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IMPLEMENTATION OF THE PROVISIONS OF THE ENERGY POLICY ACT OF 2005

HEARINGS

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED NINTH CONGRESS

SECOND SESSION

ON

ELECTRICITY RELIABILITY PROVISIONS; NUCLEAR POWER PROVISIONS; NEXT GENERATION NUCLEAR PLANT; AND RENEWABLE FUEL STANDARD AND THE FUTURE POTENTIAL OF BIOFUELS

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ELECTRICITY RELIABILITY PROVISIONS

MONDAY, MAY 15, 2006

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

The committee met, pursuant to notice, at 2:30 p.m., in room SD–366, Dirksen Senate Office Building, Hon. Craig Thomas presiding.

OPENING STATEMENT OF HON. CRAIG THOMAS, U.S. SENATOR FROM WYOMING

Senator THOMAS. I will call the committee to order. Thank you all for being here. A great turnout. There must not be much competition. No.

[Laughter.]

Senator THOMAS. I know all of you are as interested as I am in our electric future. Delivering electric services to the American citizens is kind of what it is all about.

So we are delighted that you are here. Thank you for your interest in today's oversight hearing on the implementation of the energy bill's electric reliability provisions.

With the enactment of the Energy Policy Act of 2005, Congress directed FERC to ensure the reliability and security of the Nation's bulk power system. We are now in the process of transitioning from a system of voluntary compliance to a mandatory regime. Pursuant to the energy bill, a single electric reliability organization, an ERO, will have the authority to establish and enforce mandatory reliability standards.

As many of you know, this issue is extremely important. To me as a Western Senator, I believe it is essential that we have a policy of regional flexibility. To that end, Congress was careful not to impose a one-size-fits-all approach in the legislation. Instead, we authorized deference and delegation to regional differences.

EPAct's electric reliability provisions will go a long way to ensuring the reliability in the Nation's grid. Also, I am sure we need to be concerned about our capacity to serve in the future the opportunity for transmission corridors and those kinds of needs that obviously will be more demanding.

We also need to build more transmission lines, of course, in this country. I recently introduced S. 2755, the Energy Price Act of 2006. One of the aspects of this bill is that it allows State instrumentalities to use tax-exempt bonds to finance critical infrastructure projects.

Before we get started, I would like to highlight an important issue that we are not addressing today, railroad coal delivery problems. The full committee plans to conduct an oversight hearing on this issue May 25, and as you know with our supply of coal in Wyoming, which we currently convert to electric energy, to get that energy back to the marketplace. The cost of delivery of coal is terribly important. We are very anxious to work on that issue.

Now, to our witnesses, let me welcome John Moot, the FERC General Counsel. John, I know we aggressively have set deadlines for FERC in this act. I appreciate your efforts in seeking to meet these. Rick Sergel, president and CEO of North American Electric Reliability Council. NERC, of course, has applied for the new ERO designation. So if you gentlemen would come forward please and we will begin.

As kind of a system here, if you can put your statements at around 5 minutes or so, and we will put your entire statement in the record.

So, Mr. Moot, if you would like to begin, sir.

STATEMENT OF JOHN S. MOOT, GENERAL COUNSEL, FEDERAL ENERGY REGULATORY COMMISSION

Mr. MOOT. Yes, thank you, Senator, and thank you for having me to appear today. I want to start by commending Congress for its vision and leadership in enacting new section 215 of the Federal Power Act. Section 215 marks an historic change in the way the industry is organized and regulated with respect to reliability. Although the industry made great strides since the 1960's and the blackouts of the 1960's in creating a voluntary regime of reliability standards, Congress was correct to recognize that, over the long run, only an enforceable mandatory regime of reliability standards would protect the public and would support a vibrant economy.

I am pleased to report that the Commission has worked well with the industry in implementing section 215 in a timely and responsible manner. Within approximately 30 days of enactment of EPAct, we issued a NOPR, a notice of proposed rulemaking, to implement section 215. Within the 180 days provided by the statute, we issued a final rule adopting regulations that would provide a foundation for the next steps to implement section 215.

I want to thank industry and NERC, in particular, in working with the Commission throughout this rulemaking process. I think it is fair to say that through their comments and through their statements at our technical conferences, it was apparent that industry was pulling together to support a common vision that is reflected in the final rule. I think this is particularly notable in the fact that in a nearly 400-page rulemaking, we received only a handful of rehearing requests. Certainly I as General Counsel am particularly delighted about that.

The next phase in our implementation of EPAct involves three steps. The first step is the certification of an ERO, and as you indicated, NERC has applied to do that in April of this year. I want to again commend NERC for moving quickly and responsibly in this area. It filed for ERO certification with only 60 days after issuance of our final rule. It had been working on this petition for quite some time and circulating drafts to the industry. We expect

to move promptly on this petition, and we hope to act in July of this year.

The second major area that we would be looking at is approval of the reliability standards. We intend to use an open and inclusive process to review these standards and seek industry comment. The first step in that process occurred last week when we issued a preliminary staff report identifying areas where those standards should be strengthened and improved. However, the staff report also indicated that the existing standards provide a solid foundation upon which to maintain reliability to the grid. We will seek comments on this report from NERC and from the industry over the next 45 days. We will hold a technical conference. We will consider those comments and we expect to issue a notice of proposed rulemaking in September regarding the existing reliability standards.

The third and final piece of this puzzle to fully implement section 215 are the regional delegation agreements. Those are not yet before us, but I know from being informed by folks that people are working very hard on them. We anticipate those delegation agreements to be filed with us over the next several months, and we intend to act quickly and expeditiously on those as well. Once we have taken and finished all those three steps, we will be in a position to begin an era of mandatory and enforceable reliability standards and to fulfill Congress' intent in enacting section 215.

Thank you.

[The prepared statement of Mr. Moot follows:]

PREPARED STATEMENT OF JOHN S. MOOT, GENERAL COUNSEL, FEDERAL ENERGY REGULATORY COMMISSION

Mr. Chairman and members of the committee, thank you for this opportunity to appear before you to discuss the Federal Energy Regulatory Commission's progress in implementing the electric reliability provisions of the Energy Policy Act of 2005 (EPAct 2005), provisions that will bring about historic changes in this country's electric utility industry and that represent a major contribution by Congress to the public welfare. I appear today as a Commission staff witness and do not represent the views of the Commission or any individual Commissioner. Nevertheless, I am confident that I speak for everyone at the Commission when I say that we consider electric system reliability to be a matter of the highest priority. Indeed, Commission Chairman Joseph Kelliher has stated that "[a]ssuring reliability of the bulk power system is arguably the most important responsibility given the Commission by the Energy Policy Act of 2005."

I am happy to report that the Commission has met the deadline Congress established in EPAct 2005 for issuing rules governing the certification of an electric reliability organization (ERO) and procedures for establishing, approving and enforcing electric reliability standards. The Commission currently has before it an application by the North American Electric Reliability Council (NERC) requesting certification as the ERO, as well as a request by NERC for approval of 102 reliability standards. Once the Commission processes these filings and the regional delegation agreements that will be filed in the near future, we will have established the first-ever mandatory reliability regime for the nation's bulk-power system.

Congress initiated this process in EPAct 2005 when it amended the Federal Power Act (FPA) to include a new section designated section 215. It establishes a program of mandatory, enforceable electric bulk-power system reliability standards that are subject to Commission approval and are applicable to all users, owners, and operators of the nation's bulk-power system. Section 215 of the FPA requires the Commission to certify an ERO which will develop and administer reliability standards, subject to Commission review and approval. The ERO is authorized to impose, after notice and opportunity for a hearing, penalties for violations of reliability standards, subject to Commission review. In addition to enforcement by the ERO, the Commission may initiate enforcement on its own motion. Section 215 directed

the Commission to issue a final rule implementing its requirements no later than 180 days after enactment, or by February 5, 2006.

The Commission issued a notice of proposed rulemaking (NOPR) on September 1, 2005 that contained proposed regulations concerning ERO certification, the process for developing and enforcing reliability standards, delegation of ERO authority to regional reliability entities, ERO funding and other matters necessary to implement FPA section 215. The Commission received approximately 1,700 pages of comments on the NOPR and made a number of changes to its proposed regulations based on these comments. On February 3, 2006 the Commission issued is final rule, which has been designated Order No. 672.

The regulations adopted by Order No. 672 establish:

- criteria that an entity must satisfy to qualify as the ERO;
- procedures for the ERO to propose new or modified reliability standards for Commission review;
- procedures for timely resolution of any conflict between a reliability standard and a Commission-approved tariff or order;
- procedures for resolving an inconsistency between a state action and a reliability standard;
- regulations pertaining to ERO funding;
- procedures governing an enforcement action by the ERO, regional entity or the Commission;
- criteria for delegating ERO authority to regional entities;
- regulations governing the issuance by the ERO of periodic reports assessing the reliability and adequacy of the North American bulk-power system; and
- procedures for creating regional advisory bodies composed of representatives of state governments and formed to advise the Commission, the ERO or regional entities on reliability matters.

On March 30, 2006, the Commission issued an order on rehearing in which it clarified certain aspects of the regulations issued in Order No. 672. The Commission received no comments on this order, and the rulemaking process initiated on September 1, 2005 is now complete.

As required by FPA section 215, the Commission's new regulations specify that the ERO must submit each proposed reliability standard, and any modification to an existing standard, to the Commission for approval. Only reliability standards approved by the Commission are enforceable under FPA section 215. The Commission may approve a proposed reliability standard if it determines the standard is just, reasonable, not unduly discriminatory or preferential, and in the public interest. The regulations allow regional entities to propose reliability standards through the ERO, and they allow the ERO to delegate compliance monitoring and enforcement to regional entities.

The ERO and regional entities must monitor compliance with the reliability standards. They may direct violators to comply with the standards or impose penalties for violations, subject to review by, and appeal to, the Commission. Under the Commission's new regulations, the ERO and regional entities will be subject to periodic performance assessments to assure that they remain in compliance with the requirements of the statute and the Commission's regulations. This will entail a performance assessment three years after certification and every five years thereafter.

The Commission's new regulations permit the ERO and regional entities to take remedial action other than through penalties, e.g., compliance directives or imposition of additional training requirements, and require them to have an audit program to ensure compliance. The regulations require the ERO to notify the Commission promptly of any violation, or alleged violation, of a standard and to propose penalty guidelines and a range of monetary and non-monetary penalties for violations. Non-monetary penalties can include such things as imposing a limitation on an activity, function, or operation, or adding an entity to a reliability watch list composed of major violators.

Our goal is to implement these new regulations as quickly as possible, consistent with due process and the deliberation necessary to assure that all legal and technical requirements have been met. The formal implementation process began on April 4, 2006. On that date NERC filed an application for certification as the ERO and a petition seeking approval of its current voluntary reliability standards as the mandatory standards specified in FPA section 215. The Commission received no other requests for ERO certification or standards approval.

NERC was formed in 1968 by the regional reliability councils covering the contiguous 48 states, several provinces in Canada and a portion of Baja California Norte in Mexico. NERC and these (now) eight councils operate as a voluntary, industry-sponsored reliability organization formed to ensure the reliability of the North

American bulk-power system. NERC's ERO certification application contains a detailed discussion of its capabilities, structure, rules, procedures and plans for transition to ERO status. The Commission issued a notice of this application on April 7, 2006. The Commission received comments on NERC's ERO certification application from over forty parties. Their comments generally support the application, but many offer recommendations on a host of matters pertaining to governance and balanced decision-making, the scope of the activities and functions NERC proposes, ERO funding, the reliability standard development process, reliability monitoring and standards enforcement, and delegation of the ERO's authority to regional entities. For example, several commenters address the range of users, owners and operators of the bulk-power system to be listed on a compliance registry that would be subject to possible reliability standard enforcement actions. Commission staff is currently reviewing these comments.

NERC's reliability standards petition seeks approval of 102 proposed reliability standards. Ninety of these standards, known as "Version 0" standards, became effective on a voluntary basis on April 1, 2005. NERC explained that the Version 0 standards "are a translation, with certain improvements, of [its] operating policies that were developed over several decades and its planning standards, which were approved in September 1997." The April 4, 2006 petition includes 12 new standards, which were approved by the NERC board of trustees for implementation in February 2006. NERC states that one additional standard, related to cyber security, is undergoing revision and was filed for informational purposes only. NERC maintains that the 102 proposed reliability standards collectively define overall acceptable performance with regard to operation, planning and design of the North American bulk-power system. NERC requests that the reliability standards become effective on January 1, 2007, or an alternative date determined by the Commission.

On April 18, 2006, the Commission issued a notice of a rulemaking process for consideration of NERC's proposed reliability standards. Commission staff issued a preliminary assessment of the standards last week. In anticipation of NERC's ERO certification application, Chairman Kelliher directed the Commission's Division of Reliability in the Fall of 2005 to initiate a thorough technical review of NERC's existing voluntary standards. Staff has been at work analyzing the standards for a number of months, and the document reflects its assessment to date. The preliminary assessment is approximately 130 pages long, and as one might expect, much of it is highly technical and directed primarily to an audience of power system operators and engineers. I can, however, summarize its basic conclusions in brief.

The assessment is limited to a technical review, and it makes no final recommendations about whether NERC's proposed reliability standards satisfy the Commission's criteria for acceptable standards. It is the first step in an open and inclusive process designed to solicit industry comment on the potential deficiencies in the current standards and the appropriate process and timeline for addressing them. Staff concluded that NERC's voluntary standards program represents a solid foundation on which to maintain and improve the reliability of the nation's bulk-power system. However, staff also identified a number of deficiencies, many of which, it should be noted, NERC itself has acknowledged. For example, some of the proposed standards contain ambiguities that need to be clarified. There are instances of technical inadequacy that raise concerns. Some standards lack objective measures and compliance levels that are necessary for consistent interpretation and enforcement. This list of examples is representative rather than exhaustive.

I do not wish to leave the impression that the problems staff has identified represent insurmountable difficulties. As noted, staff concluded that NERC's proposed standards constitute a solid foundation from which to proceed. However, the Commission believes that Congress intended it to promote improvements in bulk-power system reliability, and pursuing that goal makes it necessary to take a hard look at the existing standards to determine whether any require modification to meet the statutory standard.

The Commission stated in its April 18, 2006 notice that it intends to hold a technical conference on the NERC standards prior to issuing a formal notice of proposed rulemaking. This technical conference, and an opportunity for subsequent written comments, will provide the public with an opportunity to comment on both NERC's proposed standards and Commission staff's assessment of those standards. The Commission anticipates that this preliminary analysis, and the exchange of ideas it will promote, will help to focus and expedite the formal rulemaking process.

