maui landfill catching on fire, and a guy with an electric generator company—they asked people to solve it. No one did. He went online. He took the name. He's the same fellow that's building plants worldwide, including the one President Bush visited last May in Virginia.

So the market will take care of a lot of things. I'm generally a market guy and an incentive guy, but believe me, thank God we're sitting here. Thank God we had 1992 EPA Act. That was when Federal, State, and utilities had to buy a certain percentage of alternatively-fueled vehicles. That's where the whole biodiesel thing began.

Costs are coming down. We have bigger quantities being shipped. The economies of scale in oil are very large. When I was first selling biodiesel, the rule of thumb was a penny a gallon upcharge for each percent of biodiesel, so you're selling stuff for 20 cents a gallon more than the equivalent. That's a pretty hard sell.

But the alternative fuel credits made it such that somebody could spend that 20 cents and trade the credit in for the alternative fuel. You could use half your requirement by using the fuel. So maybe you need a declining subsidy or a declining incentive, but as the scale kicks in—I mean, you see every day the amount of plants being announced. It's getting to be a real win.

The CHAIRMAN. Let me see if anyone else wants to comment on that. Mr. Brown, did you have a comment?

Mr. BURKE. Yes. First of all, Ford products are designed to operate on B5, or 5 percent biodiesel. There is a joint effort underway that includes the Government, the OEMs, auto manufacturers, and the fuel industry, to come up with a specification for biodiesel, because there is a problem in both warm and cold weather. In warm weather, it's a stability problem that can cause acid to form and corrode the system and affect the fuel filters. And in cold weather, you get wax particles that form, which again plug the system. So

we recognize there are challenges, but there is an effort underway hopefully to resolve those challenges.

The CHAIRMAN. Mr. Plaza, did you have a comment?

Mr. PLAZA. Yes. I think it's important, Mr. Chairman, to recognize that there actually is an American Society for Testing and Materials specification for biodiesel. It has been in place since the dawn of biodiesel. It certainly is being refined as we grow as an industry. In 2004 we produced 30 million gallons. In 2005 it was about 50. Last year it was about 150 million gallons. So it's still small, but there is a standard in place.

And we can look to others for examples of how to grow and learn. The petroleum industry certainly had problems with quality, and they figured those out a long time ago. We are blessed to not have as many quality issues with petroleum.

Europe also uses a billion gallons of biodiesel a year without issue, so it's not as if there are not standards. The standards are there. They're improving. What it really takes is large-scale, quality production, at a larger scale, similar to the petroleum industry, and I think that's what we're starting to see in the industry.

The CHAIRMAN. Mr. Mears and then Mr. Drevna, and then I'll call on Senator Domenici if he has questions.

Mr. MEARS. Just briefly, our experience I think coincides with what Mr. Plaza had to say. We started blending biodiesel in the State of Minnesota in the fall of 2005. They have a 2 percent biodiesel mandate. Our standards for accepting biodiesel, our quality control standards were being developed at that time, and our first winter up there was not a success. We had a lot of problems with biodiesel blending in the State of Minnesota. Over the course of last year we refined our product quality specifications, and this winter we've had no problems whatsoever with biodiesel blending in Minnesota. So I think it's a process of trial and error, and it's still early on in the process, but I think it's progressing well.

The CHAIRMAN. Mr. Drevna.

Mr. DREVNA. Senator, we, as the refining industry, are one of the most heavily regulated industries in the country, in the world, and our specifications are very, very, very tight and very, very, very strict. Unfortunately, as an industry we don't have the luxury of saying, "OK, we can give you some time. We're going to blend some stuff into our product, but if it doesn't work, well, it will work next week, or their new standard will be developed."

My point is, again, we support biodiesel, it's fine, but as I think maybe the first Mr. Burke down there said, people can make this stuff out of their garage and sell it. I don't know if those folks are going ASTM anything, but somehow or another, that stuff's going to end up in the product stream. So my industry is very, very concerned that before we mandate any significant levels of this stuff, we understand the full ramifications of this before we mandate it. That's the only thing we're asking.

The CHAIRMAN. All right. Thank you.

Senator Domenici.

Senator DOMENICI. Senator Thomas was first.

The CHAIRMAN. Senator Thomas, then.

Senator THOMAS. Thank you. I'm glad we're having this hearing and appreciate your being here. This is obviously a very important

issue. Everyone agrees that we need a change and we're going to have to have a change, but all we hear basically are ideas and fairly small amounts of change, 5 percent. We're talking about the year 2025 before we can really get there. We're going to have to emphasize the production of our current products pretty strongly in order to fill this gap, it seems to me.

Whoever would like to respond, what do you think is necessary to reach this goal of alternative fuels, with respect to the market, with respect to the Government, with respect to the refiners and the requirements and so on? Very simply, what should be done besides talk about it?

Mr. BURKE. I think—and I'm not going to get into incentives and mandates because I think Mr. Drevna represented our position fairly well, but I would say that as we look at how—because we have the blending obligation. We're the second largest refiner in the United States. The blending obligation to comply with the RFS and then comply with all the different State mandates lies with us.

And we look at how we are going to hit targets, and we have run scenarios since the State of the Union, saying how would we possibly hit these targets and what sorts of things would happen. And what we find out is that the only way to get to those sorts of volumes are to make sure that we leave the doors open to multiple technologies. This is not a silver bullet, which I think Mr. Brown talked about. There isn't one.

It's the idea that we will have to build this. There's going to be a corn-based ethanol piece. There will be a cellulosic ethanol piece. There will be a biodiesel piece, a biomass-to-liquids piece. And public policy should make sure that no one pathway gets blocked now while we're trying to find out what's going to be the most cost-effective way to bring fuels to the marketplace and not overly burden the consumer.

Senator THOMAS. Yes, but you mention you're reaching the mandates. That implies that what's going to happen is rules or laws; is that right?

Mr. BURKE. Well, we are blending to meet the mandates today, yes. Because right now—

Senator THOMAS. But I hear others of you saying, "We don't want any restrictions. We don't want any requirements." And yet that seems to be what you're doing, is meeting requirements.

Mr. BURKE. We're meeting the requirements because we have to, to sell the fuel, because the basic economics do not—

Senator THOMAS. What would you do if we didn't have requirements?

Mr. BURKE. We would make the products that the marketplace would want to pay for.

Senator THOMAS. OK. Then you're saying the marketplace would do this. Anyone else want to comment on that?

Mr. DREVNA. Yes, sir, Senator. If you look at what's going on right now, we're not only meeting the mandate that Congress passed in 2005, in EPAct, we're exceeding it. And we will be exceeding that, those target numbers, all the way through the period. And the reason is, in all deference, we are supply short. There's no question we're supply short in the country. We see ethanol and bio-

diesel—as a refining industry, we see it as a valuable blendstock. It keeps additional volumes coming in.

So what we're saying is, the marketplace is a pretty good thing. It dictates where and when and how best to use these things. And we're very confident, as our counterparts in the renewal fuels industry should be confident, that this is going to be a growing thing.

And just to expand upon what Mr. Burke from ConocoPhillips said there a minute ago, when you focus your attention on one aspect or one particular element of the biofuels in a mandate, it really inhibits innovation. The box that we work in, the innovation box, so to speak, shrinks, because there are constraints.

Now I'm not saying that my industry—we always reserve the right to be a little smarter tomorrow than we are today, but it inhibits us in what we can do and what we should do if we're facing something in costs that—

Senator THOMAS. What I keep hearing is that maybe we can get to 25 percent alternative use by 2025.

Mr. DREVNA. Senator, it's—

Senator THOMAS. That's a long time.

Mr. DREVNA. That's a long time, but unfortunately for refiners, we have to make business plans for 2025 today.

Senator THOMAS. But we may have to make plans for something different before that. I think that's the issue.

Mr. DREVNA. But the thing is, we have this ever-changing target. We had a target set in 2005 of 7.5 billion gallons. Not 2 years later, we're talking about moving that target. We have to make business plans.

Senator THOMAS. I appreciate it, and I understand. My time has run out, but my point is, I guess, we all want alternatives. I think we know we're going to get there, but we talk about them a lot. We're not really making a lot of progress in terms of the percentage change, or even in our prognosis for the percentage change.

And so we either have to decide what we do to innovate that a little more quickly, or else make sure we continue to support the needs through our traditional sources. And sometimes we forget about the traditional sources when we keep talking about alternatives, but alternatives are not going to take over for quite a while. My time is up.

The CHAIRMAN. Senator Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman.

Mr. Plaza, do you want to comment on that, since you've seen a five-fold increase in what the United States produced last year just in your facility? And what else do you need, from an infrastructure perspective, that would help in the delivery and growth of your particular product?

Mr. PLAZA. Absolutely. Thanks for the chance.

First of all, Senator Cantwell, I appreciate your asking the question, because I actually do believe as a new industry we can address these supply sort of concerns with new crops. For example, we have 60 million acres of fallow land that we don't grow on in the United States. We have existing land that we don't grow energy crops in. Washington alone could grow 100 million gallons of canola oil, rotating it in with wheat.

There are next generation feedstocks. There are studies that show that with algae, we could grow all the world's liquid transportation needs on .2 percent of the world's land mass. All of this data is out there. Companies like ours that are new, small, innovative, and looking to break into the energy market, are having vision to that, and are going there quickly and making the investment from the venture capital world, the hedge funds of the Nation investing in us, looking to that next generation, not being focused on corn-based ethanol or soy-based biodiesel.

But what are the next steps? Those are out there. They're identified. There's investment going into this industry to meet that, so it's not impossible. It's actually quite achievable. What makes it work, we believe, is a long-term, stable environment that takes into account we have to help support these new industries, just like we've done with petroleum, nuclear power. All the energy sources that we've seen, all have received support from the Federal Government, so we're asking for the same level of support as we grow this new industry. We're bringing jobs to communities that are decimated by the old timber industry.

We're supposed to be talking about infrastructure, and I want to address that, because we've heard a lot about ethanol, but we haven't heard much about biodiesel. Twenty percent of the Nation's petroleum usage is diesel. Biodiesel is a one-for-one replacement for diesel, and most studies show it's about a 2 percent loss of overall energy, versus the 11 percent we've heard. That's with soy-based. With canola-based, it's actually an increase in efficiency over petroleum diesel.

The other component is, it works in the existing infrastructure with no change. We can go into a terminal operation with biodiesel, 100 percent, through pipelines, through barge economics, which we have at our facility. We'll be able to take a 83,000-barrel barge from our facility, load it, and transport it to California, to western Washington, into the existing infrastructure. The only thing that's preventing us from entering into that infrastructure is really acceptance from that terminal operator.

So we see it as not a barrier of actual technology but a barrier of acceptance. We don't feel that there really are a lot of problems in taking this industry where it needs to go, other than education, awareness, and acceptance as a Nation, and as bigger industries accept a smaller sort of up-and-coming opportunity. We think there's a tremendous opportunity and very little actually blocking the implementation of it, other than knowledge.

Thanks.

Senator CANTWELL. Mr. Brown, thank you for the flex-fuel initiative in Brazil. We heard yesterday—I think it was yesterday—from Honda, who branded themselves at the hearing as the technology leader in the automobile industry. How is Ford looking at diesel cars and the potential for looking at a variety of sources of biofuels, including that one?

Mr. BROWN. Well, let me say, first of all, that we do have a portfolio approach that will deal with, from our perspective, energy security as well as climate change as well as air quality, and clean diesel is part of our portfolio. So we are not only researching tech-

nologies that lead to the use of advanced diesel in the field, but also the type of fuel that's required.

Just recently EPA, working with the fuel industry as well as the OEMs on the auto side, issued rules for ultra-low-sulfur diesel. And we have begun that roll-out. We have technology that will coincide with the delivery of that fuel. And we expect there will be air quality benefits, as well as fuel-efficiency benefits, but clean diesel is only one of the products in our portfolio.

Senator CANTWELL. Are you seeing a play—because the Europeans, with this 1 billion biodiesel—they're at 80 times what we are, I think. Anyway, they have established that, and so some of their European auto manufacturers are making big plays in diesel. Do you see that competition?