The Commission's regulations incorporate the statutory requirement that to be approved the Commission must determine that a reliability standard is just, reasonable, not unduly discriminatory or preferential, and in the public interest. The regulations also specify that the Commission will remand for further consideration a proposed reliability standard that it determines fails to satisfy this test in whole or in

part. The Commission anticipates that the task of standards review and approval will be an ongoing process and will continue even after an initial set of reliability standards has been approved. As facts and circumstances change, and as our understanding of the bulk-power system grows, new standards, or improvements to existing standards, will become necessary. The Commission's regulations take this into account and specifically provide that the Commission may, on its own motion or a complaint, order the ERO to submit a new or modified standard when the Commission considers this appropriate to carry out the requirements of FPA section 215.

I would like to turn now to a general description of some of the key issues that the Commission expects to address in the coming months as it proceeds to certify an ERO and approve an initial set of mandatory reliability standards.

As part of its review of NERC's ERO certification application, the Commission will need to consider the details of how the ERO will operate, including matters related to compliance oversight, enforcement of standards and assessment of penalties. Section 215(c) of the FPA specifies that before an entity can be certified as the ERO, the Commission must determine that the entity has rules that, among other things, (i) assure its independence from users, owners and operators of the bulk-power system; (ii) equitably allocate reasonable dues, fees and other charges among system end users; (iii) provide fair and impartial standards enforcement procedures; and (iv) provide for reasonable notice and opportunity for comment, due process, openness, and balance of interests in developing reliability standards and otherwise exercising its duties. The Commission received numerous comments addressing some of these matters in the rulemaking that led up to the issuance of Order No. 672. In many cases the Commission concluded that the issues raised would be best dealt with in the context of ERO certification. Staffs initial review of the comments received on NERC's certification application indicates that public interest in these issues remains high.

The Commission will need to consider the establishment of regional reliability entities. The statute permits the ERO, with Commission approval, to delegate the authority to enforce reliability standards to regional entities. NERC's ERO certification application contains a pro forma delegation agreement that sets out elements that would be common to every such agreement. Individual agreements may include other elements based on matters specific to the region in question. While the Commission stressed the importance of uniformity among regional entities in Order No. 672, a certain amount of variation is likely based on regional differences and unique features of specific systems. The Commission will have to evaluate that variation on a case-by-case basis when reviewing individual delegation agreements submitted for approval.

A related issue that the Commission will need to resolve is the degree of uniformity necessary for enforcement, due process and penalty assessment across the regional entities. The Commission stated in Order No. 672 that it believes regional processes should be uniform unless regional facts, other than custom, require a difference. The Commission will need to evaluate any region-specific procedures or process standards contained in a proposed delegation agreement in light of this basic policy.

The Commission will need to devote considerable attention to reviewing NERC's 102 proposed reliability standards. As noted above, Commission staff has been engaged for some time now in a detailed technical analysis of the proposed standards and has issued a comprehensive assessment of them. The Commission will continue its analysis and expects that the process will enter a new stage once public comment on the standards is received both in the technical conference and the subsequent rulemaking proceeding.

In addition to detailed analysis of individual reliability standards, the Commission will need to consider its procedural options under section 215. The Commission could accept the standards, remand them for further development, or accept them on the condition that they are modified to address certain concerns. The Commission also must determine whether there are groups of standards that must be accepted or remanded as a package because the effectiveness or enforceability of one depends on the approval of others in the same group.

In the course of reviewing and approving reliability standards, the Commission will need to consider any proposed regional variations in standards. The Commission concluded in Order No. 672 that uniformity of reliability standards "should be the goal and the practice, the rule rather than the exception." At the same time, it noted two types of regional variations that generally would be acceptable: (i) regional differences that are more stringent than the continent-wide standard and (ii) a regional standard that is necessitated by a physical difference in the bulk-power system. In addition to considering such variations, the Commission will need to deal with the problem of transition to greater uniformity. The Commission has acknowl-

edged that the transition cannot be made overnight, but it will be necessary to ensure that reasonable progress toward uniformity is achieved.

FPA section 215 also allows for the creation of regional advisory bodies. These bodies will advise both the ERO and the Commission on a range of matters related to reliability. The Commission has already received a petition from the Western Governors Association requesting that the Commission establish a proposed Western Interconnection Regional Advisory Body. In addition to representatives from the states concerned, that organization is expected to include members representing the Canadian provinces of Alberta and British Columbia and the Mexican state of Baja Norte or an agency of the government of Mexico representing the portion of Mexico in the Western Interconnection.

The Commission also will need to work directly with regulators from Canada and Mexico to ensure successful implementation of mandatory reliability standards. The North American transmission grid is an interconnected continental system regulated by the laws of three nations. However, it operates according to the laws of physics, which do not respect national boundaries. In order to ensure transmission grid reliability, the Commission will need to continue to cooperate with both Canada and Mexico.

New FPA section 215(c)(2)(E) requires the ERO to take appropriate steps to gain recognition in Canada and Mexico. NERC has already begun seeking recognition from governmental authorities in Canada. NERC is also in discussions with Mexican authorities, although I understand that at this time the electric system regulator in Mexico may not have comparable reliability authority. Together with the Department of Energy and in coordination with the State Department, the Commission has been working closely with Canadian federal and provincial authorities for some time, and has been in contact with Mexican regulators, to coordinate implementation of this new law.

Finally, the Commission still must answer several fundamental questions arising under FPA section 215 either through additional rulemakings or on a case-by-case basis. Of particular importance is the issue of determining who is considered a "user" of the bulk-power system for purposes of section 215. The statute itself does not settle this question, but rather simply states that all users, owners, and operators of the bulk-power system shall comply with the new reliability standards. The Commission determined in Order No. 672 that who is to be deemed a user would be best considered in the context of its review of proposed reliability standards.

The Commission is well positioned to undertake all of these tasks. In fact, it began to focus on reliability issues well before the passage of EPAct 2005. Commission staff played a key role in the U.S.-Canada Power System Outage Task Force formed to investigate the August 14, 2003 blackout. When the Task Force issued its report in April 2004, the Commission took immediate steps to implement the recommendations contained in it that were addressed to the Commission. Among other things, it announced that no new independent system operator or regional transmission organization would be approved until its reliability capabilities were functional. The Commission also issued a policy statement in response to the Blackout Report that addressed a number of other issues, such as cost recovery of prudent reliability expenditures, the need to cooperate with the states, Canada and Mexico on reliability issues, and the interpretation of reliability-related provisions in transmission tariffs on file with the Commission. On this last point, the Commission stated that requirements in those tariffs to follow "good utility practice" would be interpreted to include compliance with NERC's reliability standards.

The Commission helped form the Bilateral ERO Oversight Group in February of 2004 to develop an international framework for electric reliability. The Group is comprised of representatives from the Commission, the U.S. Department of Energy, the Federal-Provincial-Territorial Electricity Working Group in Canada, with assistance from the Canadian Department of Foreign Affairs and International Trade, and the U.S. Department of State. In October of 2004 the Commission established a new Division of Reliability to develop policies, programs and strategies to promote and facilitate reliability. It also added staff with expertise in reliability matters. The Commission is currently in the process of expanding its reliability staff even further. One task of this new division has been to participate in NERC's reliability readiness reviews of balancing authorities, transmission operators and reliability coordinators in North America to determine their readiness to maintain safe and reliable operations. It also has been engaged in studies and other activities to assess longer-term and strategic needs and issues related to power grid reliability.

In conclusion, I can say that the Commission is hard at work implementing the electric reliability provisions of EPAct 2005 as Congress intended, as expeditiously as possible, and in light of input from all affected industry stakeholder groups.

Thank you again for this opportunity to speak, and I will be happy to answer any questions you may have.

Senator THOMAS. All right, sir. Thank you very much. I appreciate that.

Mr. Sergel.

STATEMENT OF RICK SERGEL, CHIEF EXECUTIVE OFFICER, NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL, PRINCETON, NJ

Mr. SERGEL. Good afternoon, and I want to thank the committee for this opportunity to discuss this important issue of reliability of the bulk power system. I also want to thank you personally, Senator Thomas, for your leadership on reliability matters over the past several years and for your intention to infrastructure issues.

One of the most important elements of the Energy Policy Act of 2005—or the most important for me—was authorization to FERC to approve and oversee an electric reliability organization, an ERO, that will promulgate and enforce mandatory reliability standards for the bulk power system. On April 4, the North American Electric Reliability Council, most often called NERC, filed an application with the FERC, the National Energy Board of Canada, and with eight Canadian provinces to become the North American Electric Reliability Organization. We hope that FERC will approve our application to be the ERO this summer, although much work will remain to be done to fully implement the reliability provisions of EPAct 2005. But if this happens, I believe we can have mandatory standards in place well before the summer of 2007.

The reliability legislation that you wrote, combined with FERC's rule implementing this legislation, provides the necessary statutory and regulatory framework for an outstanding electric reliability organization. You and the FERC have done your jobs in authorizing and launching a mandatory system of bulk power reliability standards. Now it is time for NERC and the industry to do our jobs. You should have a very high expectation of the ERO. We, indeed, intend to meet those high expectations.

Let me touch briefly on the major issues.

The first is the role of regional entities. The law provides for delegation of standards and compliance and enforcement to qualified regional reliability entities. We have developed a model delegation agreement and continue to work closely with the regions to ensure that those are coordinated properly. Delegation is our desire as well. However, the delegation and deference to qualified regional entities does not mean preservation of the status quo. Congress passed reliability legislation to make the bulk power system more reliable through better reliability standards applied and enforced by independent authorities, and we are committed to bringing about that change.

Now on to the reliability standards themselves. We filed with the FERC the complete set, 102 of them. We now have more and we will be filing those shortly. We identified a number of standards where further action on NERC's part was necessary before the Commission could approve the standards, and a number of additional areas where the proposed standards could be improved over time. I can say, to that extent, we agree with the report that has

been issued by the FERC staff in the past week. We look forward to meeting and delivering on the work plan that was part of our filing and modifying that work plan as necessary to meet the Commission's expectations.

Last week FERC released the preliminary staff report and it marks the next step in the transition from voluntary to mandatory reliability standards. We look forward to working with the Commission and its staff, governmental authorities in Canada, and all industry stakeholders to identify the priorities and the time table for putting that foundation of standards in place promptly.

As to regional standards, we want to delegate to regions where appropriate and included those provisions in our proposed rules. At the same time, however, regional standards must be coordinated and consistent to the maximum extent possible. Different regional standards may be appropriate to reflect physical differences in the operation of the grid, but a different regional standard is not appropriate merely because that is the way it was done in the past.

Who should comply? The reliability legislation that you passed applies to all users, owners, and operators of the bulk power system. We are creating a registry of those we believe are the users, owners, and operators. Those entities will be notified and provided an opportunity to challenge their inclusion on the registry if they believe they have been registered inappropriately. The goal is to include those entities on the registry whose actions or inactions can have a material impact on the reliability of the bulk power system and to do so on a consistent basis across all regions.

We will submit our budget to do all this by November 1 and hopefully have that in place by January 1, 2007.

But in conclusion, it will take some time to make the transition from today's voluntary system of reliability standards to mandatory, independently administered reliability standards, but the transition is well underway and we are committed to completing it as effectively and as promptly as possible.

Thank you.

[The prepared statement of Mr. Sergel follows:]

PREPARED STATEMENT OF RICK SERGEL, CHIEF EXECUTIVE OFFICER, NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL

IMPLEMENTING RELIABILITY LEGISLATION

On August 8, 2005, the President signed into law the Energy Policy Act of 2005. One of the most important elements of that legislation was authorization to FERC to approve and oversee an Electric Reliability Organization (ERO) that will promulgate and enforce mandatory reliability standards for the bulk power system.

On April 4th, the North American Electric Reliability Council, most often called NERC, filed applications with the Federal Energy Regulatory Commission, the National Energy Board of Canada, and with eight Canadian provinces to become the North American Electric Reliability Organization, or ERO. These filings represent a major milestone in NERC's effort to become the ERO—a strong, independent organization with the authority to establish and enforce mandatory reliability standards for all users, owners and operators of the interconnected North American bulk electric system.

We hope that FERC will approve our application to be the ERO this summer, although much work will remain to be done to fully implement the reliability provisions of EPACT 2005. If this happens, I believe we can have mandatory standards in place well before the summer of 2007.

The reliability legislation that you wrote, combined with FERC's rule implementing this legislation, provide the necessary statutory and regulatory framework for an outstanding Electric Reliability Organization. You and the FERC have done

your jobs in authorizing and launching a mandatory system of bulk power reliability standards. Now it is time for NERC and the industry to do our jobs. You should have very high expectations of the ERO. We intend to meet those expectations.

NERC has done an enormous amount of work to position itself to deliver on these high expectations. For the remainder of 2006, we will continue our efforts to:

- obtain certification as the ERO in the United States and Canada
- negotiate and execute delegation agreements with regional entities, as contemplated by the legislation
- develop additional reliability standards and strengthen existing ones,
- establish the registry of entities who will be subject to the mandatory standards, audit requirements, and enforcement
- prepare ERO and regional entity budgets for 2007, and
- establish and implement the ERO funding mechanism.

Let me provide some additional information on these.

OBTAIN CERTIFICATION AS THE ERO IN THE U.S. AND CANADA

Ten days ago, FERC received comments from more than 70 entities on our ERO application. While we received widespread support for NERC's being certified as the ERO, many of the commenters suggested changes of one kind or another they would like to see in the details of our proposal. We are preparing a response to those suggestions, and the Commission will then be in a position to act on our application.

In Canada, the provincial governments are responsible for electricity regulation. Some Canadian provinces will provide "recognition" by law. Some will do so by regulation. For others, the process has not yet been determined, but we have established good working relationships across the continent. There will be some difference in implementation details between Canada and the U.S. (for example penalty money will most likely go to the ERO or the regional entities in the U.S., but will most likely go to provincial governments in Canada). However, the standards themselves must be consistent. Based on the long history of Canadian participation in and coordination with NERC and its members, we are optimistic that this will be achieved.

REGIONAL DELEGATION AGREEMENTS

The law that you passed provides for delegation of standards and compliance/enforcement to qualified regional reliability entities. Of particular importance to the West and to Texas, the law directs the ERO to presume (rebuttably) that a proposal from a regional entity organized on an interconnection-wide basis for a reliability standard or modification to a reliability standard to be applicable on an interconnection-wide basis is appropriate and in the public interest. We have developed a model delegation agreement and continue to work closely with the regions to ensure that we are coordinated properly. Delegation is our desire as well.

It is important we take advantage of the substantial work done by the regions, rather than re-inventing the wheel. The Western Electricity Coordinating Council (WECC), for example, has developed a solid compliance program. We do not intend to start over. However, delegation and deference to qualified regional entities does not mean preservation of the status quo. Congress passed reliability legislation to make the bulk power system more reliable through better reliability standards, applied and enforced by independent authorities. We are committed to bringing that change about.

RELIABILITY STANDARDS

NERC currently has in place a comprehensive and measurable set of reliability standards for the bulk power system that provides a solid foundation for future ERO standards. We have filed with FERC the complete set of NERC's existing reliability standards (102 of them). However, substantial work lies ahead to bring these standards to the quality necessary to underpin a mandatory system of enforceable rules. NERC's petition for approval of the 102 reliability standards identified a number of standards where further action on NERC's part was necessary before the Commission could approve the standards and a number of additional areas where the proposed standards could be improved over time. NERC also provided a work plan for completing those improvements.

FERC has indicated it will use rulemaking procedures to adopt these standards, as authorized by the legislation you passed. That choice will enable FERC to consult with its Canadian counterparts and all industry stakeholders as it moves forward on the standards. FERC has also interpreted section 215 to authorize it to consider the reliability standards at the same time it is considering our application for cer-

tification as the ERO. We support that interpretation. It will enable us to have mandatory standards in effect sooner than if we had to wait for ERO certification and only then begin developing standards to be filed with FERC sometime later. We expect to have mandatory reliability standards in place well before the summer of 2007.

Last week, FERC released a preliminary staff assessment of our proposed standards. The preliminary staff assessment echoes many of the points from NERC's evaluation of the standards and identifies additional areas for improvement in some of the standards. The Commission directed that NERC file a response to the staff assessment by June 26, 2006.

The release of the staff assessment marks the next step in the transition from voluntary to mandatory reliability standards. This increased scrutiny of the content and quality of the reliability standards is a natural progression as the standards, originally developed for a voluntary and cooperative set of industry relationships, will now be used for a new purpose: Once approved, the standards will be legally binding and provide a basis for enforcement actions in the event of non-compliance, including the levying of financial penalties. We look forward to working with the Commission and its staff, governmental authorities in Canada, and all industry stakeholders to identify the priorities and a timetable for putting a solid foundation of mandatory reliability standards in place promptly and working over time to improve those standards.

As to regional standards, we want to delegate to regions where appropriate and have included those provisions in our proposed rules. At the same time, however, regional standards must be coordinated and consistent, to the maximum extent possible. Different regional standards may be appropriate to reflect physical differences in the operation of the grid, or if the proposed regional standard goes beyond the requirements of a national one. A different regional standard is not appropriate merely because "that is the way we always have done it."

APPLICABILITY OF RELIABILITY STANDARDS

The reliability legislation that you passed applies to all "users, owners and operators" of the bulk-power system. Given the potentially enormous number of entities that could be encompassed in this definition, there has been debate about who is and who is not covered. FERC provided some guidance on this in its rule implementing the legislation, but essentially has asked the ERO to address this issue. We have chosen to do this by creating a registry of those we believe are users, owners, and operators. If your name appears on the registry you must follow the standards. If not, you will not be subject to the mandatory requirements. NERC, working with the regions, will make a preliminary judgment as to who should be on the registry. Those entities will be notified and provided an opportunity to challenge their inclusion on the registry if they believe they have been registered in error. Entities will also have the right to appeal that decision to FERC. The goal is to include those entities on the registry whose actions or inactions can have a material impact on the reliability of the bulk power system and to do so on a consistent basis across all regions.

BUDGET AND FUNDING

We will submit to FERC in August a proposed budget for the ERO. Approval is expected by November 1, with funding to start January 1, 2007. This budget will include funding for activities delegated to regional reliability entities. The regions must supply the rest of their budgets, for information purposes only. The ERO must ensure that the budgets proposed by the regional entities are adequate to perform their delegated functions.

Finally, and in addition to these matters, we will start the process of soliciting and enrolling members in the ERO, and establishing the member representatives committee, which will vote on the ERO's bylaws and elect the ERO's trustees. NERC also will evaluate regional entity standards development and compliance enforcement procedures to ensure that they comply with all requirements for ERO certification and delegation.

NEED FOR MANDATORY RELIABILITY STANDARDS

It is important that we continue to proceed promptly to implement the reliability legislation, and that we do it right. If anything, the need for mandatory reliability standards today is even greater than when the bill was passed. The economy continues to grow, along with electricity demand, but infrastructure development is lagging. This means that the industry must do more with the assets it has, which, in turn, requires greater attention to standards. There is good news. Progress is being

made on matters such as cyber-security standards and vegetation management (tree-cutting) standards, but much more progress is needed.

NERC has in place a Compliance Enforcement Program that monitors and promotes compliance with NERC and regional reliability standards. This program reflects cumulative improvements made over the past seven years, but now we must move to the next level. We must develop a comprehensive audit program. Where necessary, the ERO must be ready to pursue penalties and enforcement actions.

Finally, I believe the ERO can do more to track and inspire adoption of best practices across the industry. NERC has a long history of assessing the reliability and adequacy of the North American and regional bulk power systems, and has established procedures for conducting and reporting the results of these assessments. However, we can and will make better use of benchmarking and identification of metrics against which industry participants can be measured. That will mean these assessments are not merely reports from others, but the product of independent evaluation of resource and transmission adequacy.

CONCLUSION

In conclusion, the reliability legislation that you wrote, combined with FERC's rule and other actions implementing that legislation, provide the necessary statutory and regulatory framework for creating a strong, effective Electric Reliability Organization. NERC has the experience, vision, expertise, working relationships, infrastructure, and independence necessary to be the strong ERO that Congress envisioned. Working with FERC, regional entities, the states, the provinces and other Canadian officials, we will put in place and administer a system of mandatory bulk power system reliability standards, as Congress intended. It will take some time to make the transition from today's voluntary system of reliability standards to mandatory, independently administered reliability standards, but the transition is well underway and we are committed to completing it as effectively and as promptly as possible.

Thank you for the opportunity to present this testimony. I welcome your questions.

Senator THOMAS. Well, thank you, gentlemen. Thank you for what you do and certainly thank you for your activities in the future.

Mr. Moot, let me ask you just kind of a broad question as we look at this whole issue. In most business activities, it is the responsibility of the business provider to get their services to the customer. Why do we need this special program in terms of electric reliability?

Mr. MOOT. Senator, I believe that over time and as it came to a head, in particular with the 2003 blackout and the resulting blackout report, it became the almost uniform conclusion of policymakers, including Congress, that the existing voluntary regime was insufficient. And that is because, as we move to a government oversight of that process, reliability is a public good, and it is, therefore, important that Congress stepped in and it did so and that the Commission have the ultimate authority and responsibility to oversee the work of the industry.

Now, having said that, I will emphasize that although the vision of section 215 is a top-down structure where the Commission has final authority over standards and the approval of the ERO, the bulk of the work will continue to be done by industry, by the ERO, by the regions, by volunteers. And we recognize that and we appreciate that and that continues to be necessary. But we will now have a final resort in an overall regime for enforcing what we hope over time will be truly excellent standards.

Senator THOMAS. Mr. Sergel, let me follow that up just a little bit. What do you think was the principal cause for this program to be initiated?

Mr. SERGEL. Electricity is more important today than ever to our security, both physically and economically. When you think about what electricity does in this century, compared to what it was doing when it was first invented, the change is staggering. It is essential, and we simply cannot function without the best electric system in the world whether that is from an economic point of view or reliability point of view.

Now, we have tried to make this system work when it was voluntary and that simply has not gotten the job done. We need mandatory standards and the industry and all of those involved with the industry are ready to step forward and do that and to make the system mandatory as is provided under the law. We have to do better and we will do better.

Senator THOMAS. Well, I asked myself these questions when we started talking about this. You look at the business sector and you say why is it. But it is different. You do not have an alternative. If you are the retail user, you have a provider. If that does not work, you have a problem and so on.

So, Mr. Moot, what do you think is the greatest challenge to transitioning to the mandatory system?

Mr. MOOT. I think the greatest challenge for the Commission is to work as best as we can within our regulations to have an open, inclusive process and to very clearly articulate what we are doing and why. This is the first time we have ever regulated in this area and we have no precedents for people to look at and we have no experience within the agency with which to undertake this important task. So we have and will continue to, number one, have as an open and inclusive process as we can so that people understand what we are doing and they have an opportunity to come before us, explain their views, and urge us to take different action than we contemplated, new actions, et cetera. So as we go forward, as best we can, we need to recognize that this is our first step and it needs to be a sure step and one carefully taken.

Senator THOMAS. What do you see as FERC's rule in establishing the regional entities?

Mr. MOOT. We ultimately have the responsibility to approve any regional delegation agreement. So as the regions work with NERC and ultimately the ERO to finalize these agreements, they will be submitted to the FERC for review and approval. We will look at the three principal issues, among others, the governance of the regional entity, the process it proposes for proposing standards, and its overall system of ensuring compliance and enforcement with the standards.

Senator THOMAS. How will you set up the regional variations for reliability standards? How will they be permitted?

Mr. MOOT. We have said in our final rule, order 672, that regional differences or variations will be permitted where they are more stringent than the continent-wide standard or where there are actual physical differences that merit them. As Mr. Sergel said, we are accepting of regional differences, and I think the entire industry would accept this position, that we want those regional differences to be fact-based not just based on custom and history. As we said in order 672, however, it will take time to achieve both greater excellence in standards and more uniformity, and we recog-

nize that. So we do not expect this vision to be achieved overnight and we will be cognizant of that when we review requests for regional differences.

Senator THOMAS. I see, okay.

Some of the stakeholders are concerned about the potential costs of the ERO. How do you plan to assess the expenditures for this activity?

Mr. MOOT. The ERO is required to submit its business plan and its budget for Commission review with detailed support, and so we will, on an annual basis, be looking closely at the costs to make sure they are appropriate, allocated on a fair basis, et cetera.

Senator THOMAS. These will be funded by users, not by taxpayers?

Mr. MOOT. They will be funded by end users, yes, not on a taxation basis.

Senator THOMAS. I understand the Western Governors have submitted a petition for a Western interconnect regional advisory body. How will FERC consider that petition and what is the time line, do you think?

Mr. MOOT. As you state, that petition is presently before us. We intend to act expeditiously. We are hopeful that we can act in July at the same time we act on the ERO application.

Senator THOMAS. Good.

Mr. Sergel, the bill makes all users, owners, and operators of the bulk power system subject to the mandatory standards. Identifying owners and operators should be easy. However, understanding and defining of users has proven a little more difficult. How do you deal with that?

Mr. SERGEL. Well, you have it exactly right. I think the law got it exactly right by, in fact, specifying users, owners, and operators. The Commission also got it right by providing us additional guidance, but without attempting to narrowly define somehow through regulation what that definition was.

We intend to implement it by creating a registry of users, owners, and operators. We will be notifying those who are proposed to be on said registry. They will have an opportunity to understand our position and we will listen to them. If we still believe they should be on the list, when they disagree, they will have the opportunity to go to the Commission.

But the advantage of the proposal that we have put forth is that no one will be subject to these mandatory standards without knowing it in advance, having had an opportunity to understand why they were being placed on the list, and having had an opportunity to appeal that to the Commission. So it is a not a definition which you have to look at and figure out for yourself. There will be a registry. You will have an opportunity to know that it applies to you in advance.

Having done it that way, we believe that we will be able to focus on those entities that can have a material impact on the reliability of the grid and assure those parties that we are communicating to them about what they need to do. But likewise, the definition will be broad enough for us to know who those parties are from time to time as circumstances——

Senator THOMAS. I understand you have used the words "material impact" in your plans. How do you plan to identify users that have a material impact?

Mr. SERGEL. We will begin that process at the regional level. We will attempt to identify those parties to whom we believe can have an impact. We will be starting from the standards themselves to identify what we believe are the risk factors, what the performance requirements are. And we will then work with the entities themselves to finalize the list.

Senator THOMAS. How do you see the process for the regional differences to take place? And how will this fit into the national system?

Mr. SERGEL. We believe there are two ways for the regional differences to work. I will just refer to them as the preferred and the alternative. In our preferred method, a region would propose to us in advance a regional process. We would be able to look at their process, be able to determine that the process is open and balanced, that it is technically effective, and we would, in effect, preapprove the process.

Having done so, then standards that come through that regional process to the ERO—we have a much shorter process of simply posting those for notice and to see if there are additional comments, but being able to move those quickly through the ERO and to the Commission and hopefully quickly through the Commission as well. That is pre-approving the process and, therefore, making the evaluation of each individual regional standard less burdensome.

On the other hand, if we are unable to do that, we would certainly be willing to have a regional process that is similar to the international process that we use today. It is ANSI-approved. It is an open and balanced process. It involves all stakeholders, and we would put that similar process in place for a region, albeit the scope of those involved would be smaller. In other words, we certainly would not include people from the West, for example, in a evaluation of something that was for the Eastern interconnection only and vice versa.

Senator THOMAS. Having described the plan, I presume that your opinion is that it is appropriate to have regional variation.

Mr. SERGEL. I think that the law wisely permits it. I think there are geographic differences which require it. I also think that it is appropriate from time to time to have standards in a region that are more stringent than the national standard. I have a part-time location in New York City. It is on the 19th floor. New York has more stringent reliability standards than apply elsewhere and for good reason. So I believe that is the second important reason why there should be regional standards. It is geographic differences and where they are more stringent.

Senator THOMAS. You do not see the same in New York as Meeteetse, Wyoming.

Mr. SERGEL. It could be, depending on exactly what they are doing.

[Laughter.]

Senator THOMAS. How do you see the ERO dealing with containing costs? Will you provide transparency to the stakeholders on expenditures?

Mr. SERGEL. The process is a very transparent one. Our governance requires us to post our budgets in advance to all of our stakeholders so that they have an opportunity to see that many days ahead of it being considered for action by the board. The current budget to operate NERC, which is already collected from electric consumers in the United States and Canada, is roughly $17 million. We would expect to be able to do the additional work that is contemplated by this bill for about an additional $3 million. So our budget that we will be proposing will be about $20 million, with a possible increase in that depending on what we do on real-time information systems. But that is sort of what I would call almost a product that we may or may not pursue as opposed to the services. So on the service side, we expect a modest increase in the cost that we currently have, and that will be thoroughly reviewed by all of the stakeholders and then, post that, by the FERC here in the United States and in Canada as well.

Senator THOMAS. So these rules will be put out for public comment.

Mr. SERGEL. Yes, they will.

Senator THOMAS. In assessing NERC's proposed standards, FERC has identified the implementation of the blackout recommendations. Have you been able to move toward implementing the recommendations for the blackout report and what remains to be done? What type of standards? Would they affect the recent blackouts in Texas, for example? Could they have been prevented?

Mr. SERGEL. There has been significant progress as a result of the blackout report certainly with respect to the individual companies and facilities that were most involved in that. There have also been physical additions to the system, as well as standards such as our vegetation management standard and our cyber security standards, new standards that come directly from the lessons learned from that.