Mr. BROWN. Well, of course there's competition, but in Europe the air quality standards allow greater use of diesel. And we have been working with the Environmental Protection Agency here in the United States to resolve some of those near-term challenges, as well. So, yes, diesel offers an immediate CO₂ benefit. The challenge has been, where do you set the air quality standards, from a tail-pipe perspective?

Senator CANTWELL. Thank you.

The CHAIRMAN. Senator Domenici.

Senator DOMENICI. Mr. Chairman, Senator DeMint arrived, and he has been delayed most of the day. I would yield my time to him. I know we don't want to—

Senator DEMINT. Senator, I'm actually introducing someone in the next panel, so I would rather listen to you and the gentlemen here.

Senator DOMENICI. Well, you might have to wait a long time, then.

Senator DEMINT. OK.

[Laughter.]

Senator DOMENICI. In fact, we have a lot more to do before him. The Chairman has a half hour, I have 30 minutes. That would be an hour. I don't know, what do you have, Senator, 20 minutes? Come back in an hour and 20 minutes.

[Laughter.]

Senator DOMENICI. Anyhow, I'm going to be very quick, but I wish I knew a little bit more about the history of the automobile and the fuel that fuels our engines that have been part of the evolution of the automobiles taking us around with the combustion engine. But I would assume that we just didn't bust into, all of a sudden, nationwide, using an internal combustion engine, six or eight cylinders, that all used one kind of gasoline. That didn't happen just overnight, all at once, did it? Any of you enough of a historian to say that it came in in bits and pieces, and arrived at parts of the country and then other parts? Is that a fair assessment? Who knows?

Mr. BROWN. Yes, that's a very fair assessment.

Senator DOMENICI. OK.

Mr. BROWN. But, Senator, I would point you to just the experience with, let's just say, unleaded fuel and the catalyst-equipped vehicle. That took about 2½ decades to—

Senator DOMENICI. Just for that?

Mr. BROWN. Just for that.

Senator DOMENICI. Well, it seems to me that we have to be careful here when we're talking about the system that had imposed upon it—this national system. There were some impositions, but it was still a national system. Except for California, for the most part, I guess. All of a sudden we know so much, we have some big news about what might work better in terms of conservation, right? A new way to produce the product that will run the engines or that will be different, so we will save a lot of petroleum product as we move our vehicles. And we're going through the stretches of "How do we go from where we are to the next and the next?" Is that correct?

Mr. PLAZA. I'd like to just sort of tell an anecdotal story that got me interested in this as an entrepreneur.

Senator DOMENICI. Go ahead.

Mr. PLAZA. If you look at the automotive industry, because I am somewhat of a fan of history, the original Ford, the Model A, was designed, if I understand correctly, to run on alcohol, ethanol. The original diesel motor was designed by Rudolf Diesel to run on peanut oil, vegetable oil.

Senator DOMENICI. On what?

Mr. PLAZA. On peanut oil. It was modified to use petroleum. So we're almost coming full circle back to the original source of our energy. So for us to dismiss these as inconsequential or minor is foolish, and it also prevents America from being leaders in the world and using our land mass to grow our energy. There's tremendous potential there. We need the support, long-term, of the Federal Government, such as the extension of the tax credit and others.

Senator DOMENICI. OK, that just gets me to the question. All of you are important, so if one of you said this, it's important. I can't remember which one talked about the fact that we ought to get on with using one regulation and one system, and not have—not be imposing multiples on the industry or the people that make the liquid we call petroleum. Who said that?

Mr. BURKE. Actually, I think Charlie was the one who talked about a single national standard, but when you market in multiple States, and we distribute, it gets difficult when different States have different standards or mandates. The State of Washington is implementing a new Renewable Fuels Standard that is different than the State of Oregon's in their timing and their implementation. We have a terminal in Portland that serves the greater Portland area, both sides of the Columbia River. It's difficult for us to have a fuel that works on both sides when there is discontinuity between the States.

Senator DOMENICI. Let's get back to this issue, and then I'll quit. We're not talking about the difference in two States choosing. We're talking now about how we are going to implement a variety of new products into the system that are going to be imposed on the system because they—say there are conservation issues or something like that, and we've got to get them into the system. Now, we're going to have to ask the system to adjust to that, right, and do it in an orderly manner. That isn't going to be done by one overpowering regulation, when we see all these different new prod-

ucts coming on. Am I correct in that assessment, or am I looking out the wrong kind of windows?

Mr. DREVNA. Senator, I think I know what I said. What I meant to say is—and I apologize for any confusion, but I was referring to the biodiesel side of the equation.

Senator DOMENICI. OK.

Mr. DREVNA. But if you look at ethanol, it's distilled. It's ethanol, and it's pretty much a singular product. In the biodiesel end of the business, there are so many different kinds of potential feedstocks for it. It goes from oils to animal fats to anything in between.

So the point I was making was, until the time where there are actual standards set, a biodiesel standard, it must contain X, Y and Z, before we, as refiners, feel comfortable in blending it into our diesel, that's what we are looking for. And I think they're saying we are on our way and we're doing it, and we have some bugs to maybe get out of the system. Well, that's all fair and well, but we, as an industry, as the refining industry, we can't afford to have things put into our product that we don't know if they will pass the test. That's all I was saying. We're going to use biodiesel, but let's make sure we're using the component that will operate the best through the system.

Senator DOMENICI. Thank you, Mr. Chairman. I think by coincidence it has some application to what we'll be doing, nonetheless. Thank you.

The CHAIRMAN. OK. Well, thank you, and let me thank this panel very much for your testimony. I think it's been very useful. And we will bring forward the next panel.

OK, if everyone could take their seat, we'll go ahead and get started with this panel. Let me just introduce each of the panel members. Senator DeMint, you wish to introduce one of panel members yourself. Why don't we call on you right now to do that, and then I'll introduce the other four.

Senator DEMINT. Thank you, Mr. Chairman. I do want to thank you—really, all the members—for holding this conference today and extending an invitation to Dr. Nicholas Rigas to participate. It's a privilege to introduce Dr. Rigas, a fellow South Carolinian, at this conference, but it shouldn't be a surprise. South Carolina has been leading the way in the development of alternative energy technologies, whether it's hydrogen, wind power, biofuels, and then integrating them into our everyday lives.

As director of the South Carolina Institute for Energy Studies, he has been a key advocate for new ways of meeting our Nation's energy needs and helping diversify our energy portfolio. I look forward to hearing his testimony. Dr. Rigas, I appreciate you being here, along with all the other panelists.

Thank you, Mr. Chairman.

The CHAIRMAN. Well, thank you very much.

Welcome, Dr. Rigas. We're glad to have you here. Also we have Don Paul, who is the vice president and chief technology officer for Chevron. Don, thank you for being here.

Mr. PAUL. Thank you, Senator.

The CHAIRMAN. I remember seeing you out there in Idaho, as I remember.

Tommy Foltz is with Earth Biofuels. Thank you very much for being here. George Fitch is the mayor of Warrenton, VA. Thank you for coming today. And Jonathan Lehman is with VeraSun, which is the Nation's second largest ethanol producer. Thank you for being here.

Why don't we start with Mr. Paul and just go across from left to right, and then we'll have some questions.

**STATEMENT OF DON PAUL, VICE PRESIDENT AND CHIEF
TECHNOLOGY OFFICER, CHEVRON**

Mr. PAUL. Thank you, Mr. Chairman, and members of the Senate Energy Committee. Chevron appreciates the opportunity to participate in this conference. We believe that it's essential to U.S. energy security to diversify our fuel supply system, and biofuels are integral to that diversification.

I'll briefly make a few points regarding biofuel infrastructure growth and its integration in the fuel system. First off, as we expand and integrate biofuels into the fuel supply system, we believe it is essential to do so in such a way that it continues to provide the same quality, reliability, and efficiency of the fuel supply system that we all count on every day.

Second, to achieve this objective, we believe that the infrastructure required to support increased use of biofuels needs to incorporate three key principles that I call the three S's: scale, standards, and sustainability. Let me comment briefly about these.

Scale. As we heard in the last panel, one of the challenges that we're facing is, the fuel system is enormous. The one we have took the better part of a century to build, and today, to give you a point of reference, basically half a gallon is used for every human on Earth, in the global system, every day. This is an enormous system. And this requires, to meet where we're going, a robustness and a diversity of feedstocks to meet this scale as we grow the biofuels systems, including, in our own efforts, cellulosic sources that we focus a lot of effort and R&D on.

Standards. We have heard about standards, critical not just for the fuel standards themselves but standards in the equipment to build out the supply chains themselves. This is a new industry with respect to biofuels, and the standards are yet being developed. Standards are required to induce customer confidence that the fuel they're going to have is going to meet their expectations every time they show up to fill up. And then, third, standards are required to ensure that the environmental performance of the fuel, not just the fuel in use, but the infrastructure that supplies it, that the plants themselves meet the environmental standards and safety standards we've come to expect from the fuel system.

Third, sustainability. And what I mean by this is that energy infrastructures, once in place, live not just for years or decades but generations. In fact, some part of our current system is 100 years old. So when we make choices and we grow this infrastructure, and we're talking about growing it significantly to meet the envisions that have been discussed, we're going to live with it a very long time. And I think the key that we would say is, let's make the right choices. Let's evolve the standards. Let's recognize the scale where

we need to get to, so that we can go down the road and build this diverse, robust, and secure energy system we all need.

Thank you again for the opportunity to contribute to this biofuels conference. Chevron is committed to being involved in the biofuels business through a number of activities in research as well as infrastructure, construction such as we're doing in Galveston Bay. Thank you for the opportunity. I would be glad to respond to any questions you have.

The CHAIRMAN. Thank you very much.

Mr. Foltz, why don't you go ahead.

STATEMENT OF TOMMY FOLTZ, VICE PRESIDENT OF PUBLIC AFFAIRS, EARTH BIOFUELS

Mr. FOLTZ. Thank you, Chairman Bingaman. I want to thank the committee for recognizing the importance of this issue and holding this conference. I'd also like to thank my home State senator, Senator Lincoln, for all that she has done on this issue. She has been out front and unwavering in her support and we appreciate that.

For all of us who have children or grandchildren, it's almost impossible not to think about the future. And that's obviously what this conference is about, the future: our future environment, our future economic well-being, and our future security. I think we all agree with that or we wouldn't be sitting here today. But there are some lessons from the past that I think that we can use as well.

I have been in this business for about 14 years now. I started at the Energy Department in the Clinton administration as the co-director of the Clean Cities Program. I was the vice president of a company called Blue Energy that sold compressed and liquified natural gas to the vehicle market. And I'm a co-founder and shareholder of Patriot Biofuels in Stuttgart, AK, which is a biodiesel plant. So I've seen this industry from a lot of different angles.

Right now I am the vice president of public affairs at Earth Biofuels. Earth is a publicly traded company that currently has an operational biodiesel plant in Durant, OK, that's got a capacity of about 10 million gallons per year. We're also the largest supplier of transportation-grade LNG in Southern California, which we liquify at Earth LNG in Topock, AZ. And that's about a 31 million gallon per year plant. And we recently announced acquisition and upgrades to an ethanol plant in Moses Lake, WA, which should have the capacity to produce 36 million gallons by the first quarter of 2008. I look forward to working with Senator Cantwell on that.

I want to get into a specific issue and try to keep it brief, but I want to just make three broad comments, and that is that for the most part we would rather see incentives than mandates in a policy, going forward. We saw very well last summer that when the economics are right on alternative fuels, there are plenty of buyers out there. There were a lot of biodiesel plants out there that literally could not make enough biodiesel to supply the market last summer. That's because the economics were there.

So if we're going to push incentives, they need to be sustainable. They need to be much more long-term. They basically need to be able to outlast a bank loan, in terms of creating investor confidence in the industry. And I think that obviously, for those of us in the biofuel business, President Bush's comments in the State of the

Union about 35 billion gallons a year of biofuels was a great boost to everyone who frankly are in the middle of a struggling industry right now. We're kind of almost polar opposite from where we were last summer.