We have not done everything that we can do. There is more to do, particularly by way of real-time information systems, that is, the amount of information we have about the system, all of which has been enabled by our flat rule, that is, our ability to correct and transmit information so rapidly. So we have more to do in that area and we will continue to improve the standards, but I believe that we have done a yeoman's job of implementing the lessons learned from the blackout.

As to the events in Texas, the situation there sort of moves over into that other category here because we have the reliability side, and then we have the adequacy side, the adequacy side meaning do we have enough resources, do we have enough infrastructure. That is not within the four corners of precisely what it is we do with reliability. The Texas issue is vastly more one of adequacy and in this case adequacy being caused by just absolutely unexpected conditions that occurred in the springtime that they would not have expected to happen until the summer.

Having said all that, we have instituted what we call the NERC watch list and it is just an opportunity for us to take issues, ana-

lyze them, and see what there is to learn, and then communicate those lessons learned to the rest of the industry. We will be looking at those events, and in particular, we will be looking at short-term load forecasting. I know it is kind of going off into the reeds a bit here, but that was a particular interest there. That has happened three times in the last year in different places around the country where short-term forecasting has led to some difficulties on the grid.

Senator THOMAS. Well, it is a real challenge, gentlemen, and thank you very much for being here. We need to look at reliability. There is no question about that. We have to also look at capacity, as you suggest. We are going to have to look at the different alternatives that are available for producing electric energy as we move forward. We are going to look at conservation and efficiency as well. We have all become so accustomed to having electric available to us with no limits that it is going to make a little change for us to do some things there and reliability is the key to it.

So we want to continue to work with you and I certainly thank you for being here on the panel today. We will look forward to working with you as we implement this bill. Thank you.

I wonder if we can call up our other panel now please: David Owens, the Edison Electric Institute; Allen Mosher, American Public Power Association; Michael Easley, who is with the Wyoming Infrastructure Authority and the National Rural Electric Association; John Anderson in behalf of the Electricity Consumers Resource Council; and Trudy Harper, Electric Power Supply Association.

Well, thank you all for being here. We appreciate it. We will get a broad look at this from another viewpoint, which is very important. So we will just follow along the way you are listed there. Mr. Owens, if you would like to begin, sir.

STATEMENT OF DAVID K. OWENS, EXECUTIVE VICE PRESIDENT, BUSINESS OPERATIONS, EDISON ELECTRIC INSTITUTE

Mr. OWENS. Thank you, Mr. Chairman. I am David Owens. I am the executive vice president of business operations for the Edison Electric Institute. We certainly do appreciate the opportunity to testify on the implementation of the electric reliability provisions contained in EPAct 2005.

We commend FERC for its leadership in implementing the provisions of EPAct 2005 that authorize the creation of an electric reliability organization, or ERO, that can enforce mandatory reliability standards.

We also commend the efforts of the North American Electric Reliability Council, or NERC, to prepare its application to be certified as the ERO and to ready itself to assume the significant duties of the ERO. We strongly support the prompt certification of NERC as the ERO.

Now, a smooth and prompt transition involves many steps which must be completed in a relatively short period of time in order for the ERO to be operational by January 1, 2007. For example, following certification of the ERO, reliability standards must be approved. Regional delegation agreements must be executed and ap-

proved by FERC, and regional compliance programs must be revised, as necessary, to provide consistent enforcement and due process once reliability standards are approved and enforceable. Now, throughout the transition, mechanisms must be in place continuously to assure reliability during this transition period.

Another important aspect of the transition is outreach to the entities among the users, owners, and operators of the bulk power system who may be interacting with NERC for the very first time and who must comply with the reliability standards established by NERC and approved by the Federal Energy Regulatory Commission. As a first step, these entities must register with the regions in which they operate. I am aware that a number of parties commenting on NERC's application have suggested that they should not be subject to this registration. I think Mr. Sergel and others spoke to it in the prior panel.

But we at EEI feel very strongly that there can be no exceptions from the requirements to comply with the applicable reliability standards based on the size or the nature of any entity. The electric system is only as strong as its weakest link. All owners, users, and operators of the bulk power system must register and comply with the reliability standards.

NERC has filed 102 proposed reliability standards for approval by FERC. The Commission has opened a rulemaking docket to review these proposed standards. As you heard from the prior panel, the commission last week came out with a general assessment of those standards. The goal of this process should be to establish clear, measurable reliability standards that are the basis of the statutory scheme, and to get these standards in place at the earliest practicable time.

Significant reliability expertise and resources reside within the eight regional reliability councils. The reliability provisions of EPAct 2005 sensibly provide for the ERO to delegate certain compliance enforcement functions to the regions. However, it is crucial that the Commission and the ERO demand consistency and accountability from the regions, both in how they investigate problems and in how they apply any penalties. I think Mr. Sergel stressed that point as well. Uniformity and consistency is very important, and this is because the regions will be exercising delegated statutory authority to levy penalties that can reach as high as $1 million per day. Delegation of this authority requires that regional compliance enforcement procedures, and the enforcement decisions that are made around these programs are legally sustainable and meet rigorous Federal standards for due process.

We at EEI strongly believe that the reliability provisions were the most critical elements of EPAct 2005, and our members in EEI were strongly committed to achieving what Congress had in mind in the implementation of these provisions: a strong, mandatory electric reliability regime that applies to all users of the system with effective and fair enforcement mechanisms. We believe that through proper implementation of the reliability provisions of EPAct, American consumers will have increased confidence that every time they flip on the switch, the light will come on.

I appreciate this opportunity to be before you, Mr. Chairman, and look forward to your questions.

[The prepared statement of Mr. Owens follows:]

PREPARED STATEMENT OF DAVID K. OWENS, EXECUTIVE VICE PRESIDENT, BUSINESS OPERATIONS, EDISON ELECTRIC INSTITUTE

Mr. Chairman and members of the committee, I am David Owens, Executive Vice President of Business Operations for the Edison Electric Institute EEI EEI is the association of U.S. shareholder-owned electric utilities and industry affiliates and associates worldwide. We appreciate the opportunity to testify on the implementation of the electric reliability provisions contained in the Energy Policy Act of 2005 (EPAct 2005).

Today's electricity market requires a mandatory reliability system, with enforcement mechanisms that apply to all market participants. Beginning in 1999, a broad group of stakeholders, including EEI and its individual member companies, strongly supported federal legislation to achieve this goal. Reliability legislation was included in every significant energy bill considered by Congress this decade. The August 2003 blackout underscored the need for mandatory reliability standards, and we were very pleased that EPAct 2005 contained the reliability provisions.

EEI commends the Federal Energy Regulatory Commission (FERC or the Commission) for its leadership in implementing the provisions of the EPAct 2005 that authorized the creation of an electric reliability organization (ERO). FERC has met the aggressive timeline set by the Congress in EPAct for establishing the regulatory basis on which the ERO will be created.

EEI also commends the efforts of the North American Electric Reliability Council (NERC) to prepare its application to be certified as the ERO and to ready itself to assume the significant duties of the ERO. We strongly support the prompt certification of NERC as the ERO.

In the months ahead, FERC and NERC will continue their work together to implement the reliability provision of EPAct and establish the ERO. Important steps in the process include establishing mandatory reliability standards, delegating the enforcement authority to regional entities, and ensuring that the regional entities properly enforce those standards. To accomplish these goals and create the strong electric reliability system envisioned by Congress, EEI believes the Commission and NERC need to focus on many issues, several of which we will highlight in our testimony today: establishing clear and measurable reliability standards, developing an effective compliance and enforcement program that assures due process, and leading the transition—effectively and promptly—from today's world to the new era called for in EPAct 2005.

TRANSITION ISSUES

The ERO transition plan—how, and how fast, does NERC plan to move from today's reliability mechanisms to those called for by the Energy Policy Act—is one of the major challenges facing FERC and NERC. A smooth and prompt transition involves many steps, which must be completed in a relatively short amount of time in order for the ERO to be operational by January 1, 2007.

For example, following certification of the ERO, reliability standards must be approved. Regional delegation agreements must be executed and approved by the Commission. Regional compliance programs must be revised as necessary to provide consistent enforcement and due process to be ready when reliability standards are approved and enforceable. Throughout the transition, mechanisms must be in place continuously to assure reliability during this period.

Another aspect of the transition is outreach to the entities among the "users, owners and operators of the bulk-power system" who may be interacting with NERC for the first time and who must comply with the reliability standards established by NERC and approved by the Commission. As a first step, these entities must register with the region(s) in which they operate. A number of parties commenting on NERC's application to be the ERO have suggested that some entities may be too small or not covered by the statute and therefore should be exempt from the registration process.

We feel very strongly that there can be no exceptions from the requirement to comply with applicable reliability standards based on size or the nature of an entity. A small entity that violates a vegetation management standard by having a tree over-hanging a power line can have as serious an impact on the reliability of the electric grid as a large utility. The electricity system is only as strong as its weakest link. All owners, users and operators of the bulk power system must register and comply with reliability standards.

We believe it is imperative that the transition to the ERO be completed by January 1, 2007, so that we have in place the mandatory compliance enforcement system

set forth in EPAct. EEI and its members will continue to offer input and assistance to NERC as it works to implement the ERO provisions within this timeframe. We will also continue to support the efforts of the regional reliability councils to fulfill their roles as Regional Entities under the statute.

RELIABILITY STANDARDS

NERC has filed 102 proposed reliability standards for approval by FERC. The Commission has opened a rulemaking docket to review these proposed standards. As the first step in the process, Commission staff soon will release its proposed assessment of the proposed standards, followed by a technical conference at which stakeholders can comment on the proposed standards and preliminary assessment. The goals of this process should be to establish clear, measurable reliability standards that are the basis of the statutory scheme and to get these standards in place at the earliest practicable time.

Maintaining a reliable electricity system in the U.S. is both a national and a regional matter because significant expertise and experience reside with the regional reliability entities. In addition, some of the reliability standards that will be developed will be regional in nature to reflect the differences in regional operations, systems, resources, and other important factors.

COMPLIANCE AND ENFORCEMENT

Significant reliability expertise and resources reside within the eight regional reliability councils. The reliability provisions of EPAct 2005 sensibly provide for the ERO to delegate certain compliance enforcement functions to the regions. At the same time, however, the ERO, with the Commission, will need to exercise close oversight over these delegated functions.

It is crucial that the Commission and the ERO demand consistency and accountability from the regions, both in how they investigate problems and in how they apply any penalties. The regions will be exercising delegated statutory authority to levy penalties that can reach $1 million per day. Delegation of this authority requires that the regional compliance enforcement procedures and the enforcement decisions that are made under these programs are legally sustainable and meet rigorous federal standards for due process. Regional compliance enforcement programs can best ensure this if they follow a consistent model that affords necessary due process protections to entities subject to the statute's requirements.

Consistency in standards and compliance enforcement processes is particularly important since many of the entities who must comply with mandatory reliability standards operate in more than one region. The regions must treat all parties fairly and even-handedly with respect to the conduct of investigations, confidentiality and other matters surrounding enforcement. And the regions must uniformly apply any enforcement penalties. Sanctions must consistently fit the severity of violations regardless of the region.

CONCLUSION

EEI and its member companies, along with the other stakeholders involved in this critical initiative, are committed to achieving what Congress intended in EPAct 2005: A strong, mandatory electric reliability regime that applies to all, users of the system, with effective and fair enforcement mechanisms. We believe that the reliability provisions were among the most critical and important in EPAct 2005. Through proper implementation of the reliability provisions of EPAct, American consumers will have increased confidence that every time they flip the switch, the lights will turn on.

Senator THOMAS. Thank you. Exactly on time. That is good work. Thank you.

Mr. Mosher.

STATEMENT OF ALLEN MOSHER, DIRECTOR OF POLICY ANALYSIS, AMERICAN PUBLIC POWER ASSOCIATION

Mr. MOSHER. Good afternoon. I am Allen Mosher, director of policy analysis for the American Public Power Association. APPA is the trade association of the Nation's State, municipal, and other locally owned electric utilities. We have about 2,000 members in 49 States in the United States. They range from quite large, vertically

integrated electric utilities to very small municipalities and villages. APPA serves about 43 million people, and that is about 15 percent of the Nation's electric consumers.

We have been actively involved in the development, application, and enforcement of voluntary industry reliability standards through NERC and its regional councils. APPA strongly supported passage of the reliability subtitle of EPAct. A mandatory reliability regime is, indeed, needed to assure reliable electric service to the Nation's electric consumers. I frankly doubt that you will hear any disagreement on that point today. We, in fact, all are in the room supporting the reliability subtitle.

We want to express a vote of confidence in NERC, FERC, and the industry. We believe we are on the right course to getting the reliability provisions converted from voluntary standards into mandatory, enforceable reliability standards that apply to all users, operators, and owners of the bulk power system in the United States.

FERC's regulations carry out Congress' intent. They, in fact, got these regulations issued on time, and the Commission should be commended for that.

APPA is supporting NERC's ERO filing with just modest adjustments. Again, as Rick Sergel said, we have a few minor details that we are concerned about, but in fact, we are in complete support with certification of NERC and moving forward on the reliability standards as quickly as we can to get them in place.

One thing I want to emphasize is that I view this process as one that should be industry driven. The gap that we had in the voluntary regime before was that we could not bring everybody up to the highest possible level of standards and consistently enforce these standards because, again, it was a voluntary regime. That is why we needed FERC to have the regulatory backstop to our activities. But the standards themselves need to be driven by the industry, with a corporate prodding by FERC to get our standards up to the highest level to ensure the reliability that customers need.

APPA is working with its members to develop a compliance culture to fully embrace their compliance obligations and to understand what those obligations will be in the future and to embrace best practices that are voluntarily developed within the industry.

Now, we do have a very reliable electric power industry in the United States, but it is not as good as it should be, as witnessed by the August 14, 2003 outages and other outages that have happened. Part of the problem is that we do not have quite an adequate infrastructure, particularly on the transmission side, and that is why I am quite pleased that you have put the Wyoming infrastructure authority that Mr. Easley is going to talk about next on the agenda to talk about. APPA members would very much like to invest in new transmission infrastructure. We are investing billions of dollars in new coal and renewable energy resources, and we need a way to get it to our load centers. Frankly, the infrastructure is overstressed today.

In terms of the issues that are most important to APPA, I will just list four that we are tracking.

The first is the cost of reliability regulation. This is a new regime and we do need to manage the costs carefully, both the costs that are directly incurred, that is, the cost of regulation and the cost of

the ERO, but also the indirect costs that are incurred by customers in managing their compliance costs.

Second is the application of reliability standards to small public power utilities. We have no dispute about the regulation of public power entities that have a material impact on the bulk power system, but if an entity does not have a material impact, it should not be within the compliance regimen.

A third point is the relationship between NERC and the regional councils. We do support some flexibility for regions. WEC in particular, the reliability council in the West, has done some very interesting things and they ought to have the flexibility to do it. But compliance enforcement needs to be uniform across regions so that if you violate a standard in the East or in the West or in Texas, it does not matter. The enforcement will be uniform.