But what I would say in terms of setting a goal is, we obviously have to have goals and we have to be shooting for something, but let's not let the goal get in the way of good public policy. And what I mean by that is that in the past—the Energy Policy Act of 1992 comes to mind, and that is where essentially the Department of Energy was allowed the flexibility to either impose or not impose the private and local fleet mandate based on whether or not imposing that or implementing that fleet mandate would get to the goals of the Energy Policy Act of 1992. When it was determined that going with those mandates would not achieve the goal, then they did not impose the mandate.

Again, we're not really for mandates, but I would say that on incentives, in any way, I think that what we might see from the detractors out there is that they say, "We can't ever get to 35 billion gallons, so why try?" And you have a hard time convincing me that if we made it to 28 million gallons or 30 million gallons—or billion gallons—that the country would be a worse off place. So Rome wasn't built in a day, and neither will the widespread alternative fuels market be.

On regional infrastructure, I think we heard in the previous panel that it's pretty unlikely that biofuels are going to be transported by pipeline in any big amount anytime real soon. So I think that the biggest thing that can be done on regional infrastructure is to increase the amount of biodiesel storage and blending at the pipeline terminals.

I'm echoing what was said in the earlier panel, but just to give you an idea of not what it is but what it is not, the Little Rock, AK, school district was a B20 user, and they will be again, but as they got into their plan, their diesel distributor had to go through North Little Rock, pick up 6,000 gallons of straight diesel, drive 35 miles to the closest bulk plant that had B100, splash in 1,500 gallons of B100, close the lid, drive 35 miles back to Little Rock, just to supply B20 to the school district. That added about 20 cents a gallon to the overall process. It works perfectly fine as a fuel to do it that way, but the logistics, and therefore the economics, are not viable with that.

When you have pipeline terminal blending, the jobber is able to pull up, put unleaded gasoline in one compartment, straight diesel in one compartment, B20 in one compartment, B5 in one compartment, then go on about his business without spending 1 extra minute of labor or 1 extra mile of transportation.

The CHAIRMAN. Could you summarize the remainder of your remarks?

Mr. FOLTZ. That is the remainder of my remarks.

The CHAIRMAN. OK. Well, thank you very much. We'll have some questions.

Mayor Fitch.

STATEMENT OF GEORGE FITCH, MAYOR OF WARRENTON, VA

Mr. FITCH. Thank you, Mr. Chairman. I am the mayor of Warrenton, the seat of Fauquier County, about 50 miles west of here. We are dedicated to becoming self-sufficient in renewable energy. Toward that end, we have embarked on a plan for an integrated biorefinery at our landfill that will use different types of waste: our municipal waste at our landfill; construction and demolition waste, broken pieces of drywall, broken kitchen cabinets, tops and bottoms of wood posts. We will also use agricultural residue, primarily corn stover, a bit of wheat straw, and some soybean stubble.

Woody biomass, forest residue—40 times a year, thinners go into the woods, private and public, in Fauquier County, and thin them out. They don't really take them anywhere. In addition to that, you have all the tree thinnings by the private contractors, the leaves. There's a lot of woody biomass material right in our back yard.

We're horse country, so we have horse manure in addition to cow manure that's been composted. We also operate a sewage treatment plant. We have 2,000 tons of sewer sludge. We pay \$40,000 a year for someone to come in, pick that up, take it out of the county and drop it on somebody's farm, I'm sure much to the chagrin of the neighbors. We could get paid \$40,000 by selling it to a biorefinery plant.

So we're using a multitude—at least the plan is to use a multitude of different types of waste. We have sized this, at this particular stage, for about a 350 to 400 ton per day facility that would then produce about 8 megawatts of electricity, of which about 3 or 3½ megawatts would be used internally for process heat and steam. The balance we would put on the grid, and in so doing, electrify every single household in Warrenton.

Now, I didn't come here to shine the light on Warrenton, but I'd like to point out to the committee what I think is an overlooked stakeholder in this whole debate, in trying to reach this very laudable goal of using renewable energy, and that is local governments like mine. There must be hundreds if not thousands of Warrentons across the country with a lot of different types of waste in their back yard, that should be encouraged to use that in a biomass facility. Even though the ledger says that small scale biorefineries are not economical, we believe we can show that they are.

I think what's fascinating is that in this case a local government can actually be efficient, and in so doing, shatter that oxymoron where local governments are ineffective. Because, just like Chevron and the major integrated oil companies, we can control or certainly influence the stream of the product, the downstream, the midstream, and the upstream. We, as a local government, in conjunction with the private sector—I'm not proposing the local government should be in this business, but just to facilitate the development, to take it to a stage that will attract the private sector to come in under a public-private partnership.

We influence the permits. We can enter into PPAs with a utility company. We can work best with our farmers. We can work best with the forest residue. So we are uniquely positioned to facilitate the development of what I believe is an untapped resource, and that is local communities contributing on a very large scale. For ex-

ample, the numbers I gave you, 10 million gallons for a small area like Warrenton, 55,000 people in our county, times hundreds and thousands of communities like that, can really make a valuable contribution toward not only ethanol, but renewable diesel, as well as green electricity.

Now, I have had a chance to talk to farmers in my community and throughout Virginia and colleagues of mine in other counties, and based on those discussions and finding out what is holding them back, I have come up with two specific suggestions that I would like to make to your committee that would really provide a big, important kick start to get local governments and the stakeholders in the community to get motivated, to get involved in what we're doing.

First is to provide an incentive production payment of \$20 per ton for agriculture and forest residue used in a biorefinery. Congress has a Section 210 to provide a \$20 payment, but that is strictly for forest residue on tribal land and at-risk forest land. Extend that to any forest land, and extend that for agricultural residue. Farm land in Virginia is basically idled. Half of our farm land, half of 8 million acres of Virginia farm land is idled. It is not being used. It is marginal. We have farmers that are prepared to try switchgrass.

Quickly, my second point would be the whole area of infrastructure—the collection, the gathering, the harvesting, the storage—needs a lot of help according to the farmers that I've talked about.

Those are two of my suggestions. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very, very much.

Dr. Rigas.

STATEMENT OF DR. NICHOLAS RIGAS, DIRECTOR, SOUTH CAROLINA INSTITUTE FOR ENERGY STUDIES, CLEMSON UNIVERSITY

Dr. RIGAS. Yes. Thank you, Senators, for this opportunity to discuss biofuels and regional infrastructure integration. My name is Nick Rigas, and I am the director of the South Carolina Institute for Energy Studies at Clemson University. I serve as the chairman of the newly formed South Carolina Biomass Council, and lead a commission focused on promoting alternative transportation fuels sponsored by the South Carolina General Assembly.

Many organizations, including Clemson University, the Savannah River National Laboratory, the Palmetto State Clean Fuels Coalition, the South Carolina Biomass Council, and others, have been working together to develop statewide programs to promote a sustainable biofuels industry in South Carolina. My comments today are a result of this collaborative effort, and represent the thoughts and ideas of many of the individuals throughout the State.

Development of the biofuels industry has been based on the successful corn and soybean model that capitalized on the existing regional infrastructure in the Midwest. Although the model has been very successful where grain yields are high, this model would be less successful where grain yields are lower, and in many cases, a grain deficit exists.

Most of the biomass potential in South Carolina and the Southeast resides in the form of cellulosic materials which will require

a different regional model in order to develop a viable and sustainable biofuels industry. First, the diverse nature of the cellulosic feedstocks will require a regional infrastructure to support the growing, harvesting, collection, processing, and delivering of these feedstocks.

Studies are needed to, a, identify the regions and the feedstocks that will support a sustainable and competitive industry; b, examine the synergies within the existing regional infrastructure, including agriculture, forestry, and other industries; and c, identify the infrastructure and methodology gaps that exist to efficiently grow, harvest, process, and deliver these feedstocks.

Second, the biofuels industry will require a large regional distribution network. The industry, due to the nature of the feedstocks, will be decentralized, and therefore, cannot be developed on a centralized distribution model as exists for petroleum fuels. Biofuels will require a regional model that reliable and cost-competitive services demand.

Incompatibility with the existing petroleum fuel infrastructure will add to the complexity of the supporting infrastructure. Studies should focus on developing distribution systems that service this regional demand and capitalize on the respective regions' strengths.

And, third, the technology to produce the cellulosic biofuels will require a regional focus, due again to the diversity of these feedstocks. The capacity of these units and the technology that these facilities utilize will be dependent on the regional feedstock. Research will be required to identify and develop the best feedstocks and technologies to convert these regional feedstocks into biofuels. Projects should be wholistic, funded through regional centers, and should address the entire supply chain from growing the biomass through delivering the fuel to the customer.

Thank you, Senator, and I look forward to your questions.

The CHAIRMAN. Thank you very much.

Jonathan, we're glad to have you here. Go right ahead.

STATEMENT OF JONATHAN LEHMAN, VERASUN ENERGY

Mr. LEHMAN. Thank you very much, Mr. Chairman and members of the committee. I really appreciate the opportunity to participate today in this very important hearing.

We're very fortunate, because of your hard work and the Energy Policy Act of 2005, to be looking at what we do next. For several years we were looking at pushing a renewable fuels standard to get to 7.5 billion gallons of ethanol. Because of your hard work, we're going to be surpassing that in the not-too-distant future.

As you heard this morning, there are 70-plus ethanol plants under development and construction which will add 6 billion gallons of ethanol into the United States. That allows us to look at where we go next. We're going to easily meet the near-term demand of the 10 percent blend market, and it allows us the opportunity to see where we go next to spur renewable fuels. To that end, we really appreciate the President's statement during the State of the Union setting the goal of 35 billion gallons of ethanol, and we believe that is eminently reasonable.

VeraSun Energy is one of the Nation's leading producers of ethanol. We have two operating facilities, three under construction, and one under development. When complete, we'll have 670 million gallons of ethanol capacity each year. In addition, VeraSun has spent the last 24 months on an aggressive E85 strategy. We have partnered with Ford and GM to spur additional E85 locations across the country. To date, we have more than 80 locations offering VeraSun E85 in eight States.

VeraSun believes that the long-term outlook for renewable fuels includes a robust E85 market as well as additional lower blends such as E20. From our experience, there are several key steps that are necessary to achieve large-scale E85 and a robust cellulosic ethanol market.

First, in the near term, we need to maintain the E10 demand. And to do that, we should look at increasing the RFS as well as extending the existing ethanol tax credits. This gives us the opportunity to springboard to higher blends.

In the mid-term, we believe that E20 is the catalyst to move to an E85 infrastructure in the United States. E20 provides the near-term demand driver necessary to continue to move to E85. It will double the amount of ethanol demand in the current blend market, and this is important because it provides incentives for the ethanol industry to continue to grow as well as to work to develop E85. It ensures a continued investment in research and early stage development of cellulosic ethanol.

Finally, in the long-term our experiences indicate in order to spur additional investment in E85, we need to do several things to change the economics of E85. Today E85 is sold at a discount because current FFVs are not designed to take advantage of E85's high octane. This results in fewer miles per gallon run on E85 versus conventional blends, and it has to be priced accordingly.

Additionally, refiners take advantage of ethanol's high octane to increase refinery output, so ethanol is valued more highly as a blend component than a move to E85. These two factors mean that currently ethanol is blended in E10 versus E85. We need to change those economics today to start spurring an additional E85 infrastructure across the country.

Second, we should provide incentives for the automakers to increase the production of advanced fuel-efficient vehicles. We truly appreciate their commitment to increase the number of FFVs on the road. We believe that we should work to decrease the mileage penalty and create FFVs that have comparable fuel efficiency standards as existing automobiles.

And, finally, our experience indicates that we should increase the incentives for retailers to offer E85 from 30 percent to 50 percent, to try to spur additional E85 stations across the country.

With that, I'm happy to take your questions.

The CHAIRMAN. Thank you very much.

Senator Lincoln has arrived, and she has not had a chance to ask questions during today's conference. Let me defer to her. She can take my place in this round of questions.

Senator LINCOLN. Well, thank you, Mr. Chairman. I appreciate that, and certainly knowing that chivalry is not dead around here. I'm very grateful to you for that.

And I want to say how proud we are to welcome Tommy Foltz here today in the committee. Tommy is an Arkansasan, and has done tremendous legwork in bringing about the reality of renewable fuels in our home State of Arkansas. So we're very grateful to him and grateful that he is spending time with the committee, and we look forward to working with you.