Finally, there is the issue of the effect of reliability standards and enforcement on competition. FERC should not give deference to NERC or the industry on those areas.

Thank you very much.

[The prepared statement of Mr. Mosher follows:]

PREPARED STATEMENT OF ALLEN MOSHER, DIRECTOR OF POLICY ANALYSIS, AMERICAN PUBLIC POWER ASSOCIATION

The Committee has asked representatives of the Federal Energy Regulatory Commission ("FERC" or "the Commission"), the North American Electric Reliability Council ("NERC") and various electric industry stakeholders to provide a progress report on implementation of the Energy Policy Act of 2005 (EPAct05) Section 1211, Electric Reliability Standards, which added a new Section 215 to the Federal Power Act. To go directly to the bottom line, the American Public Power Association ("APPA") believes Congress drafted the Reliability Subtitle just right. Further, NERC, FERC and the industry are well on their way to making what we all hope will be a relatively smooth transition from the voluntary electric reliability standards regime of the past to a new system of clear, comprehensive and enforceable mandatory electric reliability standards. This transition will take some time and Congress should not be surprised to hear at some point that we've hit some bumps in the road. However, APPA and its members fully expect the end result of the Reliability Subtitle will be a bulk electric power system that meets the needs of the nation's electric consumers in reliable and affordable electricity.

APPA is the trade association representing the interests of the nation's state, municipal and other locally owned electric utilities. The United States has more than 2,000 public power communities, ranging from large cities to small towns. Collectively, we serve 43 million people—15% of the nation's electric customers. While a number of public power systems are large vertically integrated utilities, most public power systems are small distribution systems that interact with the bulk power system only indirectly, through the scheduling of energy to serve our load centers, many of which are embedded within and dependent on the electric transmission systems of other larger electric utilities. Many of these APPA member distribution utilities are served at wholesale by municipal joint action agencies, which own, operate or purchase the generation and transmission needed to serve their member cities.

APPA and its members have been active participants in the development, application and enforcement of voluntary industry reliability standards through the NERC and its constituent regional reliability councils ("RRCs")[1] APPA strongly supported the passage of the Reliability Subtitle in its various iterations in the years leading up to the passage of EPAct05. APPA believes that a mandatory reliability regime is indeed needed to maintain reliable electric service to the nation's electric consumers. APPA is working with other industry participants, NERC, and FERC to help implement that regime now that the Reliability Subtitle is finally enshrined in law.

[1] APPA and its members also participate in the development of voluntary electric industry business standards through the North American Energy Standards Board's ("NAESB") Wholesale Electric Quadrant ("WEQ").

The Commission's reliability regulations, which were issued as Order No. 672 on February 3, 2006, carry out Congress' intent to allow the industry to create and the Commission to certify a self regulatory reliability organization in North America, with authority to enforce reliability standards applicable to all direct users, owners and operators of the bulk-power system, subject to Commission oversight and review. The Commission's Reliability Rule, which adheres closely to the statute, provides a sound basis for NERC, its regional reliability councils, and industry stakeholders to move forward although there are numerous issues that we will have to work through over the next few months if NERC is to meet its transition plan timelines.[2]

NERC's April 4, 2006, application to FERC for certification as the Electric Reliability Organization for North America carries out Congress' intent to create and put in place an industry self-regulatory reliability organization in North America, with clear, enforceable reliability standards applicable to all users, owners and operators of the bulk power system, subject to Commission oversight and review. APPA believes the proposal NERC has laid out in its application, with certain limited refinements and clarifications, establishes a corporate governance structure and Rules of Procedure that properly build upon and apply the lessons NERC has learned from the voluntary membership regime it administers today. APPA supports Commission approval of NERC's request for certification in an order to be issued this summer, with a workable compliance filing schedule that will allow the industry to make a smooth and rapid transition to NERC and Regional Entity ("RE") enforcement of compliance with mandatory reliability standards by all direct users, owners and operators of the bulk power system, beginning in 2007. In a word, this is a remarkable and successful exercise of industry-driven institution-building.

On April 4, 2006, NERC also filed with FERC an initial set of some 102 proposed Reliability Standards. The Commission decided to hold off on posting these standards for industry comment until the Commission's reliability staff had completed an initial review of these proposed standards. Just last Thursday, May 11, the Commission released publicly its preliminary staff technical assessment for industry comment.[3] The Commission plans to hold one or more technical conferences in the coming days and weeks to assess these standards for completeness, clarity, adequacy and applicability to the industry. Again, APPA agrees with this approach, which is new territory for the Commission, NERC and stakeholders.

Over the last several years, NERC and the industry worked diligently to convert NERC's pre-existing operating policies and planning standards to its so-called Version 0 Reliability Standards, while analyzing and responding to events such as the August 14, 2003, outage in the Midwest and Northeast. However, it is essential that we collectively make sure that all stakeholders and industry segments, as well as NERC, the regional councils, plus FERC and its counterparty Canadian authorities, are all on the same page as to the exact meaning of these standards and the compliance obligations of each entity.

If we are successful, the Commission will be able to provide effective oversight and policy direction to the industry without conducting an interventionist, intrusive regulatory regime. To paraphrase President Teddy Roosevelt, the Commission need only "speak softly but clearly," because it wields an enormous regulatory stick. Merely by having the authority to impose financial penalties on users, owners and operators of the bulk power system and to publicly disclose that such violations have taken place will provide an effective deterrent against violations. The Commission is also taking the appropriate managerial steps to build the staff technical expertise to wield this stick wisely. Thus, we believe that Congress should not judge either FERC's performance or that of NERC and the industry by the number of standards issued, the training hours undertaken or the standards violations tallied in each reporting period. Rather, our collective task is to show policymakers and the public that we have learned from our past mistakes and will make fewer and fewer mistakes over time.

APPA is working with its members so that they understand and prepare for the compliance obligations they face—but again this transition from voluntary and often ambiguous standards to clear enforceable standards has taken some time. APPA

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[2] Section 215(b)(2) of EPAct required the Commission to issue a final rule to implement the requirements of Section 215 not later than 180 days from enactment (February 4, 2006). EPAct did not establish a deadline for certification of the ERO or for the ERO to begin operation and enforcement of reliability standards. Subject to regulatory approvals, NERC intend to make the transition beginning January 1, 2007.

[3] See: *Federal Energy Regulatory Commission Staff Preliminary Assessment of the North American Electric Reliability Council's Proposed Mandatory Reliability Standards*, May 11, 2006, Docket No. RM06-16-000, posted at http://www.ferc.gov/industries/electric/indusact/reliability/standards.asp

will also work with NERC and its members to develop a compliance culture within our utilities, to measure and assess our compliance, and to look for voluntary industry best practices to improve the reliability of service we provide.

APPA also supports NERC's efforts to improve industry-wide assessment of reliability and real-time awareness of conditions on the bulk power system, particularly as it concerns reducing the risk of cascading outages such as August 14, 2003. A perfectly reliable bulk power system is never going to be possible—but we can reduce the risk of such cascading outages as well as controlled events such as load shedding that become necessary on rare occasions due to events such as load forecast errors, generation and transmission outages, and anomalies in bulk power system performance that result when the system is operated in an unstudied state. It is important to underscore to the Committee that we have an incredibly reliable bulk power system in the United States. Most Americans never recognize this fact because they know no other system. Further, since almost all outages take place on distribution lines and feeders, generally during severe weather conditions such as hurricanes and ice storms, if uninterrupted retail service and high power quality are our ultimate goals, we must expend resources on bulk power system improvements wisely.

This last point leads me a broader point of clarification that we hope the Committee will deem useful—there are two different dimensions to reliability: first, there is reliable operation of the electric grid, which means keeping the lights on with the electric generation and transmission resources and the electronic communication and control systems that are available. Equipment must be maintained and operated to stay within its design limits. System operators must communicate with neighboring systems. And when things go wrong, operators must make quick decisions to reconfigure equipment to isolate failures and if necessary, shed load in a planned manner, to ensure that one set of outages doesn't cascade into surrounding regions. The second dimension to reliability is system adequacy: the planning and installation of adequate facilities to ensure that consistently reliable and economic operation of the grid is achieved. System adequacy is only partly within the scope of authorities and responsibilities granted by Congress to NERC and the Commission in EPAct05 Section 1211, but it is just as important to ensure reliable service to end use customers.

While the primary focus of this hearing is on the reliability subtitle, APPA is pleased that the Committee expanded its scope to include consideration of questions regarding transmission infrastructure, particularly the Wyoming Infrastructure Authority to be discussed by Mr. Easley. The WIA is the kind of innovative public-private partnership involving state and local governments and the private sector that is needed to ensure we have an adequate interstate transmission network. A robust bulk transmission network is essential to support the new coal and renewable generation resource plans of public power systems, and those of our investor-owned and cooperatively-owned counterparts as well, to meet our respective retail load obligations. Many APPA members would be very interested in participating as equity or long term contract rights holders in projects in their own regions or states that are similar to the projects being proposed by the WIA. Infrastructure upgrades such as these will have the added benefits of increasing the real-time operational flexibility of the, bulk power system. Too much of the time, the bulk power transmission system is operated at close to its limits. It makes sense to have a more robust grid so that our investments in generation to serve customer loads can be used more efficiently and economically.

Having lavished well-deserved praise on Congress, the Commission, NERC and the industry, let me now cite some of the issues we're following now and the ways that FERC, NERC and NERC's regional councils may get off track in the coming months.

Jurisdiction, Applicability and Costs—Section 215 greatly expands the Commission's jurisdiction over users, owners and operators of bulk power system facilities. Many of APPA's members are very concerned about the potentially high costs of the new ERO and Regional Entities. They fear the creation of large and unresponsive new bureaucracies for which they will have to pay. APPA has urged the Commission to take all action necessary to ensure that the costs of this new regulatory regime—which APPA supports—are exceeded by reliability benefits, so that these concerns will be proved unfounded.

Application of Reliability Standards to Small Entities—The Reliability Subtitle did not adopt a "bright line" test as to which entities and facilities are subject to the mandatory reliability standards regime. Rather, Congress adopted the industry's function-based approach to compliance, under which all direct users, owners and operators of the Bulk Power System must comply with reliability standards, while facilities used in local distribution are explicitly beyond the Commission's jurisdiction

under Section 215 of the Federal Power Act. Between the two extremes, there are hundreds of small entities, many of whom are small municipal distribution systems, that make only indirect use of the bulk power system and generally do not own or operate facilities that are part of or are directly interconnected to the bulk power system. Subject to statutory limitations, entities large and small that have a material impact on the reliable planning and operation of the Bulk Power System must be subject to NERC's standards. In contrast, small entities that do not have a material impact on the bulk power system should not be subject to mandatory standards and should not be subject to NERC and regional enforcement programs. To do otherwise will substantially increase the regulatory burden on small entities without corresponding benefits to the nation and may result in a loss of focus within the NERC compliance program. Accomplishing these goals requires attention to detail, in both the drafting of NERC standards and their application to specific entities.

Inclusion of an entity on NERC's proposed compliance registry in and of itself imposes significant costs, because it places the entity on notice that the industry may propose and NERC may adopt reliability standards applicable to the entity. Thus, each entity that is included on the compliance registry will have to incur ongoing costs to monitor the development and understand the content of standards that may apply to it in the future. Section 501 of NERC's proposed Rules of Procedure states:

> The purpose of the compliance registry will be to clearly identify those entities that are responsible for compliance with reliability standards. Organizations listed on the registry will be responsible for knowing the content of and for complying with the NERC reliability standards.

Inclusion of an entity on the compliance registry will also impose significant costs on NERC and the regions, to develop a compliance program that tracks and ensures compliance by each such entity on an ongoing basis. Again, if an entity has a material impact on the reliable operation of the bulk power system, it should be subject to and must comply with NERC standards.

Relationships between NERC and its Regional Councils—Passage of the Reliability Subtitle and the pending certification of NERC as the Electric Reliability Organization ("ERO") will fundamentally change the relationships between NERC and the regional reliability councils. APPA supports some flexibility in how each region organizes its internal operations and governance—and indeed, EPAct05 provides such flexibility. APPA also supports regional initiatives to undertake functions that do not fall squarely within the four corners of Section 215, provided that these activities receive the full support of regional stakeholders and do not present a conflict of interest with delegated statutory duties. However, the regions must have substantial uniformity in the design and operation of their respective reliability standards enforcement programs, so that the industry is confident that standards enforcement is consistent across regions, taking into account real differences between regions in system design and operations. There are a host of significant regional differences extant today that need to be either winnowed down or justified for operational reasons. The regions are also in quite different conditions in their preparedness to begin enforcing standards under authority delegated from NERC. We expect that NERC will be able to negotiate final Regional Delegation Agreements with each region in the coming months and will be able to complete review and approval of regional reliability standards and regional variations from NERC standards, but it is going to be tight to get each of these tasks completed by January 2007, particularly once Commission approval is factored in to the timeline.

The Effects of Reliability Standards and Enforcement on Competition—In instances where the issues of reliability, commerce and economic regulation intersect, the Commission should take an expansive view of its responsibility to examine proposed reliability standards. While APPA believes that the Commission will in fact be able to rely on industry self regulation in the first instance to produce clear, enforceable reliability standards and to vigorously enforce such standards on all users of the bulk power system, there may be more difficulty in addressing issues where there is a substantial conflict between reliability and commercial interests. Thus, the Commission, in reviewing proposed reliability standards, should be alert for whether a standard might give any market participant an unfair competitive advantage. In reviewing penalties and sanctions, the Commission should examine whether there is evidence that corners have been cut to save money (particularly by entities that are already under financial pressure) or a standard has been manipulated to extend or sustain a preference for one industry segment or class over another.

In conclusion, we appreciate the passage of the Reliability Subtitle in EPAct05 and are encouraged by the actions taken to date to implement the Subtitle. At the same time, there are important issues yet to be addressed, and APPA will continue to provide input to NERC and FERC in order to ensure that the final implementa-

tion of the Subtitle will result in a bulk electric power system that meets the needs of the nation's electric consumers in reliable and affordable electricity.

Thank you again for the opportunity to testify before the Committee on this important issue.

Senator THOMAS. Thank you.

Mr. Easley, welcome. Nice to have you here. I was in Sundance, I think, on May 1 and I believe you had 30 inches of snow and they closed the road there.

Mr. EASLEY. Well, that is one of those charming differences about the West.

Senator THOMAS. Welcome, glad to have you here.

STATEMENT OF MICHAEL E. EASLEY, CEO, POWDER RIVER ENERGY CORPORATION, AND CHAIRMAN OF THE BOARD, WYOMING INFRASTRUCTURE AUTHORITY, SUNDANCE, WY

Mr. EASLEY. Thank you, Mr. Chairman and members of the committee. My name is Mike Easley. I am the CEO of Powder River Energy Corporation. I am also chairman of the board of the Wyoming Infrastructure Authority, and I am a member representing the National Rural Electric Cooperative Association today.