Mr. FOLTZ. Thank you. I appreciate that.

Senator LINCOLN. Just a couple questions, if I may, Mr. Chairman. One of the things that I have focused on, that I think is really important for us as a legislative body to recognize when we look for incentives that are really going to jump start the industry of renewable and alternative fuels, is to ensure that we get them out to the consumer as quickly as we can.

And for me, in looking at this process, one of the things that has been most relevant has been making sure that rural communities have the tools that are necessary. They are the likely place where this has to occur, obviously, and they need the tools to build the infrastructure to produce and distribute the fuels. It makes all the sense in the world. Obviously we're not going to jump start an industry if it costs them more to use an 1-wheeler burning petroleum diesel to haul their feedstock from one place to another and it becomes cost-ineffective.

It has long been recognized that one of the most efficient models for getting this industry off the ground is small facilities serving a local area. And the industry represents an opportunity, I think, also, from my standpoint representing a rural State, to revitalize many of our rural communities. I think we must all work hard to ensure that we can take advantage of that.

My hope is that Mr. Foltz, who was a real pioneer in Arkansas, could help us in that conversation. I know the multiple different entities that we worked with Mr. Foltz and the others in bringing about the partners to make this happen. It also took time. And if there are ways that we here in the legislative body can jump start some of those or even reinforce some of those areas, I know it was patching together grants, working with wonderful nonprofits like Winrock International and different types of groups to put together what was necessary to actually start a facility.

Maybe you might expand on that, in terms of those different components that really brought us to the reality of having Patriot Fuels in Stuttgart, AR. I think that would be enormously helpful.

And then my second question—and certainly this is to the entire panel, any of you who would like to jump in on that question and the next one—is really looking at diesel vehicles. They are so common in Europe, as we know, and in many cases preferred, but here in the United States, consumers are not as assured of a diesel vehicle product. They're still wary of whether a diesel car is going to be as clean, despite the rapid advancements that we've seen in diesel technology and certainly much better fuel mileage.

So maybe in discussions here we can look at how we encourage Americans to give a second look to diesel automobiles, because I think that really has an effect on the market. Or maybe perhaps you might want to talk about what effect that would have on the market for biodiesel and other types of diesel fuel.

So, Mr. Chairman, those would be my two questions, for starters, if I may. Thank you.

Mr. FOLTZ. I think I would like to take the second question first, because I think I can explain it more quickly.

From my personal experience, when I was with Patriot Biofuels, we had a company car. And essentially we were relegated to a Volkswagen Jetta, which is a very good car. We would have rather had an American-made car, but they don't—American automakers don't really make passenger diesel vehicles.

But the thing that strikes you the most with the Volkswagen Jetta, at least, is when you walk on the lot there, if you want the gasoline version, it gets 32 miles to the gallon, which is excellent, but if you want the diesel version, it gets 41 miles to the gallon. So we talk a lot about hybrids, which are very positive for the marketplace and on a number of different levels, but without even trying, diesel is more efficient than gasoline.

I don't think that we're going to replace all the gasoline with diesel, but Europe made a transition primarily for greenhouse gas reduction strategies. I believe that in 1991 or 1992, about 10 percent of the new vehicle registrations were diesel, and now it's about 50 percent. So if you combine the inherently better fuel efficiency that you get with a diesel vehicle with biodiesel, which according to the Department of Energy and the Department of Agriculture gets about a 78 percent reduction in greenhouse gases on a life cycle basis, that's a good place to be.

Unfortunately, and this is where the right hand doesn't know what the left hand is doing, that Volkswagen Jetta is not available in diesel in the 2007 model year because it's slightly over the NO_x requirement. So from a ground-level ozone perspective, it's worse than a gasoline-powered Jetta, but from a greenhouse gas production strategy, it's far better, and from an energy security standpoint, it's far better. I think that we would do well to look from a very comprehensive approach to our policy, in that it's not just about air quality, it's not just about greenhouse gas reduction, it's not just about energy security.

I said I would make it short, but I didn't, so I apologize.

Senator LINCOLN. That's OK.

Mr. FOLTZ. In terms of the teamwork to put together Patriot Biofuels, I think that we were fortunate to find some pretty enlightened investors. Those don't exist everywhere, but I think that one of the reasons that our investors were willing to invest is because they didn't see the biodiesel tax credit going away. We felt like, in the post-9/11 world, it's more likely that that gets extended than gets sunsetted. And we hope that that's the case, because the biodiesel industry needs that \$1 blender's credit in a very, very big way.

As I said in my opening statement, having long-term, sustainable incentives that are out there, that create investor confidence, if what we're trying to do is build a biofuels industry, we need investors and so we've got to create that investor confidence. But downstream you've got people like Winrock and the Arkansas Oil Marketers, et cetera, that are very helpful to the process.

You know, we talk about the Arkansas Oil Marketers or the Texas Oil Marketers or Oklahoma, and you think they're going to

be against us. They're not. They move really all of our product into the marketplace. They are interested in selling liquid fuel, and it doesn't really matter exactly what it's made out of.

The CHAIRMAN. Why don't we go ahead and ask Senator Domenici to ask questions, and then I know Senator DeMint also had some questions.

Senator DOMENICI. Senator, I want to tell you as Chairman how good this symposium has been and how good the record will be to help us. I'm sorry that more Senators didn't come and spend more time, but that's the way it is here. I did my best to find time, and I'm hopeful that I have been constructive. I think having one of our new Senators here, I want to let him ask a couple of questions and then I'll go about and do something else.

I want to thank all of you particularly for the good testimony you gave us, and just ask this one question. As new kinds of fuels and new kinds of engines requiring in many instances, different infrastructure and different service, as they start entering this gigantic market, how do you see this melding together? Is there going to be a problem? Have we created any problems by pushing when we shouldn't or pulling when we shouldn't, and therefore we have automobiles trying to get into the market or the things that feed them trying to get space when it doesn't fit anywhere else? Do you understand what I'm talking about? Would somebody just answer for us as to how things are going out there in that regard?

Mr. LEHMAN. Senator Domenici, VeraSun's perspective is that E85 is a long-term goal and flexible-fuel vehicles will meet the needs of our transportation fuel system. That's going to take some time in order to change the fleet from the conventional vehicle to a fuel-efficient FFV. And our belief is, in order to get there you have to sequence the items.

Today we have E10, and we're going to meet that demand from the 10 percent blend in the not-too-distant future. We need a stepping stone and a catalyst to get from E10 to an E85 structure in a robust, nationwide system. It's our belief that an E20 system that can run in our conventional automobiles can be that catalyst to get us to the next generation flexible fuel vehicle.

Senator DOMENICI. Dr. Rigas.

Dr. RIGAS. Yes, Senator. If you look at biofuels, we're talking about a liquid fuel here, similar to our petroleum fuel infrastructure, which is one of the beauties of biofuel. I don't view biofuel as competing with the new plug-in or hybrid technology. They're actually complementary technologies. One really promotes energy efficiency in terms of getting more miles per gallon out of that fuel, whether it's a gasoline, a biodiesel, or a bioethanol.

I think that is one of the things we're talking about here, is diversifying our liquid fuel resources, not just being strictly reliant on one, which we have been for many, many decades, which is petroleum. And so I think with the right resources and the right focus, the integration will be fairly smooth, because we are still talking about a similar type of a fuel. We're talking about a liquid fuel here, again, whether it's bioethanol, biodiesel, gasoline, or diesel.

Mr. PAUL. I see this diversification as an essential part of strengthening our energy security. We are early in the beginning

of this, so there will be adjustment factors and there will be learning as we go along, but I think the diversification of the fuel mix to include blends, to include traditional petroleum products, to include pure bio products, as well as vehicles that take advantage of them, I think we are in a more diversified area.

There are some key things that we all need to work together—government, private sectors, local, national, and State governments together—so that the standards can be put together to let this infrastructure evolve efficiently. Because you are going to need to leverage the existing infrastructure, as opposed to building an entirely new one alongside it. That would probably be the one thing that would create problems in the long run. But I think we can do that.

Mr. FOLTZ. And I think also, just from a diversity standpoint, again, Earth Biofuels, we're in the ethanol, biodiesel, and LNG business. Now, Southern California needs the emission reductions badly, so LNG works. It's one of the few places that it really works in as robust a way.

And I think what we need to understand is that it may make more sense to make biodiesel out of cottonseed oil in the South rather than soybean oil, and I think we need to be open to the idea that different feedstocks, as long as they spit out a biodiesel that meets the standards—there was a lot of discussion about that in the previous panel. There is a standard, it's ASTM. I can't think of the number, but you've got to meet that standard. It doesn't matter what you're making it out of. And I think we need to understand that we can't get where you all want us to get and where the President wants us to get based on one feedstock. It's just not real possible.

The CHAIRMAN. All right. Senator DeMint, why don't you go ahead with any questions you have.

Senator DEMINT. Thank you, Mr. Chairman.

Mayor Fitch, you kind of stimulated my thinking here. I know when you were talking about local fuel production you were primarily talking about fuel for the generation of electricity, but it did make me think. We're looking at a major paradigm shift in fuels in the country, and it seems that we are assuming that we are going to send these new fuels through the same infrastructure.

Before we put new wine in old wineskins, or assume that maybe we do need this infrastructure that Dr. Paul was talking about, I would just like to question the panel on the idea, as we look at biofuels, we're looking at really a decentralization of the production of the fuel source itself, the raw material. In effect, it would become very much a cottage industry. And as I think was just said, maybe in different parts of the country, different fuel sources—cottonseed may be better, and sawgrass in another, sugar beets in another. It could become very diversified.

And I think it seems like we're assuming that we're going to take all this feedstock to some central distribution center, we're going to use all the fuel to get it there, we're going to use all the fuel to distribute it like we're doing now with petroleum. And I just wonder, as we think about what Mayor Fitch was talking about, I know from years of working with our local communities, the infrastructure for roads, we've got sewer plants that serve multiple

counties, we've got reservoirs of water that may serve a small region. Electricity, you've got this regional area. You've got cable that is—I just wonder, as you think about this, should we assume that we need major centralized refining and distribution, or can we possibly look at more and more localized actual refining capability and distribution that may not require the dependency on a major infrastructure in a centralized system?

Obviously, the ability for our country to sustain some kind of major terrorist attack that could destroy a large part of our fuel production, if we have hundreds of mini biofuel refineries and the ability for local communities to cooperate, share fuel, it just seems like maybe we should be talking about that paradigm, or at least exploring if that may be possible, because that would create a whole lot more energy security and may take a whole lot of trucks off the road.

Dr. Rigas.

Well, Mayor, I'll yield to you, since I have referenced you here.

Mr. FITCH. You did a much better job of selling what I came here to sell, which is that local communities like ours are the answer, the decentralization, the cottage industry. When we use basically what's in our back yard, that nobody else is using—the waste, the urban waste, the sludge, the municipal waste, the corn stover, the soybean stubble—we're small, and hopefully the economic modeling will show that we will not lose money, that you can have a small scale biorefinery.

We will make 10 million gallons of ethanol. We will lean on a couple service stations to have a dedicated underground ethanol tank, to make it available to our local residents. If not, we don't have to go too far, to Arlington County, which has a mandate to use renewable fuel, to sell it. And of course, as I said earlier, the electricity generated will go on the local grid.

This is exactly why I came here, Senator, was to present this idea of, "Don't forget about local communities as being a major player and contributor in the effort to generate more renewable energy." What I didn't think about was your idea of the security aspects of it, too, so I'll have to use that next time I make a presentation.

Senator DEMINT. Thank you. We've helped you cover it.

Dr. Rigas.

Dr. RIGAS. Yes, Senator, you're absolutely correct. And I agree with Mayor Fitch, it is going to be a distributive system that we're talking about in the future, for several reasons. First of all, the feedstocks are now decentralized, so therefore they don't come out of the ground from large reserves, similar to our petroleum industry. Therefore, locating small plants to produce the biofuels near the feedstocks is going to be the way it's going to be done, similar to the way it has been done in the Midwest. That's how the ethanol industry and the biodiesel industry came out of the Midwest, which was a very successful model.

Second is that the markets are regional, too. We're not making a product here that we have to take to the coast to export or do whatever. There is a regional demand in the local area for that product, therefore, local production and the local regional demand

feeds exactly into what you're saying, into a distributive, decentralized type of infrastructure.

Senator DEMINT. Any other comments?

Mr. PAUL. I would agree. I think our view is that it's going to take—this will be the hybrid. They'll be distributed. Biomanufacturing, I think that's the nature of it, combined with the existing underlay of the larger petroleum system that can also serve the very dense urban areas.

Mr. FOLTZ. I mean, one thing that I would add to that as well, it's not that we have to take it to the coast, it's that we can't take it to the coast. Typically, your economies of scale that you get from going big are outweighed by the freight that it costs to get it to a much bigger market. At some point you saturate your local area, and so you really need to size—you want your plant close to feedstock, but you also want it sized appropriately to the market because the freight is going to kill you.

Mr. LEHMAN. You're seeing that today in the new ethanol plants that are under construction. They are coast-to-coast. They're not just centralized in the upper Midwest, where they were 10 years ago. So you're seeing this regional diversity come into play already.

Senator DEMINT. Right.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman. Thank you, gentlemen, for your discussion of biofuels and the distribution of biofuels. I wonder if you could comment on the current energy language that allows for \$30,000 of tax incentives for those facilities to actually have alternative fuel pumps on their site, and whether you're finding that a success. Or Chevron, I don't know if you are motivated to install lots of alternative pumps at that particular point or what else we need to do. So maybe Mr. Lehman, and then Mr. Paul, if you could address that.

Mr. PAUL. Yes, Senator, I would be glad to give our perspective. Since we blend more than 300 million gallons a year at such large volume, especially in major urban markets such as California, we basically consume all of the ethanol that we can get in the blending of gasoline at the volumes that we do. So I think that over time, where you have more production, and especially distributed production that may come from cellulosic ethanol, which will allow you to distribute the feedstocks, I think that would shift.

So I think, from our perspective, where we're managing a very large fuel system, we may have a different perspective on it than local retailers may have, and I think my colleagues here might have other comments on that.

Senator CANTWELL. So basically you're saying that isn't motivation?

Mr. PAUL. For us, no. For us it's not a motivation.

Senator CANTWELL. Mr. Lehman.

Mr. LEHMAN. Our experience has shown that it's kind of threefold. You need to have E85 and you need to have FFVs in order to spur the retailer to put in the E85 pump. So it's a combination of the incentive of the 30 percent—we would say increase that level to give the retailers a little bit more incentive to do it, while we

increase the number of FFVs and the amount of E85 that's available. You need all three components in order to spur the siting of new E85 stations.

Senator CANTWELL. So have you had a lot of interest from people?

Mr. LEHMAN. We've been at this for 24 months, and we have locations in 8 States. Over 80 stations have put in these facilities. And it has taken a public awareness campaign. We work very closely with Ford and GM in different roll-outs in order to make consumers aware that they may actually own an FFV or they can go out and purchase an FFV. And once we get to a critical mass, the retailer makes a decision: "OK, I'll knock out a premium or a midgrade and put in E85 capacity." So you need those three pieces.

Senator CANTWELL. Mr. Rigas, I noted you wanted to comment on this.

Dr. RIGAS. Yes, Senator Cantwell. I just want to give you an example of a local retailer, a very large local retailer, Spinx Corporation, in upstate South Carolina, in the Greenville area, who have taken advantage of what you talked about. They have really led the State in introducing bioethanol, E85, biodiesel, to their stations in the upstate. Now, he is concentrated in the upstate, but it is again an example of local, regional people taking advantage of the incentives being offered.

Unfortunately, he has to import all his bioethanol and biodiesel from the Midwest. He is still waiting for bioethanol facilities and biodiesel facilities. Even though there are some biodiesel facilities going up in South Carolina, there are no bioethanol facilities currently.

Senator CANTWELL. What kind of dealer is he?

Dr. RIGAS. He's a retailer of—a local retailer. He has I think it's over 40 or 50 stations in the upstate, and he has introduced bioethanol and biodiesel to his service stations in the upstate.

Senator CANTWELL. But is he, in those 40 stations, a specific dealer of Chevron—

Dr. RIGAS. No, no, no.

Senator CANTWELL. What?

Dr. RIGAS. He's an independent. He's an independent, Senator.

Mr. PAUL. Senator, I would like to comment on—we're involved in a very important demonstration project with the State of California having E85 facilities. These are demonstration facilities with General Motors, in order to validate the key issues with respect to specific emission requirements that exist in California, E85. So we are involved in that, but as your question was for specific conventional retailing, no.

Senator CANTWELL. Mr. Chairman, I see my time is almost up, but I think this is an interesting point, and that is that the one person who has taken advantage of this is an independent dealer with 40 stations. Given what has transpired in the challenges of individual retailers versus company-owned stores at the retail level, I think that poses a particular challenge for us as we try to roll out things that are incentives that might be usable. So I think it's something that we should look at further.

The CHAIRMAN. I agree. I think that's a very good point.

We have one other panel. Let me just ask if either Senator DeMint or Senator Sessions wish to ask some additional questions of this panel, or should we dismiss them and go on to the next panel?

[No response.]

The CHAIRMAN. Well, thank you all then very much, we appreciate your good testimony.

And we will ask that the sixth panel come forward, please. If the witnesses would go ahead and take their seats, I'll go ahead and introduce the panel and then we'll go to their statements. First, on my left, is Dr. Steven Taylor with Auburn University, which, as I understand it, will have demonstration biorefineries running throughout Alabama later this year, and we're anxious to hear about that. Maybe Senator Sessions wishes to say something else in introduction of Dr. Taylor before I introduce the remainder of the panel.

Senator SESSIONS. Well, thank you, Senator Bingaman. Thank you for your leadership and the time that you have committed to this, this year. I think this is the kind of attention that's required, and I thank you for it.

Dr. Taylor and his team at Auburn have an alternative fuel initiative. He is the chair of Auburn's Biosystems Engineering Department. Auburn has had a tremendous reputation as a land grant institution, that has been its heritage, with decades of experience in agriculture, forestry, and engineering. I visited their switchgrass program over a decade—I guess a decade ago. They have studied it intensively and have seen its possibilities before the product became as well known as it is.

Dr. Richardson, Auburn's president, saw that Auburn could play a role in helping meet the important issues facing our Nation regarding alternative energy. He launched the alternative fuels initiative. He has committed \$3 million, at least, already to developing a center there, using university money to help augment our Nation's energy supplies.

We in the Southeast have an abundant growing season and a great deal of rainfall, and properly utilized, I think we have some special capabilities to contribute to our Nation's energy system. Mr. Chairman, the more I read and I understand from the hearing today, there's a growing understanding that corn cannot meet all our needs for ethanol, and the cellulosic breakthrough is what's needed to take us to a higher level, and I think that's what Auburn is working on. I've been pleased to work with them.

Thank you for letting me have those few minutes.

The CHAIRMAN. Thank you very much. Let me introduce the rest of the panel. We have four of our Nation's excellent laboratories represented. Dr. Kristala Prather with MIT's Laboratory for Energy and Environment, welcome to you. Dr. Dan Arvizo, who is the head of the National Renewable Energy Laboratory. He used to be in our State of New Mexico, and we are glad to have you here, Dan. Dr. Michael Davis with the Pacific Northwest National Laboratory, from the part of the country Senator Cantwell hails from. And Dr. Terry Michalske, who is of course from Sandia National Laboratory, where Senator Domenici and I hail from.

So we're glad to have all of you here, and look forward to hearing your views, particularly focused on what we need to be doing in the research area to get to the goals we've been talking about today. Dr. Taylor, why don't you start and give us about 2½ or 3 minutes of your views, and then we'll go across the panel.

**STATEMENT OF DR. STEVEN TAYLOR, CHAIR, BIOSYSTEMS
ENGINEERING DEPARTMENT, AUBURN UNIVERSITY**

Dr. TAYLOR. Thank you, Mr. Chairman, and special thanks to Senator Sessions for his longstanding support of Auburn University.

I am here representing Auburn University's alternative energy program, and as such, I really speak for a diverse group of scientists and researchers. For example, among our faculty is a researcher with decades of experience in growing energy crops like switchgrass, other scientists are world leaders in the technologies for producing and harvesting forest biomass, and we have nationally recognized experts in the conversion of synthesis gases to liquid fuels.

To build on our intellectual wealth, Auburn University is investing significant resources, our own resources, into research and education on bioenergy and bioproducts that can be created from our abundant natural resources. We're here today with two primary messages. First, a sustainable biofuels industry must be based on a balanced portfolio of regionally appropriate biomass feedstocks and biofuel conversion technologies. And, second, the creation of a successful biofuels industry will only be possible through significant and sustained funding of research and development that identifies technologies to make biofuels cost-competitive with petroleum fuels.

We recognize the significant strides that the corn-based ethanol and soy-based biodiesel industries have made for acceptance of biofuels. We believe, however, that to achieve U.S. energy security goals, we'll need additional biomass feedstocks and fuel conversion technologies. Like many others, we believe various forms of cellulosic and ligno-cellulosic material hold great promise for expanding our biofuels industry and should therefore be emphasized in our national R&E funding priorities.

For example, in the Southeast United States, abundant woody biomass, energy crops, and agricultural waste like poultry litter should be major sources of our feedstocks. In other regions of the United States, different biomass feedstocks are going to be more appropriate and more cost-effective.

In a similar fashion, we believe it's critical to fund the development of a balanced portfolio of fuel conversion technologies, not just ethanol production. Auburn's energy initiative is currently emphasizing the thermochemical approaches and gas-to-liquids technologies that will make synthetic diesel fuel, aviation fuel, and gasoline directly from biomass.

For our Nation to create a sustainable biofuels industry, we recommend emphasizing the following four principles in research and development funding: First, utilize this diverse suite of biomass feedstocks and fuel conversion technologies. Second, use a systems approach from the farm or forest all the way to the fuel pump. Yes-

terday in a meeting with Energy Assistant Secretary Karsner, he commended Auburn's approach using systems approaches to solving problems. Third, we must ensure long-term sustainability of the production systems. And, fourth, we must demand cost-competitiveness with petroleum fuels.

With focused R&D, these technologies will be ready for commercialization in 2 to 5 years, by using Auburn's partnership approach with industry and government agencies. You know, regardless of our actions, we're all leaving a legacy for our children and grandchildren. At Auburn University, we hope that part of our legacy will be a secure, sustainable energy supply for America.

Thank you again, Mr. Chairman, for inviting us, and thank you, Senator Sessions.

The CHAIRMAN. Dr. Prather, go ahead, please.

STATEMENT OF DR. KRISTALA PRATHER, ASSISTANT PROFESSOR OF CHEMICAL ENGINEERING, LABORATORY FOR ENERGY AND ENVIRONMENT, MIT

Dr. PRATHER. My name is Kristala Jones Prather. I'm an assistant professor of chemical engineering at MIT, and I'd like to start by thanking Chairman Bingaman and the rest of the committee for this invitation to speak to you on behalf of MIT on the topic of R&D for transportation biofuels.

You may or may not be aware of a major initiative we do have at MIT in the area of energy. We have a major energy initiative, which was launched by our new president almost 2 years ago. And at the same time that she announced a major effort in energy, she also announced that we should spend time working toward the further integration of life sciences and engineering. And so it's particularly appropriate to talk about transportation biofuels, because we do believe that it combines both of those areas very nicely.

Let me start by saying we do think of this as a grand challenge in technology. I heard one of the panelists earlier say that he doesn't think there's a single silver bullet in terms of identifying one biofuel, and we also believe there's not a single technological hurdle that can be overcome in order to make all of this a reality.

Instead, as Dr. Taylor has already said, this is certainly a systems problem. It requires integration, from planting of the crops, identifying what those crops are in the first place, all the way through toward separation and end use of the fuel. And so while it's helpful to think about specific technological hurdles, we don't want to forget about the fact that each individual decision we make is going to impact both what's happening upstream and what's happening downstream.