My purpose today is to connect the dots regarding energy reliability from the customer at the end of the line through the regional level and to items of national interest. I believe my testimony will elaborate on that.

Powder River Energy has 9,000 miles of power line over 17,100 square miles in northeast Wyoming and southeast Montana. We serve 15,000 residential customers and rural agricultural customers, many oil production facilities, and additionally, we provide power to 13 coal mines which produce nearly 400 million tons of coal. That is 100 million tons a day. Black Thunder Mine, our largest single meter, produces nearly 90 million tons of coal per year. When you add this up, it is 36 percent of the Nation's coal delivered to 35 States.

Powder River Energy's load is primarily two-thirds load to these large industrial consumers that are needed to produce the natural resources that others use to produce a good portion of our Nation's electrical needs. Reliability is paramount to PRECorp and its customers, especially as our load is expected to double within the next 5 years due to the coal bed methane growth in the Powder River Basin.

There is a correction to my written testimony regarding coal bed methane growth. Coal bed methane is produced from over 12,000 wells in the Powder River Basin, producing over 300 million mcf of gas annually, with almost 2 trillion mcf produced since 1994. Wyoming's role in supporting the energy needs of our Nation and the West continues to increase.

I would like to thank Governor Freudenthal and the Wyoming legislature for their leadership roles in helping develop energy resources in the West. This includes the involvement of Governor Freudenthal with his colleagues, as well as a lot hard work by the Wyoming legislature, to make this happen.

The Wyoming Infrastructure Authority was created in 2004 as the State instrumentality whose purpose it is to see that transmission infrastructure is built in Wyoming and beyond. We have

been very busy over the past 2 years. We have public/private partnerships in order to build several transmission projects out of Wyoming. One of those is the TOT3 project which is a Wyoming to Colorado project. One is the TransWest Express, which is Wyoming to Arizona; also, the Wyoming West project, which is Wyoming to Salt Lake and other points west; and finally, the Frontier Line, which is a vision for a robust transmission network from Wyoming to California, bringing the benefits of regional diversities throughout the West.

Also, Mr. Thomas, I would like to thank you for your leadership in recognizing the importance of what States are doing to stimulate investment in electric transmission. Last week's legislation you introduced to relax the private use restrictions and to allow State instrumentalities, like the WIA, to issue tax-exempt bonds to finance multi-State transmission. We urge the continued support of your proposal and inclusion of that in the upcoming energy legislation.

But reliability is not just about transmission. There is an underlying infrastructure which supports the production of our domestic energy resources in order to have the coal and natural gas needed to fuel our Nation's fleet of generators. Reliability depends on stable infrastructure, including timely rail shipments.

In my written testimony, I provided a real-life example of what can happen if coal deliveries by rail fail. These real issues are critical issues that must be addressed and not taken as business as usual.

I understand the committee will soon be holding a hearing regarding the reliability of coal-based generation. I appreciate the committee's interest in this important issue and interest from the Senators across the country whose constituents are experiencing similar problems.

Finally, I would like to comment on NRECA and its membership's strong support of the reliability title of the Energy Modernization Act of 2005. Cooperatives, some 930 of them, 75 percent of the Nation's land mass, who serve 39 million people believe in the focus, the direction, and progress of both NERC and FERC as they move toward final implementation. My written testimony provides additional details on this topic.

The bottom line for cooperatives is we believe this is moving in the right direction and we need to continue to move ahead.

On behalf of 15,000 members of Powder River Energy Corporation, the citizens of Wyoming, and the NRECA leadership, I thank you, Mr. Chairman, and the committee for your efforts not only in passing the Energy Policy Act, but your active oversight of the implementation process. Thank you, and I look forward to your questions, sir.

[The prepared statement of Mr. Easley follows:]

PREPARED STATEMENT OF MICHAEL E. EASLEY, CHIEF EXECUTIVE OFFICER, POWDER RIVER ENERGY CORPORATION, SUNDANCE, WY, AND CHAIRMAN OF THE BOARD, WYOMING INFRASTRUCTURE AUTHORITY

Mr. Chairman and members of the committee, thank you for inviting me to appear before you today. My name is Mike Easley. I am the Chief Executive Officer of Powder River Energy Corporation (PRECorp), the largest electric cooperative in Wyoming. I am also Chairman of the Board of the Wyoming Infrastructure Authority (WIA).

Electricity reliability is an increasingly important issue to the State of Wyoming, the Western Interconnection, the electric utilities that comprise the nation's electric grid and the customers we are all privileged to serve. My perspective begins with that of the individual customer at the end of line and expands to a broader regional perspective through my work with the Wyoming Infrastructure Authority. In addition, I am bringing the on the ground view as a member of the National Rural Electric Cooperative Association (NRECA), an organization representing approximately 930 cooperatives serving 39 million people across 75% of the nation's land mass.

PRECorp is a customer-owned electric utility and the largest electric cooperative in Wyoming serving 350 Mw of industrial, commercial, and rural residential load. Our service area covers 17,100 square miles in northeast Wyoming and southern Montana. Our service territory is larger than the States of Massachusetts and New Hampshire combined. Powder River Energy is unique among rural electric cooperatives due to our high percentage of industrial and commercial load, a good portion of which is providing electric service to coal, natural gas and oil companies in the Powder River Basin.

PRECorp's single largest load is the Arch Coal Company's Black Thunder Mine Complex. The largest coal mine operation in the country, it produces 90 million tons of coal per year. Growing energy needs continue to stimulate Wyoming coal production. In 2005, Wyoming coal mines led the nation for the 19th consecutive year in coal production with over 400 million tons produced. Approximately 36% of the nation's coal comes from Wyoming with most of the coal used to produce electricity. Wyoming coal is used in 35 states across the country.

This is just one piece of the energy and electric reliability puzzle. While coal is big in Wyoming, today it has competition in the Powder River Basin and the competition is Coal Bed Methane or CBM. CBM is another industry served by PRECorp.

Since the first CBM wells were drilled in Campbell County in the early 1990's, production in Wyoming has jumped to more than 12,000 wells. Over 326 million cubic feet of coal bed methane have been produced in the Powder River Basin over the last decade. With reserves in the Powder River Basin estimated at as much as 43 trillion cubic feet, northeast Wyoming and southeast Montana are the sites of a major source of America's fastest growing natural resource—coal bed methane natural gas.

PRECorp also provides electricity to over 60 oil production facilities and various oil pipeline loads. The majority of an oil facility's on-going costs come from electricity. It is safe to say those facilities rely on us to provide reliable electricity.

In the short time taken to read this testimony, if PRECorp were to have lost its ability to provide electricity to northeast Wyoming, 8,000 homes would have been without electricity, 600 tons of coal, the equivalent of six rail cars, would have failed to be produced, and 3,100 cubic feet of natural gas and 2.91 barrels of oil would have had no way of getting out of the ground.

What would happen if the mines in the Powder River Basin, the very mines that supply the coal used to generate electricity in 35 states, were themselves without electricity? What would happen if the coal bed methane and oil production in the Powder River Basis were to come to a halt because electric power was unavailable? It would take the term "rolling blackout" to a whole new level.

PRECorp is a customer owned electric utility and in spite of our tremendous responsibility to provide reliable power for use in this great country, we keep the lights on in Northeast Wyoming. Our cooperative was formed in 1945 by a group of concerned citizens who decided not to wait for electricity to be brought to them, and instead brought the electricity to themselves. Today it is our job to continue this legacy.

PRECorp has long recognized its role in the bigger picture and for the past two years has been supporting the Wyoming Infrastructure Authority in hopes of creating a more reliable and robust transmission system in the Wyoming and the West.

The Authority is an instrumentality of the state of Wyoming. Its mission is to diversify and expand the state's economy through improvements in the electric transmission system to facilitate increased utilization of Wyoming's renewable and traditional energy resources and to support the development of advanced coal technologies as it relates to electricity production. It is very important to understand that the electric grid in the West differs from that of much of the rest of the country. From its early inception, the electric transmission grid in the United States evolved from small individual utilities building a "hub and spoke" transmission grid to serve their customers from specific generation resources. The electric utilities also interconnected with one another to provide for emergency backup from a neighboring utility and to a lesser extent, to sell or exchange electrical power. This is very apparent in the West as the electric transmission grid was not designed for, nor is it capable of, transporting electric energy over long distances in amounts significant

enough to enable the development of a robust power system capable of capturing regional diversities.

The Western Governors Association recognized the need to strengthen the electric grid in the West for both reliability and economic development purposes. Wyoming has been a leader in this area through the efforts of Governor Dave Freudenthal. The Governor has encouraged the WIA to stimulate private and public partnerships to strengthen the transmission grid to improve reliability and reduce bottlenecks. Currently, the WIA is focusing on paths from Wyoming to the Colorado Front Range via the TOT3 project, the Phoenix area via the TransWest Express project, and expansion of capacity towards Salt Lake City via the Wyoming West project. In addition, the WIA is participating in the Frontier Project which will provide a reliable transmission grid capable of moving significant amounts of bulk power to growing markets in California and Nevada.

Mr. Chairman, I would like to commend Senator Thomas for his leadership efforts in recognizing the importance of what states are doing to stimulate investments in electric transmission. Last week, he introduced legislation, which if enacted, would go a long way toward providing a valuable stimulus to regional transmission expansion. Senator Thomas' proposal would relax private use restrictions and allow State instrumentalities like the WIA to issue tax exempt bonds to finance needed multi-state transmission projects, thereby significantly lowering the project cost of these facilities to consumers, while improving reliability and reducing bottlenecks. This is a particularly powerful economic tool and I hope you and others will join Senator Thomas in making this provision a part of any energy legislation that Congress enacts.

With expanded capacity, the Western states transmission grid will deliver low-cost electricity to the wholesale marketplace and enable development of alternative and renewable electric energy supply. Our partnerships involve independent transmission companies, investor owned utilities, cooperatives, municipalities, independent power producers, and the Western Area Power Administration. Sister organizations have also been formed in other states, including North Dakota, South Dakota, Idaho, and Kansas.

All of these efforts should be viewed as reducing constraints and bottlenecks and thus increasing the overall reliability of the Western Interconnection. We have and will continue to work closely with the FERC and the Department of Energy as partners in this process.

Providing adequate and reliable transmission infrastructure is not only important to support the economic growth of the West, it is essential that alternatives exist for the delivery of energy. As new advanced coal technologies emerge there will be an effort to locate generation facilities closer to coal mines to capture favorable economics and to reduce coal shipping risks. As we have seen in the case of the Laramie River Station in Wheatland, Wyoming, these risks are very real. This is an unfortunate example of how generation supply can be impacted by rail transportation issues and how reliability could be impacted if this occurred on wide-scale basis.

Electric generation at Laramie River Station (LRS) consumes 24,000 tons of coal per day at full load and requires roughly one and a half unit trains of coal each day for operation. The Missouri Basin Power Project is a consortium of six public power entities in the region, which own the Laramie River Station. Basin Electric Power Cooperative is the majority owner and operator of the plant. The project partners normally keep 700,000 tons of coal in its stockpile for emergencies.

In May of 2005, there were two derailments on the Joint Line out of the Powder River Basin (PRB), causing a major disruption in the delivery of PRB coal. According to the railroads, increased demand for PRB coal and problems with their software tracking system exacerbated rail delivery problems. Sporadic and reduced coal deliveries throughout 2005 forced the plant to dip into its stockpile for normal day-to-day operation of the plant. At one time the plant had roughly three days of coal in stockpile, around 125,000 tons. When the stockpile dropped below 50% of normal levels, Basin Electric notified DOE and the North American Electric Reliability Council of the stockpile situation, since there was not enough coal remaining in the stockpile to operate the plant during a major emergency. Project partners also prepared a plan to curtail generation if the stockpile dropped to critical levels, in order to conserve coal.

Fortunately, curtailment plans were never implemented, and coal deliveries have improved somewhat since the first part of the year. In great part, the improvement in supply has been the result of an LRS Unit being in the middle of a seven-week maintenance outage. However, if it was not for the Unit 1 outage, the plant would have just 268,000 tons of coal on hand (11 days). The stockpile will likely increase throughout the remainder of the outage, but the levels are still far too low to accom-

modate the plant at full load if there is a repeat of last years rail derailments, a major late spring snowstorm or other unexpected event.

Situations like the LRS need careful attention and should not be dismissed as a normal course of business. The reliability of the grid depends on many factors, not simply technical coordination between system operators. Reliability also depends on a stable infrastructure, including timely rail shipments, fair costs and enough competition among shippers to ensure that consumers are realizing benefits of the system they have paid for over the years.

I understand that this Committee will soon be holding a hearing regarding coal delivery problems and potential problems for electricity reliability. This is a critical issue that must be addressed and I appreciate the interest from Senators across the country that are experiencing similar delivery issues with the railroads.

Finally, I would like to comment on the status of implementation of Section 215 of the Federal Power Act, as amended by the Electricity Modernization Act of 2005. NRECA and its member cooperatives were part of a large industry coalition encompassing investor-owned utilities, municipals, independent power generators, transmission owners and operators, customers and industry trade associations that strongly supported the reliability title of the Energy Modernization Act of 2005. As did all members of the coalition, cooperatives recognized that the enforcement of mandatory reliability standards would be necessary in the evolving competitive wholesale power industry in order to ensure the continued reliable operation of the bulk transmission system.

More than that, however, cooperatives believed that mandatory reliability standards should be drafted and enforced by a self-regulating industry organization (SRO) with access to the engineering and operating expertise of all stakeholders. Although a few stakeholders suggested that FERC should be given direct authority to draft the mandatory reliability standards, cooperatives, an overwhelming majority of the coalition and Congress itself concluded that an SRO, operating through an ANSI (American National Standards Institute) approved standards development process would best be able to establish technically rigorous reliability standards, and to judge whether those standards had been violated.

Such a process would insure that all proposed reliability standards passed the critical review of a broad spectrum of engineering experts, while also helping to appropriately separate the reliability standard development process from the commercial business practice activities at the North American Energy Standards Board (NAESB). Said differently, cooperatives wanted to be absolutely certain that at the critical moment when decisions had to be made to keep the lights on, that commercial interests did not attempt to trump physics. We also wanted, to the extent possible, to make certain that reliability standards were not used to promote commercial interests.

To demonstrate the importance of this concept to cooperatives, it is instructive to note that one of the longest running NRECA member resolutions deals with the establishment of mandatory reliability standards by a self-regulating industry organization.

Cooperatives were extremely pleased that the Energy Modernization Act gave the bulk of responsibility over reliability to an Electric Reliability Organization (ERO), with FERC having the appropriate role of approving reliability standards established by the ERO, enforcing the standards, and providing the ERO the oversight required to give the ERO legal "legitimacy." Cooperatives were also pleased that reliability standards were, as we believe Congress also intended, not confused with economic or other policy goals, and that the mandatory reliability standards for the bulk power system were generally not applicable to small distribution utilities that operate exclusively or primarily at the retail level.

For these reason we are pleased with the focus, direction and progress of both NERC and FERC as they move toward final implementation of the Electric Reliability Organization mandated by Congress. In short, we cooperatives believe Congress got this one right, and at this point it looks like both FERC and NERC are going to get it right too.

That is not to say there will not be several bumps along this evolutionary highway. Cooperatives continue to be concerned that to the extent the Commission believes changes should be made to existing reliability standards, the process should be evolutionary, with those standards remanded to the ERO and to the industry for reconsideration and revision as appropriate. We also are concerned that the eventual makeup of various working committees at the ERO continues to be representative of all segments of the industry, as they currently are at NERC. Cooperatives also strongly concur in NERC's proposed use of a "material impact on the bulk power system" test to determine whether entities should or should not be subject to reliability standards, and do not want it changed. At the same time we remain

concerned about the potential for inconsistency across regional entities in terms of delegated functions, especially with selection of entities for the compliance registry and compliance/enforcement activities.

But the bottom line for cooperatives is we believe we are moving in the right direction, and need to continue to move ahead toward timely implementation of the Electric Reliability Organization.

Mr. Chairman, on behalf of the 15,000 members of PRECorp, the citizens of Wyoming, and the NRECA membership I would like to thank you and this Committee for your efforts. Not only in passing the Energy Policy Act, but your active oversight of the implementation process.

Thank you for the opportunity to testify. I would be pleased to answer any questions the Committee may have.

Senator THOMAS. Thank you very much. Your being here reminds me of my time as manager of the Rural Electric Association in Wyoming.

Certainly one of the points you make is an excellent one, and that is the largest coal supplies in the West, in Wyoming, in Montana, and to the extent that we are going to use that for electric generation or, indeed, conversion to other sources, the transmission system is important certainly to be able to do that. So thank you.

Mr. Anderson.

STATEMENT OF JOHN A. ANDERSON, PRESIDENT AND CEO, THE ELECTRICITY CONSUMERS RESOURCE COUNCIL

Mr. ANDERSON. Thank you, Mr. Chairman. First of all, I thank you for the opportunity to be before you today. I am John Anderson, president and CEO of the Electricity Consumers Resource Council, or ELCON.

ELCON is the national association representing large industrial consumers of electricity. All of our members are multi-State, mostly multi-national corporations from all segments of the manufacturing community. We have facilities in every region of the country. The common denominator is that each company uses a lot of electricity in its industrial operations.

At the outset, I observe that the participants at today's hearing clearly illustrate a problem that today's large and small consumers face when dealing with the reliability issue. Too many policymakers view reliability as either a regulatory or a utility issue. They overlook the fact that it is consumers who are most affected by reliability, or the lack thereof, of the interstate transmission grid.

Consumers are the ones who suffer the most when power is lost. By way of illustration, the 2003 blackout caused billions of dollars in total damages. Residential customers certainly lost a lot, but industrial customers lost even more, business opportunities. They suffered from substantial financial lost from damaged equipment and lost production. Now, to emphasize, we have documented that the 2003 blackout shut down at least 70 auto and auto parts plants, over 30 chemical and petrochemical facilities, at least 8 oil refineries, and roughly a dozen steel mills, including one where the inability to cool the furnace produced irreparable damage, driving the company into Chapter 11.

Make no mistake about it. Reliability is a consumer issue, though it is not often presented that way. That is why when the opportunity became available, ELCON staff and member compa-

nies' representatives were among the first non-utility representatives to volunteer to serve on NERC committees.

ELCON staff were also active in the stakeholder group that met for roughly 10 years to draft the framework language that eventually became the reliability section of last year's act.

Earlier this month, ELCON filed comments at FERC regarding the application of NERC for the certification as the ERO. In those comments, which were supported by several industrial organizations, we made the following seven points.

First, the ERO should be a strong, top-down organization that implements uniform standards throughout North America. The end result should be uniformity across North America to the maximum extent feasible. Too much deference to the regions undermines this principle.

Second, only those industrial users that truly can materially impact the bulk power system should be subject to registration and to the NERC reliability standards. Senator Thomas, you raised this issue just a few minutes ago, and it is very important to us. The proposed registration requirements for the compliance registry that Mr. Sergel talked about a little bit earlier would sweep in hundreds or even thousands of industrial facilities under the jurisdiction of the ERO and regional entities even though these facilities can have no material impact on bulk power reliability. Putting all or even most of such facilities on the registry would result in the loss of focus within NERC and would impose costly and unnecessary requirements on those facilities, as they would be required to comply with standard on such issues as training, site inspections, and even information system security.

Let me be clear. I am not suggesting that no industrial facilities should be required to register. There are facilities, in particular the ones with extensive on-site generation, that should be on the registry list. They should be subject to the standards, but that is only a small percentage of the total number of manufacturers.

We have several guidelines that we think should be followed. First, any entity demonstrating to be able to materially impact the reliability of the bulk power system, irrespective of other considerations, should register, but others should not have to register. Under NERC's proposal, the burden of proof is placed on the nominated facility to prove, via what could be a lengthy and costly procedure, that it should not be on the registry. This is sort of like being assumed guilty until you prove yourself innocent. We disagree. The burden of proof for the third party nomination should be on the nominator, not on the nominated facility.

Second, consistency between regions and across the Nation with respect to which entities are registered is absolutely essential. Industrial users are also concerned about a timing issue. NERC has not yet become the ERO and yet they are registering people right now. We think the actual registration should not start until NERC has been approved as the ERO.

The third point is NERC's committee membership, structure, and sector definitions should be rationalized and the end use customer should be given far greater voting weight. NERC proposed to establish different stakeholder processes for each of its two major committees, although NERC proposed only one process in its initial ap-

plication. The irony is that by going from draft 1 to draft 2, it cut the representation of consumers from 22 to 11 percent, and it gave the regions, which are really extensions of the ERO itself, the 22 percent that it took away from customers.

Fourth, the board of trustees should not be self-perpetuating and should be responsive. We believe strongly that the stakeholders should control the nomination process for new board members and oversee the board's compensation. NERC's proposal gives these functions to the board itself, and we do not think that is appropriate.

Fifth, the relationship between NERC and the regional entities should be clarified. Delegation of responsibilities to the various regions will undermine consistency and uniformity among the regions. Thus, delegation must be minimized.

Sixth, the assessment and use of fees deserve very careful consideration. We are concerned that there could be double-counting. Today many utilities have NERC fees already in their rates and if they just add an ERO fee on top of it, it results in double-counting.

Senator Thomas, you raised this issue a few minutes ago. It is of great concern to us. It is not enough just to say that the costs need to be transparent. Those that pay the bills must be able to veto expenditures of which they do not agree.

Our final point is compliance enforcement must be independent and uniform.

I appreciate the opportunity to be here today, Mr. Chairman, and I look forward to your questions.

[The prepared statement of Mr. Anderson follows:]

PREPARED STATEMENT OF JOHN A. ANDERSON, PRESIDENT AND CEO, THE ELECTRICITY CONSUMERS RESOURCE COUNCIL

Mr. Chairman, I am John Anderson, president and CEO of the Electricity Consumers Resource Council, or ELCON. ELCON is the national association representing large industrial consumers of electricity. Our members are all multi-state, mostly multi-national, corporations from all segments of the manufacturing community that have facilities in every region of the country. The common denominator of ELCON's members is that each company uses a lot of electricity in its industrial operations.

I begin by thanking you, Senator Thomas, as well as Chairman Domenici and Senator Bingaman for the opportunity to testify.

At the outset, I observe that the participants at today's hearing clearly illustrate the problem that today's large and small consumers face when dealing with the reliability issue. Too many policy makers view reliability as a regulatory or utility issue. They overlook the fact that it is consumers who are most affected by the reliability—or the lack of reliability—of the interstate electricity transmission grid.

Consumers are the ones who suffer most when power is lost. By way of illustration, the 2003 Midwest-Northeast Blackout caused billions of dollars in total damage. Residential consumers lost perishable food and experienced major disruptions to their daily lives. Some, with medical difficulties, were impacted far worse. Industrial consumers lost significant business opportunities and suffered substantial financial loss from damaged equipment and lost production. To emphasize, we have documented that the 2003 Blackout shut down at least 70 auto and auto parts plants, over 30 chemical and petrochemical facilities, at least eight oil refineries, and roughly a dozen steel mills, including one where the inability to cool the furnace produced irreparable damage, driving the company into Chapter 11.

And the power does not have to be completely shut off for industry to experience substantial negative financial impacts. There are manufacturing processes, such as Intel's chip-making operations—and I have visited their facility in Albuquerque—where even in the slightest blip in electric service, a blip that is not even noticeable to the naked eye, can cause millions of dollars in lost product.

The irony is that not only do consumers suffer most from power failures, they also have to pay for both the construction and expansion of the transmission grid as well as for the operation of the Electric Reliability Organization, or ERO. In fact, the EPAct specifically states that the ERO should be funded completely by electricity end users. To make matters even worse, consumers probably will have little say in the governance of the ERO.

Make no mistake about it, reliability is a consumer issue, though it is often not presented this way.

That is why we as consumers opposed for so long the fact that participation in the North American Electric Reliability Council was restricted, basically, to utility employees. And that is why, when the opportunity became available, ELCON staff and member company representatives were among the first non-utility representatives to volunteer to serve on NERC committees.

ELCON staff were also active in the stakeholder group that met for roughly ten years to draft the framework language that eventually became the reliability section of last year's Energy Policy Act. Throughout the drafting process, we as consumers pressed for a strong, top-down organization. We supported mandatory and uniform reliability standards throughout the nation with minimal, if any, regional variation. We opposed efforts calling for deference to regional groups, because we believe that such deference undercuts the concept of national standards and results in standards that can vary significantly across North America. We believed that too often reliability was addressed without considering the impact on commercial markets. And we advocated a governing system that would allow consumers and other non-utility stakeholders to be fairly represented and play more than a token role.

As consumers, we place a high value on a reliable electricity transmission grid, and we supported the final language, even though I still believe it could have been improved.

Having worked with NERC members and NERC staff for many years, I value their experience and their expertise. I have always believed that NERC would be named the statutorily sanctioned ERO and ELCON supports that designation.

As NERC prepares to assume its new role, we are facing a number of important decisions about how standards will be developed and who will be subject to those new standards. As these decisions are made, ELCON believes it is essential that NERC's rules fully implement the statutory requirements enacted last year calling for fair and equitable representation.

Earlier this month, ELCON filed comments at FERC regarding the application of NERC for certification as the ERO. In those comments, which were supported by several other industrial associations, we made the following points:

- The ERO should be a strong, top-down organization that implements uniform standards throughout North America
- Only industrial users that truly can materially impact the bulk power system should be subject to registration and to the NERC reliability standards
- NERC's committee membership, structure, and sector definitions should be rationalized and end use consumers should be given far greater voting weight
- The Board of Trustees should not be self-perpetuating and should be responsive to NERC membership
- The relationship between NERC and the Regional Entities should be clarified
- The assessment and use of fees deserve careful consideration
- Compliance enforcement must be independent and uniform

I address each of these points in more detail below.

The ERO Should be a Strong, Top-Down Organization that Implements Uniform Standards Throughout North America

ELCON agrees with FERC's directive in Order 672 that "a strong ERO with primary responsibility for performing all reliability functions is the preferred model for ensuring Bulk-Power System reliability." We also agree with the FERC Order which goes on to say that "the statute assumes a strong ERO."

The end result should be uniformity across North America to the maximum extent feasible. Industrial users believe that, starting with the threshold applicability determinations, NERC's rules and standards should establish clear, uniform and equitable criteria. Too much deference to the regions undermines this principle.

Only Industrial Users That Truly Can Materially Impact the Bulk Power System Should, be Subject to Registration and to the NERC Reliability Standards

To reiterate what I said earlier, industrial customers not only want, they demand a truly reliable bulk power system. However, if the Electric Reliability Organization is to be run efficiently, it should impose its standards only on those facilities that

can truly—or materially—impact the bulk power system. If the standards are applied too broadly, i.e., to facilities that cannot have a material impact, there will literally be thousands of facilities that will be ERO-jurisdictional for no sound reason, leading to an ERO that is stretched way too thin in its ability to effectively enforce its standards.

The proposed requirements for entities to register in the compliance registry represent just such a situation. NERC's current registration proposal has the potential to sweep hundreds or even thousands of industrial facilities under the jurisdiction of the ERO and the regional entities, even though these facilities can have no material impact on bulk-power reliability.

Simply having a substation on a manufacturing facility's site does not make that manufacturer able to materially impact reliability. Putting all, or even most, of such facilities on the compliance registry would result in a loss of focus within NERC and would impose costly and unnecessary requirements on these facilities as they would be required to comply with standards on such issues as training, site inspections, and even information system security.

Let me be clear. I am not suggesting that no industrial facilities should be required to register. There are facilities—in particular facilities with extensive on-site generation from which they sell power onto the grid—that can have a material impact on reliability. They should be subject to NERC's reliability standards. But only a small percentage of manufacturing facilities meet the "material impact" threshold.

As a representative of industrial users, some of which generate on-site, we suggest two guiding concepts.

First, any entity demonstrated to be able to materially impact the reliability of the bulk power system, irrespective of other considerations, should register. But others should not have to register.

And, second, consistency between regions and across the nation with respect to which entities are registered is absolutely essential.

Manufacturers are very concerned about the proposal that allows any third party to nominate an industrial facility (or any other entity) to the registry, if the third party believes that the facility was inappropriately excluded. No facility that could indeed materially impact the reliability of the bulk power system should be excluded from the registry. However, the question is where does the burden of proof lie?

Under NERC's proposal, the burden of proof is placed on the nominated facility to prove—via what could be a lengthy and costly procedure that it should NOT be on the registry. This is sort of like being assumed guilty until you prove yourself innocent. We disagree. The burden of proof for third party nominations should be on the nominator, not on the nominated facility in question. The nominator should clearly demonstrate that the nominated facility can materially impact the bulk power system before that facility is required to register.

Industrial users are also concerned about a timing issue. NERC has not yet become the official ERO, and, even after such certification, NERC standards will be subject to FERC review and approval. We are therefore concerned that NERC and the regions are registering entities at this time, even though FERC's current schedule does not call for its approval of NERC's Version 0 and Version 1 reliability standards until at least late summer. We believe that it is premature to actually begin the compliance registry process until after FERC approval has been granted. Of course, NERC should be developing the criteria that it will propose to use to register entities once it has been granted ERO status. But the actual registration should not start until NERC has been approved by FERC as the ERO in the United States.