I would like to highlight a couple of areas where I think biotechnology, this integration of life sciences and engineering, can play a role, and the first one is on the side of biomass production. You've heard lots of talk about corn-based ethanol, and you are, I'm sure, very aware by now of a lot of the debate regarding the energy balance associated with it. A recent MIT study concluded that it was essentially too close to call, that it really depends on what your inputs are and the system boundaries.

On the other hand, cellulosic ethanol is generally agreed to be very positive in terms of the energy balance. The problem, from a

technological perspective, is that it's more difficult to convert into useful biofuels. So where we think biotechnology can play a role is in helping to develop crops that are easier to grow, requiring less energy input, and easier to convert into the biofuels that we're interested in.

Second, on this conversion scale, we want a process that's going to have very high yields and have high productivities, and we're limited in that capacity currently by our ability to really convert all of the sugars that are available to us and to deal with the toxicity issues. Again, we have work at MIT in this area. A recent paper from a research group in *Science* showed increased tolerance of both bacteria and yeast to ethanol, which would presumably give us higher productivities.

I've been talking about biotechnology because we again are interested in that, and it's my own area of expertise, but I do want to also emphasize what Dr. Taylor has said, in that there are chemical methods as well that should be examined in terms of how you can convert biomass-derived carbons into biofuels. Likewise, we can take advantage of chemistry and chemical engineering for the separations part of this process, and that tends to be typically very energy-intensive and also cost-intensive as well. So if we can have some novel chemistry and chemical engineering methods to help us to purify the fuels that we get, usually in fairly dilute solutions, this can help in the economic balance.

I want to end by making two points. First of all, I don't think we should confuse biofuel with ethanol or biodiesel. I think that point has been made, but I want to emphasize it again, that we need to be considering lots of different options.

Certainly ethanol is the most advanced, and biodiesel as well, from a commercial perspective, but there are lots of challenges associated with them, including the low energy density relative to gasoline and the infrastructure issues which you've already heard about. So we should be thinking longer term about alternatives, some of which I believe you heard about this morning; and as well, not forgetting about this systems problem, we should think about how new fuels or alternative fuels would integrate into both our existing vehicle infrastructure and distribution infrastructure.

Let me end by saying that I think this is a big problem. I think it's a problem we can solve. We can do it as scientists. We can do it as a country, if our government shows the will and puts the full support of our country behind it. I like to think of the Manhattan Project and the Apollo Program as examples of great technological challenges which we met, as long as we had the support for it. What we don't need is the up and down, on again, off again investment in the R&D for alternative energy. Instead, we need a sustained commitment for it.

As far as a timeline, I think we'll see cellulosic ethanol at a commercial scale within 10 years. Alternative fuels are going to take longer, but it can certainly be done.

Thanks very much for the time, and I look forward to questions.

The CHAIRMAN. Thank you very much.

Dr. Arvizo, welcome.

**STATEMENT OF DR. DAN ARVIZO, DIRECTOR, NATIONAL
RENEWABLE ENERGY LABORATORY**

Dr. ARVIZO. Thank you, Mr. Chairman. It's great to be here, and I do appreciate the leadership that's exhibited by this committee. It is clearly a very robust topic and we've had a great day already in terms of informing, I think, the discussion and debate.

I'm the director of the National Renewable Energy Laboratory, and I want to acknowledge the faithful and tenacious commitment that Senator Salazar has provided to our laboratory and to this topic in general. I commend him for that. We are the home of a number of technology opportunities, one of which is the National Bioenergy Center, and it is, in fact, the Nation's only pilot-scale cellulosic ethanol laboratory. I had the opportunity and the privilege to brief the President while he toured that facility last year.

I think this is a unique point in time and we have great opportunities in front of us. What was striking about the discussion today thus far is the enormity of the task. And while the technology research, certainly from our perspective, is required, so is resource development and utilization research, ensuring that the integrity and the fuel supply have validity to them, vehicle and transportation system integration with fuels, impacts on water and environment, and infrastructure requirements, among a number of other things that are necessary and in play to get to where we need to be.

So what we need first and foremost is a comprehensive, integrated program for biofuels development that takes into account the critical factors both individually and collectively. And to do this, I propose that we have a national needs assessment to be undertaken with haste and that it be comprehensive, a report and study that would analyze our long-term needs and take into account the full range of needs, on the demand side, on the supply side, on the infrastructure supply, on what is required to meet the goals that we have set out for ourselves.

Second, we need to look beyond today's research. We have a robust research program, but much more needs to be done. We need to carefully plan to embark on the broadest portfolio. We've heard that recurring theme today. And we need to work, as we have worked with the producers and people who have pioneered these areas and the scientific and technologic community and providers in the energy business. It's very clear that we need a multifaceted approach to biofuels development, and that will serve the country well. We need to do that in close collaboration with industry. We manage, at the national laboratories and certainly at NRL, portfolios that are very much hand-in-glove with industry, so that the technologies that emerge are market-relevant.

Third, we need to make necessary investments in our research capabilities. I think having adequate research capabilities is important. The Nation's world class laboratory system and leading academic institutions need to be retooled for this mission, and I think we can do that. We need to draw on the regional research and educational capabilities.

And while we are confident that the current focus on developing technology to quickly enable the development of cellulosic ethanol in this country is a correct and prudent first step, I think we need

to go much beyond that. History has shown that by setting out the broadest research courses, we can best guarantee that we're going to get to the place we need to be as the market evolves, as the technologies evolve, and provide choices from which policymakers, industry, and the marketplace can make wise decisions to have sustainable industries, going forward, and maintain U.S. leadership in what I consider to be an area that's going to have fierce global competition.

I'll be happy to take questions at the appropriate time. Thank you.

The CHAIRMAN. Thank you very much.

Dr. Davis.

STATEMENT OF DR. MICHAEL DAVIS, PACIFIC NORTHWEST NATIONAL LABORATORY

Dr. DAVIS. Thank you, Mr. Chairman, members of the committee. Also, Senator Cantwell, who actively engages the full resources of the Northwest in terms of these important issues, we thank you for that.

I like to keep in mind the two big challenges. One is energy security, the other is climate change. Energy security is much more of a domestic issue. Climate change is much more of a global issue. We have got to get our policy right domestically to meet both challenges. There is no question about it.

We also have heard a lot about infrastructure today. We really need to get clear on our point of departure. We're in an 85 percent dependent situation on hydrocarbons, domestically and globally. That is an incredible infrastructure and dependency, and that fundamentally is a hydrocarbon dependency. Biomass is just another form of hydrocarbon. It might be very young, but it's another hydrocarbon.

So I think we need a much greater focus on conversion efficiency across the whole board. Anything we convert, we've got to convert more efficiently. As long as we're dealing with hydrocarbons, we need a much more aggressive program on carbon capture and management, and I don't think we've done near enough yet on end-use efficiency. If we save a gallon there, do the math, it's two or more gallons of production.

So with respect to biofuels, it's still a hydrocarbon. I think there is sufficient focus on corn and bioconversion technology. I think we need much greater focus on broadening the feedstock base, and certainly municipal waste is an example. We have not aggregated a lot of the biomass waste. We certainly have aggregated a lot of municipal waste. We put a lot of money into aggregating it. We ought to be thinking about how to better convert it. And we need more work on conversion technology, particularly in the thermochemical conversions base.

I think there is sufficient focus on ethanol, and I think ethanol remains a very substantial infrastructure challenge. While I think the overall goal is right, I think we ought to think very carefully about how much of that goal we actually try and meet with ethanol.

I think we need much greater focus on other products. Certainly biodiesel is one; DME; there's others. We should be much more

careful, I think, about what products we actually can derive, what their price points are, and what their market entry points are. There's an awful lot we can do with biomass besides going directly to commodity fuels. I think we should anticipate more electricity into the transportation sector, and be equally as enthusiastic as we are with ethanol in terms of electricity.

I think we need to use existing infrastructure to the maximum extent possible. We've got 1,000 biomass stations—or ethanol stations, if you will. We've got 170,000 fueling stations. We've got something like 5 million flex-fuel vehicles. We need something like 55 million if you wanted to consume all the ethanol that you're talking about producing. We also need much more focus, as I said earlier, on vehicle efficiency.

I would echo what Dan said. He was the first guy all day, I think, that mentioned water. We need to pay much more attention to water, both for processing and also realize that these feedstocks are hydrogen-deficient. The hydrogen has got to come from somewhere.

I would be very careful with incentives and subsidies, and avoid biasing either the conversion technology or the product. Then, finally, I would say that we should do everything we can to encourage public and private R&D partnerships, because all the R&D we're doing, we should really work hard to have the best market channel we can to get that research to the marketplace as quickly as possible. So please reinforce the public-private partnerships and research.

Thank you.

The CHAIRMAN. Thank you very much.

Dr. Michalske is the clean-up hitter here on this whole conference. Go ahead.

STATEMENT OF DR. TERRY MICHALSKE, SANDIA NATIONAL LABORATORY

Dr. MICHALSKE. Thank you. It's a great honor for me to be here representing Sandia National Laboratory. Sandia is managed and operated by the National Nuclear Security Administration of the Department of Energy, and the Sandia Corporation, which is a subsidiary of Lockheed Martin.

On behalf of Sandia, I'd like to begin by thanking Chairman Bingaman and the members of the committee for organizing this conference, and I'd also like to thank both Senators Domenici and Bingaman for their leadership in passage of the Energy Act, which provides important new policies in the biofuels area.

Now, I think everything we've heard in the course of the day would confirm the potential for biofuels to have an important impact on reducing our Nation's dependence on foreign oil, and also reducing the level of greenhouse gas emissions, which makes this an important and high-priority area for government investment. And we think the Government investment ought to be focused in a number of areas: first, in supporting long-term and sustained fundamental research—there are difficult challenges here that will need to be addressed over the long haul; providing key incentives that speed the development of infrastructure for production, distribution, and the utilization of biofuels as they come into the mar-

ket; we also think the Government needs to play a role in establishing innovative mechanisms that promote public and private partnerships in the research, development, and deployment; and, finally, in assessing and enacting policies that will ensure the protection of our environment, land and water resources.

So the challenges that lie before us really sit at the intersection of science, technology, economics, and social and political interest and support. And these challenges have to be met in a world of fluctuating oil prices, where free market principles don't necessarily apply, and our environmental constraints are frequently changing. There is no question that success is going to depend on the development and deployment of some advanced technologies and engineering systems that simply don't exist today.

To meet these challenges, the investment should be systematic, with a focus on driving critical, fundamental science, understandings that are directed at achieving dramatic cost reductions and efficiency gains. In this regard, I think it's going to be very important that we look at innovative ways to focus together the strengths of industry, academia, and the Government laboratories, to bring those talents together to focus on these critical problems. Just as SEMATECH demonstrated the value of public-private partnerships in advancing our competitive advantage in the semiconductor industry, I think those same kind of models will be very important as we go forward here.

We believe that in the near-term the focus on ethanol moving toward the technologies for cellulosic biomass conversion are going to be very important, but in the longer-term, we need to evaluate the broader range of biofuels and biocrude as it may be produced from novel biomass sources such as algae or microorganisms. And again we're going to have to focus on the entire energy system, including the distribution, the utilization, and that's going to mean investments in materials, engineering, and combustion and engine design.

But as we move forward, we must be mindful of the water resources. Because biomass-based fuel production requires water both for growth and for processing, biofuels will have significant impacts on our water resources. For this reason, investments in technologies to address those challenges must be prioritized in the context of these interdependencies.

So thank you again for the opportunity, and I look forward to questions.

The CHAIRMAN. Thank you very much. Let me just ask one question. I'll start with Dr. Arvizo, and any of the rest of you who want to comment can do so.

You talked about the need for a comprehensive plan. I think you stated we need a national needs assessment in this area. I recall when the semiconductor industry came up with—I think working with some of our Federal laboratories participating, came up with a road map for the development of the semiconductor technology that they thought was needed to move ahead. Is that what you're talking about, a road map for where we need to make breakthroughs and where we need to concentrate resources in the research field and the development field? Is that what you're describing?

Dr. ARVIZO. Yes, sir. In fact, it has a lot of the flavors of that old SEMATECH that you're talking about, which is really a private sector road map and partnership that would go forward. In the 2002 Biomass R&D Act—I'm sorry, in the 2000 R&D Act, there was a biomass R&D board that was formulated to coordinate activities across agencies, and I think that maybe is the start of where we can plug a national needs assessment type of thing into it.

But we need an architecture, we need a framework around the entire—as my colleagues have said, a systems approach to the entire fuel-to-transportation chain—a value chain, if you will. And what I envision would happen would be something of a network that is coordinated centrally, but it is very regionally distributed in terms of trying to get at the regional specifics of some basic tenets regarding what are the attributes we need out of a future energy economy that has a much more robust acceptance of biofuels.

Biofuels touch so many different things. We've got to worry about everything from sustainability to the way financial markets work, the way the players work, the way the infrastructure is all formulated, and it does inform an R&D agenda in that process.

The CHAIRMAN. All right. Let me defer to Senator Domenici. Why don't you start, Senator Domenici, and then I'll come back to this side over here.

Senator DOMENICI. Thank you very much. And I'll be brief, because it is late.

I at least want to thank you, all of you, especially for waiting so long. By the time you get up here, not only are you tired, but it's quite obvious everybody up here is tired. We just hope you had a fine afternoon in spite of all that.

We're glad to have you, and we know a couple of you pretty well. You've been at this kind of thing for quite some time, and we're very proud of you. Some not so long, only because you aren't very old; some a long time, because you are very old, like me. No aspersions. I'm old, too, and I still think I know what I'm doing, but you know that's questionable. In any event, let me thank you all.

But let me ask Dr. Arvizo just one follow-up on Senator Bingaman's question. I don't quite get it. Why is it more important that we do a road map for this when we have so many other alternative energy sources that are entering the arena that are going to be—in terms of quantity, that are going to be just as big as this, and we're not doing road maps on them? Is this something special here, or am I misstating the question?

Dr. ARVIZO. You're not misstating it. I would offer that we need road maps in a much broader and more comprehensive way. You know, in our laboratory we look at the renewable areas, renewable fuels, renewable electricity. I think you need road maps on both. The kind of impacts that are required, the kind of investments in the private sector that are going to be required, are in the trillions of dollars, and to do that, I think government has a role to play that can help facilitate market mobilization of capital. And that's really what is I think at the origin of this.

Senator DOMENICI. Let me ask one for you, Dr. Prather, and then I'll yield to the chairman. You stated that cellulosic ethanol is 10 years away from commercialization; did I read that right? Didn't you say that?

Dr. PRATHER. Yes. The estimate of that is actually less an estimate of the demonstration of technical feasibility, and includes actually bringing up biofuels-dedicated crops, so that includes the entire process timeline. The demonstration of actually being able to convert cellulosic materials to ethanol, that is already happening, but in terms of getting something up to scale, where we would actually see competition with corn-based ethanol and actually having the appropriate agricultural infrastructure in place in order to do that, I do think is closer to a 10-year timeline.

Senator DOMENICI. Well, the President is asking for 35 billion gallons by 2017 from this particular fuel. Is the President's goal attainable, given the state of research, if alternate fuels were limited to cellulosic ethanol?

Dr. PRATHER. Let me make sure I understand the question. Are you saying, if we are only looking at cellulosic ethanol, is it possible to do that in 10 years?

Senator DOMENICI. Right.

Dr. PRATHER. If we're looking at cellulosic, if we look at it in combination with corn-based ethanol, I think that's realizable. I'm less confident that we're going to go completely from a corn-based ethanol system to a cellulosic-ethanol-based system, and we're going to stop making ethanol out of corn, in a 10-year timeframe.

I do think what we'll see—and I will also say again this is not my area of expertise, but I think what we'll see is a gradual introduction of cellulosic-based ethanol into the market. The benefit to that is, as the cost of that comes down to be competitive with corn or better than corn, you may see some displacement of what is made from corn, but I think you'll see a combination of both of those for some time before you actually get the net benefits that are available from cellulosic.

Senator DOMENICI. OK. Thank you very much.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman.

I want to follow up on Senator Domenici's question, because I think there is a bit of irony here. Obviously my two colleagues from New Mexico and the lab that is there and the Pacific Northwest lab remember the history of our country, when we had a mandate from a President who said in a very short period of time he wanted us to, I think, go from about \$2,000 of research into becoming a plutonium-producing Nation, and we did that in about 3 of 4 years. I can't believe the challenge of cellulosic is more daunting than that.

And so my question is, in this process—and maybe, Mr. Taylor, your 6 years on switchgrass can give us some insight as to this issue, enzymes versus gasification of materials—what really is the focus of what we need to do on breaking through on cost-effective production of cellulosic material so that we can expedite this time period? Anyone who wants to answer.

Dr. DAVIS. I'd like to comment on that, because I think there are technologies today, particularly gasification, where we can break down any hydrocarbon and we can synthesize what we break it down into, into the molecules we want, and we can actually do that

at a massive scale. It's back to focus. We've focused for 20 years on bioconversion. I think we've made progress. I think we need to continue to work.

I think we forgot about the thermochemical conversions, and that's our world today, and we do it because we can do them at very large scale and they're quick conversions. So thermochemical conversions open up the market substantially.

I'll say again that I don't think the only product we ought to be trying to produce is ethanol. I think we ought to let the market sort out the product, and I think we ought to broaden the technology base we're using to produce them. And I only want to, at some risk, chide Senator Domenici because, if he remembers, in a prior life he actually confirmed me for a position in DOE, so you're partly to blame, sir.

Senator DOMENICI. Somebody did tell me that recently. I wouldn't have remembered, but now I do. It's a long time ago.

Dr. DAVIS. Right.

Senator CANTWELL. So, Dr. Davis, just to clarify, you're saying we could go faster with the focus? It's not the science that's prohibiting us; Is that what you're saying?

Dr. DAVIS. I think we can go much faster than what's conventional wisdom.

Dr. TAYLOR. Can I add to that, Senator Cantwell?

Senator CANTWELL. Yes, go ahead.

Dr. TAYLOR. We both talked about thermochemical conversion. The technologies are there. The oil industry is investing very heavily in that to take natural gas to liquid fuels. The technologies are there, and they're fairly well known. There are some small process control variables that we've got to work out.

Take an example: If you're feeding poultry litter into that, as your feedstock, into that gasifier, you know there are some things we've got to work out there. If you're feeding wood chips from Washington State versus Alabama, there's probably differences in how we control that process. So the things that we need to know, the technologies, are there, and we think there's a fairly quick horizon to be able to commercialize those and produce a significant amount of fuel.

I guess our message is: Have a balanced portfolio, don't just put all your eggs in one basket. Let's look at cellulosic ethanol. That's fine, but let's also broaden that to bring in other technologies that are—

Senator CANTWELL. Well, I'm definitely not for picking technology winners and losers, but at the same time, I'm not so sure that the security threat is any less than it was during this previous decade in there where the United States wanted to shift strategy in investment. We have a very big challenge and we're very dependent, and it could be a lot more drastic scenario than just trying to talk the Chinese into putting more pressure on Iran for nuclear proliferation. So, to me, expediting this is a national security issue.

Dr. ARVIZO. Senator, if I may comment on that, we frequently get asked that question: "So what can you do in what kind of timeframe?" And it really is about the timeframe. We have run some models. And I'll grant that the models for predictions in these

areas are very inadequate, but the best models that we have suggest that over the course of the next 10 years the upper limit for cellulosic ethanol is on the order of 6 billion gallons. Now, that's a small fraction of what the President's goal is, maybe a sizable fraction from some circles, but it doesn't meet the whole goal. And part of what—

Senator DOMENICI. How many was that, Doctor? How many?

Dr. ARVIZO. Up to 6 billion. In fact, we've run models, a very aggressive scenario, assuming a variety of things in terms of how you mobilize capital, and it's 5 to 6 billion gallons by 2017. Now, the way you accelerate that is, you make assumptions about more aggressive public policy. Now, we're not modeling anything, but some of what we've considered to be more basic kinds of instruments, the mechanisms for—we don't have the first cellulosic ethanol plant in production yet, and it's not because—as we heard earlier today, it's not because we don't have the technology to actually begin the pilot testing program. We simply don't have investors willing to take the financial risk to make that happen. Loan guarantees, as you offered earlier, are a way in which we can accelerate.

So there is a technology component, there is a market component, and there is a policy component, and I think it is a matter of national will as to how quickly we want to get to those goals.

Dr. MICHALSKE. If I could add to that. This challenge, it is quite a large challenge, but I think what's inspiring is that there are a set of tools now in the world of biosciences that give us a completely new way to go about this. These tools have the ability to learn how to genetically modify plants so that they actually are easier to break down, to develop through nanotechnology and biotechnology better ways to extract the energy and then convert it into a useable fuel.

And one of the things that's very difficult now is that there are many process steps along the way. This is a very intensive process of conversion. The opportunities are to really gain great efficiency advantages by combining those steps, and using these technologies to have single process steps that do multiple functions and really streamline the cost-effectiveness. So I think we can do the processing now, but the potential to be able to do it in a much more cost-effective way is what the science and technology investments really need to focus on.

Senator CANTWELL. And that's a U.S. economic advantage?

Dr. MICHALSKE. Absolutely.

Senator CANTWELL. I mean that what you just said about nanotechnology and other things is an advantage we have in the production of these biofuels that the Europeans or Chinese or other people don't have; right?

Dr. MICHALSKE. It's an advantage that we need to capitalize on.

Senator CANTWELL. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Senator Sessions.

Senator SESSIONS. Thank you. If you would just, Dr. Taylor, clarify for us. You take a product like switchgrass, Dr. Bransby's field—I've seen it—and we talk about how many gallons per acre, if you had a good conversion system. But what I really am curious

about is, how do you take this dry cellulose, this cornstalk, and convert that to a fuel that we can utilize?

And I understand there are two ways to do it, through biochemistry and hydrolysis and through heat or a thermal process. Can you explain the differences? And then I know you're going to be building some bio plants this year, Auburn University is; are they going to emphasize these technologies?

Dr. TAYLOR. Yes. You've got two or three questions there. I've got to remember all of them.

Senator SESSIONS. Yes, I do.

Dr. TAYLOR. The investment that Auburn is making this year is really emphasizing that thermochemical approach, so we're putting in larger laboratory-scale gasification, gas-to-liquids equipment. Auburn has had a longstanding history of gas-to-liquids technology research at a fairly small laboratory scale to work out some really neat new breakthroughs in the gas-to-liquids technologies. And so we're going to a larger scale that will let industry come in and partner with us and take the results and scale that up to an industrial process.

Senator SESSIONS. Now that you have concluded, I think it's fair to say, from what I understand, that the prospect for thermoconversion gasification is better at this point than the—

Dr. TAYLOR. We think so. Both approaches, the biochemical approach versus thermochemical approach, I guess if you look at the billion ton report, the assumption that's in there is a ton of biomass might make 60 gallons of ethanol or 60 gallons of fuel. We think those are fairly conservative estimates. By really increasing our efficiency, increasing the technology there, maybe you double that.

Theoretically, if you look at the carbon that's there, theoretically we might be able to produce 200 gallons per ton, we think. So let's say you take that 60 gallons per ton and you double it. That's a significant increase in the amount of fuel that we might be able to produce.

Those are the kind of things that we need to answer in both the biochemical and thermochemical approaches. The thermochemical approach gives us some other advantages.

Senator SESSIONS. Can you say basically, just for the layman, how the heat will convert a dry cellulosic product to become a fuel?

Dr. TAYLOR. In those thermochemical approaches, typically you would gasify the material, and that's an incomplete combustion process that gives you—it takes that cellulose, lignon, all the hemicellulose, and you get a synthesis gas that has primarily carbon monoxide and hydrogen molecules in it. And then you can take those into the gas-to-liquids technologies or other catalytic conversion technologies and re-form those or put them into a new molecule that might be a diesel fuel, gasoline, or other paraffins, olefins, other higher value chemicals that come out of that stream at the end of that.

Senator SESSIONS. And you will test that this year?

Dr. TAYLOR. Yes.

Senator SESSIONS. And one more thing. How much, and how many kinds of switchgrass cellulose can be produced in an acre of land?

Dr. TAYLOR. If I remember right, Dr. Bransby, your good friend, I think his record is about 15 tons per year, per acre. Does that sound right?

Senator SESSIONS. So at 60 gallons per ton, 15 tons an acre, that's a good bit of fuel.

Dr. TAYLOR. Several gallons per acre, that's right.

Senator SESSIONS. If you can make the conversion process work, you should be able to have a pretty good source of energy. Now, the thing about switchgrass is, everybody is talking about it, but the advantage, if you see it, is you just cut it like you do regular grass. It grows up to 10 feet tall. And you can go in and cut it, but you don't have to replant it. I believe Dr. Bransby has cut the same fields for 10 or more years, never had to replant, don't have to break the soil up, and does not fertilize at all or very little. So it's a pretty tough, hardy-growing product, if you could make the conversion work.

Dr. DAVIS. Senator Sessions, if I might add a comment, I think we're not trying to put thermochemistry or biochemistry against each other. Keep in mind that we need conversion technology that both scales up to massive scale and scales down to a distributed scale, that works for a wide variety of feedstocks. That's pretty challenging.

We just got back from 10 days in China, and they are building gasification technology on a massive scale, but they're not producing it to make ethanol. They're basically building it to make fertilizer and to make methanol as an intermediate for chemical activities. And, in fact, we have agreements now to work with them to campaign some of our technology on their gasifier, because I'm not ready to ask the committee for enough money to build a new gasifier at PNL, but I'd like to do that. So with that cooperation, we'll be able to campaign a number of important technologies on large gasification systems this year.

Dr. TAYLOR. If I can just tack onto it, I guess our approach is, let's keep our slate open. Let's consider a balanced portfolio of those fuel conversion technologies. Thermochemical just happens to be one of those that we have some expertise in, and that's what we're emphasizing.

Senator DOMENICI. Mr. Chairman?

The CHAIRMAN. Yes, Senator Domenici.

Senator DOMENICI. I know we don't have a DOE official here. I guess maybe you come closest, being from Sandia. Or I guess a couple of you do, three of you do. Anyway, I want to lay this before you, because I know about it and I think you would be interested in getting the facts for us.

It would seem kind of strange that the President of the United States would be giving a State of the Union address and be talking about such a large quantity of ethanol in the future, when you are sitting before us today talking about the fact that we don't know how to make it yet, we don't know how to make that second breakthrough which will create big quantities.

But the Department of Energy has let three contracts or loans or whatever the instrument is, Senator Bingaman, \$160 million each. That's out there, and I don't know where they are in status, but I think it would be good, if you would think so, that we write

DOE and ask them. Because it would seem that our committee, we started it by authorizing it in our bill, and then they took it and they found the money for it. They didn't find the money for some of the other things, which I'm glad for, but I think it would be good for us to know where it is. It seems rather important that we pursue it with some degree of vigor.

The CHAIRMAN. I agree. I think we should inquire from the department how we get from here to 35 billion.

Senator DOMENICI. It's a good point.

The CHAIRMAN. Yes.

Senator DOMENICI. Very simple.

The CHAIRMAN. Since that's what we're supposed to be doing.

Let me call on Senator Salazar.

Senator SALAZAR. Thank you very much, Senator Bingaman. And I know it's late in the day, so I will be short.

Let me just first say that I congratulate each of you and your institutions for all that you do in the laboratories. I am particularly fond of NRL, and thank you for greeting the President and Secretary Bodman and myself and others, Senator Allard, over the last year and a half.

I have a question that I'd like each of you to just take a quick minute and a half to answer. I heard Dr. Arvizo's response to several of the questions here: that we are limited perhaps in even reaching the President's renewable fuels goal here at 35 billion gallons by 2017. And I thought I heard Dr. Arvizo say we have the technology issues and the market issues and then the public policy issues that we deal with. And I think your concluding statement was that an aggressive public policy might make a difference in terms of your modeling how much alternative fuel we can produce by 2017, 10 years out. So my question to all of you—and I would like you to spend less than 2 minutes on this each, 1 minute maybe, because otherwise the chairman will get mad at me. So at the end, he said an aggressive public policy could accelerate us achieving these goals, an aggressive public policy. What would be the two things that we could do in this U.S. Capitol on that aggressive public policy, to accelerate what we are doing now so that we can achieve and perhaps surpass the President's goals? Terry, we'll start with you and go down the table.

Dr. MICHALSKE. I think that currently we are investing a shockingly small amount of our resources to achieve this goal, and that if we're going to take on a challenge like that, I believe we can make it. But we can't make it on a shoestring. We're going to have to take that challenge seriously in how we support the research all the way through the development that will allow this to go forward.

Senator SALAZAR. Do you have a quantum of what that would be? I mean what kind of money we're talking about. When you say it's on a shoestring now, how much more do we need to get the acceleration done that you're talking about?

Dr. MICHALSKE. Senator, I don't have a good quantitative estimate for that.

Senator SALAZAR. But your conclusion is, right now we're operating on a shoestring budget to essentially reach this goal that is a visionary goal.

Michael, let's go to you.

Dr. DAVIS. I'd like to do a "don't" along with a couple "dos". Don't require the 35 billion gallons to be all ethanol. I don't think that's a good solution. Do more on vehicle efficiency. The math is for you. You save a gallon on the consumption side, you're saving more than two on the production side. Allow for some electricity to be a part of this solution.

We're spending—the whole DOE research budget on energy is \$2.5 billion. We spend \$1 billion on oil every day. If I was buying insurance, I'd spend a hell of a lot more than \$2.5 billion on energy research in this country, period. So I don't think we've even begun to understand the challenge, relative to the total budget.

And then we fracture that budget pretty substantially because all these issues have some merit. We don't set priorities well enough to manage the resources we do, and I think we can make the case that we're underinvested, aside from the wishes of the committee. We certainly appreciate your support.

Senator SALAZAR. Thank you, Dr. Davis.

Dr. Arvizo.

Dr. ARVIZO. Yes, I think first of all we're talking about all the wrong scale here. I think we need to have—earlier in the presentation or during the day, Senator Domenici said we got the zeros wrong. I think we've got the zeros wrong here. I agree with Dr. Davis regarding underinvestment in our energy future. Our future energy economy requires a lot more investment than we've had to date.

If I just focus on this one area, biofuels, the one thing I will say is that right now, under Ray Orbach's program for bioscience centers, we have scheduled two essentially bioscience centers that will be funded at something on the order of \$50 million a year for 5 years. These are formidable efforts. There are actually five major bioregions of the country where you have feedstocks that are similar in nature. We ought to have five bioscience centers, not two. That would be a huge step forward in getting regionalization and getting an infrastructure.

I think there is some science to be done. Clearly it can be aided by public policy. I think in this case, looking at more robust feedstocks that are for the purpose of energy production, we have to get out of this quandary that we have that we're affecting food prices because we're trying to develop energy, liquid fuels.

Again, taking a holistic approach back to this road map that I was talking about earlier, we really do need to look at this thing in its broadest perspective. I think we'll find more than enough challenges to spend an enormous amount of money on, only a little bit of which will be really, really effective in terms of meeting the needs.

The difference between this and the Manhattan and the Apollo programs is that we've got to do this at an achievable and sustainable market price. We didn't have that particular dynamic overlaid on those other grand challenges. This is a grand challenge of unprecedented proportion, so it needs that kind of attention.

Senator SALAZAR. Thank you, Dr. Arvizo.

Dr. Prather.

Dr. PRATHER. I think I'll kind of piggyback exactly on that point, that I think there's a difference between "can we do it" and "can we do it at a price that makes it realistic." So I'll leave it at that.

I apologize for not remembering the writer's name, but there was a professor at the University of California at Berkeley who did an analysis in terms of economic investment in R&D and concluded that what we need is a ten-fold increase in investment, governmental investment, in the energy area. And this included renewable energy altogether, it wasn't specific to transportation, biofuels.

But his analysis concluded that it was a factor of 10, and that through historical analysis you could do that ten-fold increase in investment without significantly affecting the R&D efforts of other major initiatives. One of the concerns is always if you overfund in one area, you're going to underfund significantly someplace else. And he also argued in this analysis that historically what we've seen is when the Government does ramp up its investment in major R&D issues, the private sector follows, so a ten-fold increase from the Government actually ends up being more than that because private industry steps in as well. So I'll try to give that number.

The second point I'll make in terms of what to do is diversification, to really get the conversation going beyond "Can we make 30 billion gallons of ethanol?" to "What does it really mean to have renewable, sustainable energy?" And think about going much broader than that.

Senator SALAZAR. If you can find that article, I'd appreciate it if you could get it to us.

Dr. PRATHER. Sure. I have it in my backpack back there.

Senator SALAZAR. Thank you, Doctor.

Dr. Taylor.

Dr. TAYLOR. Dr. Kammen, I think, at UC-Berkeley, is who you're thinking about.

Dr. PRATHER. Yes.

Dr. TAYLOR. A couple of things. I guess maybe our goals—we could rethink our goals a little bit. Instead of saying so many gallons, let's say that our goal is to create a biofuels industry that's cost-competitive with petroleum. If it's competitive, consumers will buy it. You know, if it's the right price, we're going to buy that and put it in our cars and trucks. So let's fund the R&D that will make the technology that will make the industry cost-competitive and sustainable at the same time. You've got to have both of those.

Long-term environmental sustainability is what we want, but if it's cost-competitive, we're OK. The money, I don't know how much we spent on the Apollo missions or other things like that, but if we elevate it to a level of a national priority, let's really look at how much money was invested in those and that will give us some perspective on how much we should invest here.

I know the farm bill has a bioenergy, bioproducts research initiative in it, proposed. That's wonderful, but I'm not sure that that's enough.

Senator SALAZAR. Thank you very much.

And thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman. I just want to thank you for today's various panels. And the organization of the committee into this biofuels day I think has been very helpful to the committee and to the Senate, so I thank you for your leadership on this issue.

I wanted to follow up with Dr. Davis.

You mentioned electricity a couple of times, and the notion that electricity, in and of itself, is a fuel. I know that the lab just came out with an analysis that 70 percent, I believe, of the cars, trucks, and other vehicles could be powered off of our current electricity grid capacity. That is, if we had plug-in cars, with that plug-in capacity, batteries could be recharged with the current supply of today's grid.

Dr. DAVIS. That's correct.

Senator CANTWELL. If that's the case, what do we do to enhance the use of current energy that's already available?

Dr. DAVIS. There are a couple of important aspects to that. We looked at the 150 control regions of the country, and we looked very carefully at the installed electric-generating infrastructure, transmission and distribution. If you look at the amount of energy that could be produced off-peak, that's available, largely from coal plants, then it gets very specific in terms of different regions, but it does look, in aggregate, like something on the order of 70 percent of the entire fleet, on an energy-equivalent basis, could be powered with electricity.

The infrastructure is there to generate it and deliver it. You're going to use more fuel. You've got to use that electricity off-peak, because you can't compete with peak demands, where we're essentially using the infrastructure for delivery. What's going to require that to be unlocked is the right kind of technology on board vehicles, electric vehicles, plug-in hybrid vehicles, battery technology. Those are challenges as well, but those challenges might be a shorter path to victory than some of the other challenges.

As to Dan's point, I think I would look at a study that gets at how we move things, not just biomass in particular, but what are the options for us to gain energy security and address climate change issues in terms of how we move things? And I think you come up with a broader suite of answers, and some of them get you there faster than what we're talking about with just ethanol.

Senator CANTWELL. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Sessions, did you have additional questions?

Senator SESSIONS. I would just add, I believe Auburn is looking also at garbage, waste-to-ethanol. Is waste and newspaper and traditional garbage also potentially a source of ethanol?

Dr. TAYLOR. It is another one of those cellulosic forms of material, yes. I think that we have some partnership agreements with an industry partner and we are working together there.

Senator SESSIONS. Thank you.

The CHAIRMAN. Well, I thank this panel very much. I think it has been very useful testimony, and we appreciate everyone who has participated in today's conference. The hearing is adjourned.
[Whereupon, at 4:55 p.m., the conference was adjourned.]

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