This sequencing problem is compounded since the corresponding rules of each of the regional entities, which are charged with implementing the registration process, are also not approved. In fact, under current procedures, these rules will be submitted to FERC and posted for public comment only after NERC has been certified as the ERO. Yet, as we speak, some regional entities are actively compiling their own registry list of bulk power system users.

Again, industrial customers do not oppose ongoing efforts to plan for implementation of the compliance registry. However, any and all action should be deferred for any entity or facility that has not voluntarily registered.

NERC's Committee Membership, Structure, and Sector Definitions Should be Rationalized and End Use Consumers Should Be Given Far Greater Voting Weight

NERC proposed to establish different stakeholder processes for each of its two major policymaking committees. The Member Representatives Committee (MRC) that will elect the Board of Trustees and vote on any changes to the Bylaws would have twelve voting segments; the Registered Ballot Body (RBB) that will approve proposed reliability standards would have nine segments. We believe that having

two voting bodies, with two different methods of allocating votes, is unnecessary, confusing, inefficient, costly, and potentially discriminatory. The structures of the stakeholder segments should be identical.

Manufacturers strongly prefer the nine-segment approach proposed for the RBB. It has been demonstrated to work and work well in the establishment of NERC standards. Interestingly, NERC itself proposed in Draft I of its ERO application to use the RBB segments for both the RBB and the MRC. After heavy lobbying by the regions, NERC chose to change the segments for the MRC in the final ERO application.

In the 12-sector MRC allocation, end-use consumers would have a vote share of approximately 11 percent (4 out of 33-37 members), while in the RBB segment structure, end-use consumers have approximately 22% of the total vote. This is particularly ironic since the statute requires that all costs of the ERO be allocated equitably among end-use consumers. In addition, the MRC approach would give the regions at least 22 percent of the votes, even though the regions, in reality, are simply functional extensions of the NERC itself. We believe the regions should have only non-voting status and recommend that the RBB approach be used throughout.

Also, in the interest of establishing a more efficient ERO, ELCON proposes that NERC merge its present Operating Committee and Planning Committee into a single committee. We suggest that this new committee be named the Technical Advisory Committee, or TAC, and the TAC basically oversee the activities of each of NERC's new six program committees.

The Board of Trustees Should Not Be Self-Perpetuating and Should Be Responsive to NERC Membership

The proposed structure of the Board of Trustees opens the possibility that membership could be self-perpetuating and, equally distressing, that it is open to charges of conflict of interest.

We suggest that the number of MRC representatives on the Board nominating committee be increased from three to at least five, and at least two of these be representatives of large and small end-use customers. As I mentioned earlier in my testimony, it is consumers who bear the brunt of any lapse in reliability. Consumers should have a much larger say in the governance that has been proposed by NERC in its application.

In addition, the provision calling for the Board to establish the compensation levels for its own Members must be changed to avoid potential conflicts. A better option is to authorize the MRC to determine compensation for Board Members.

The Relationship Between NERC and Regional Entities Should be Clarified

One of the most difficult tasks facing the "new" NERC will be to establish relationships with the Regional Entities that reflect the statute and the intent of Congress.

In the past, the Regional Reliability Councils were the actual owners of NERC. They funded NERC and, accordingly, they had considerable autonomy in implementing NERC standards which were, under the old regime, only voluntary.

But that regime is over. It was ended by last year's EPAct. We believe that the new NERC should be a strong, top-down organization. NERC may, appropriately, "delegate to regional entities the responsibility for determining whether entities are in compliance . . . and for imposing penalties for noncompliance." But, again per NERC's application, "to the maximum extent possible, regional difference will be addressed through the NERC reliability standards development process." We advocate even stronger language to ensure consistency and uniformity among and between the regions.

We agree with NERC's application and FERC Order 672 stating that there are only two reasons for regional differences: (1) a regional difference that is more stringent than the overall standard, and (2) a regional standard necessitated by a physical difference in the bulk power system. No other differences should be approved.

The Assessment and Use of Fees Deserve Careful Consideration

Consistent with the strong, top-down approach we advocate, NERC's application to be the ERO states that "NERC shall review and approve each regional entity's budget for adequacy in meeting the requirements of its delegated authority." Industrial users are concerned about the potential for cross-subsidization and duplication, which would be both costly to consumers and inefficient from the perspective of NERC's operation.

We believe that regional entities should be the collection agents, but NERC and FERC must provide the necessary guidance and control to ensure that, for ERO funding purposes, there is no double billing. The regional entities must account for instances in which NERC funding costs are already included in the rates of any

transmission providers' Open Access Transmission Tariffs (OATTs), as is currently the case for many utilities. If a layer of new billings is simply added without the elimination of the present costs in the tariffs, some consumers will have to pay twice. The burden of proof should be on the entity collecting the funds to demonstrate that each OATT does not already include a funding mechanism for the ERO and regional entities.

ELCON also believes that FERC must scrutinize the ERO's and the regional entities' costs very carefully. They should not replicate the high budgets that we are now seeing—and paying for—in the RTOs and ISOs, where we contend that costs greatly exceed expected benefits.

The first draft of NERC's proposed budget for 2007 calls for an increase of at least 20 percent over the 2006 budget. In addition NERC staff has indicated that there are several expensive "new tools" that may be recommended for implementation. While industrial users support all means and procedures necessary to ensure a reliable grid, and we recognize that even the slightest improvements to reliability entail a concomitant cost, reliability at any cost is never justified. This, again, highlights the need for more consumer involvement, since consumers will pay the bills and consumers will suffer the consequences of any outage.

Compliance Enforcement Must be Independent and Uniform

We do not believe that the compliance proposals in the proposed Rules of Procedure ensure that the compliance will be independent and/or uniform. It must be made very clear that compliance enforcement should be independent of the entity that is being enforced. No employee should be allowed to audit, monitor, etc., any entity from which that employee is paid. FERC should audit NERC and NERC should audit the regions.

Moreover, to promote uniformity, the proposed Rules of Procedure should specify that NERC compliance staff shall participate in all audit teams for all regional entities. The application says only that NERC compliance staff may participate.

Conclusion

As I have stated repeatedly throughout my testimony, reliability of the interstate electricity grid is, first and foremost, a consumer issue. Accordingly, ELCON has been active in both NERC proceedings and FERC proceedings to put forward, as constructively as possible, the objectives and concerns of consumers as NERC is designated the new ERO and as NERC begins to develop and implement reliability standards in that context.

We support a strong, top-down approach that leads to an efficient NERC. That new NERC needs to include the views of consumers both in the development and enforcement of reliability standards and in the development of its budget and operating procedures.

I appreciate that the Senate Energy Committee has chosen the reliability issue as one to exercise early congressional oversight, and I hope that such oversight continues. For consumers, grid reliability is simply too big an issue to ignore.

Senator THOMAS. Thank you very much. I see you are located in Washington.

Mr. ANDERSON. Yes, sir.

Senator THOMAS. But your boots look like you might be from the West somewhere.

Mr. ANDERSON. Well, it is probably envy. I would love to be from the West, Senator Thomas.

[Laughter.]

Senator THOMAS. Very good.

Ms. Harper.

STATEMENT OF TRUDY A. HARPER, PRESIDENT, TENASKA POWER SERVICES CO., ON BEHALF OF THE ELECTRIC POWER SUPPLY ASSOCIATION, ARLINGTON, TX

Ms. HARPER. Thank you so much. I looked down the panel and I cannot believe you scheduled me to get the last word, and I realized they are not letting me get the last word.

[Laughter.]

Ms. HARPER. I thank you for inviting me today. I am Trudy Harper. I am president of Tenaska Power Services. We are an unregulated, privately owned energy company doing independent power development and power marketing.

I am here representing the Electric Power Supply Association, the trade association for competitive suppliers of electricity.

We, as competitive suppliers of electricity, are as dependent on reliability as those who are regulated. We are very delighted with the reliability provisions of the Energy Policy Act of 2005. The 1992 Energy Policy Act is the very reason that we are even in existence today. It is because of your vision for competitive markets. We accept the fact that the 2005 Act is a continuation of that same vision.

We support NERC in its application as the ERO. We have been active in its development. As a matter of fact, I personally chair the NERC stakeholders committee, which is the group that advises the independent board of NERC as to industry activities, and other members of our organization, just like ELCON, have participated actively in the development of the standards. We embrace those standards and we recognize and accept our responsibility to comply with those standards.

We believe that consistent, uniform, enforceable standards will improve the operation of those systems and markets. And I will speak to your point, Senator, and say that consistent is not the same as the same. Consistent means that we should be working toward the same objective, but we do not have to get there in the same way.

We appreciate the requirement that reliability standards not adversely impact competitive markets. We think that is critical to continuing the vision of the 1992 Energy Policy Act. And FERC has demonstrated that they take this requirement very seriously in their analysis that they have just issued of the current standards that NERC has promulgated.

We believe that good standards must be harmonized with good business practices to achieve long-term reliability.

But standards, we believe, are just one important step, but ultimately the reliability of our system will depend on our ability to plan, permit, and develop new transmission infrastructure. Regional planning and regional tariffs have helped this process immensely, but the barriers to entry for building new transmission are still very high. The approval processes are lengthy, costly, and uncertain.

The Congress and FERC have made some strides in encouraging transmission development through backstops of FERC jurisdiction, but it remains to be seen whether these will overcome the significance of the barriers to entry. We really believe transmission needs to get built.

IPP's are proud to play a significant role in the electric power industry, and we welcome the new comprehensive reliability standards.

[The prepared statement of Ms. Harper follows:]

PREPARED STATEMENT OF TRUDY A. HARPER, PRESIDENT, TENASKA POWER SERVICES CO., ON BEHALF OF THE ELECTRIC POWER SUPPLY ASSOCIATION, ARLINGTON, TX

Mr. Chairman and members of the committee, thank you for the opportunity to testify today; it is a pleasure to be before this Committee. I am Trudy Harper, President of Tenaska Power Services Co., the power marketing affiliate of Tenaska, Inc. Tenaska is an international power development company and energy marketer with expertise in power plant development, ownership and operation; natural gas and electric power marketing; and fuel procurement. Tenaska—headquartered in Omaha, Nebraska—has developed about 9,000 megawatts of generating facilities and currently owns and manages approximately 7,400 MW of generating facilities in operation. We operate a 24-hour trading floor dealing primarily with sales of physical electric power, transacting more than 20,049 gigawatt-hours of electricity sales in 2005.

I am here today representing the Electric Power Supply Association (EPSA). EPSA is the national trade association representing competitive power suppliers, including generators and marketers. These suppliers, who account for nearly 40 percent of the installed generating capacity in the United States, provide reliable and competitively priced electricity from environmentally responsible facilities serving global power markets. EPSA seeks to bring the benefits of competition to all power customers.

On behalf of the competitive power industry, I would like to thank you for crafting the mandatory electric reliability section in EPAct. We strongly supported its inclusion and believe that establishing a new electric reliability organization is vital to the ongoing development and operation of the reliable electric grid on which we depend. We provide our customers with reliable, reasonably priced electricity. Our nation's bulk-power transmission grid must be the interstate highway which independent generators use to deliver our product; if this system is not reliable, we're out of business. I presently chair the NERC Stakeholder Committee; and EPSA and its members have long contributed to and supported the development of NERC by serving on other NERC committees. We strongly support NERC's ERO application.

As FERC, NERC and industry stakeholders work to implement Congress's reliability statute, it is crucial that we understand that reliability and commercial standards are inextricably linked. Reliability standards do not exist in a vacuum. Broad regional wholesale electric markets contribute to reliability by providing access to a large and varied pool of generation assets, and reliability standards have competitive impacts on these markets. This is why all parties are committed to coordinating the development and implementation of reliability and business practice standards. What the standards are and who sets the standards, and how the standards development and enforcement are funded all impact competitive markets and the consequent consumer benefits. We are working to ensure that existing and proposed standards do not cause undue adverse impacts on commerce and markets. Reliability does not require that consumers lose out on the benefits of competitive electric markets—competition and reliability are complementary goals.

As the experience of regional grid operators has demonstrated, not only are competitive markets consistent with reliability, but they also support and promote system security. Because consumers and load-serving entities need a reliable bulk power system to provide them access to the most efficient or preferred sources of supply, and because competitive suppliers need a reliable grid in order to satisfy that consumer demand, the competitive power sector is fully committed to maintaining grid reliability.

The record of the competitive power sector in improving transmission system operating reliability has been impressive. Between 1993 and 2003, the competitive generation sector added approximately 187,000 megawatts of generating capacity to the U.S. grid, providing a significant degree of supply adequacy to the reliability equation at no risk to ratepayers. Generators provide reactive power, an essential factor in monitoring system reliability. This reactive power supplies voltage which is necessary for electric transmission—it's like providing water pressure to the pipes in your homes. Without the reactive power we provide, electricity could not be reliably transmitted. Further, competitive forces have improved grid reliability by reducing equivalent forced outage rates, reducing maintenance down-time, increasing capacity factors of traditional base-load power plants, introducing sophisticated methods of risk and power plant operations management, and creating efficient, market-based congestion management protocols that are superior to and more efficient than the blunt instrument of transmission line-loading relief.

EPSA is committed to the successful implementation of the Electric Reliability Organization with mandatory, enforceable reliability standards under new section 215 of the Federal Power Act. We believe that great progress has been made. We are

seeing a fundamental shift in focus from the patchwork of relatively autonomous regions to a more centralized, better coordinated model. Virtually all parties recognize the need to harmonize reliability standards with related business practices essential to promote robust commercial activity.

EPSA joins many other stakeholders in urging maximum consistency and uniformity of enforcement programs and standards development processes used by regional reliability organizations under Regional Delegation Agreements being negotiated with the ERO. FERC has issued regulations permitting the ERO to enter delegation agreements, subject to FERC approval, authorizing regional entities to propose reliability standards to the ERO and enforce reliability standards within their respective territories. Such delegations, however, must not only be effective, but also promote efficient reliability management. Balancing the role of the regions with the need for standardization will be an ongoing challenge which we believe FERC and the ERO will be able to meet.

Congress concluded that a strong ERO with primary authority for bulk-power system reliability was essential for establishing a continent-wide regulating organization. In fact, maximizing efficiencies through uniform, standardized processes and procedures can help minimize differences at seams between regions, facilitate transactions across regions, cut costs and reduce litigation. Ultimately, we support Congress's and FERC's direction that regional processes must be uniform unless the region can demonstrate unique operational facts and circumstances.

All regional reliability organizations must demonstrate their independence from the owners, users and operators of the system. Particularly, delegation agreements granting enforcement authority must be scrutinized for any possible conflicts of interest. The congressional statute and FERC's regulations permit regional entities to be governed by an independent board, a balanced stakeholder board or a combination of the two. However, whatever model is utilized, they must ensure transparency and fairness in the consideration of stakeholder views and interests.

Infrastructure development also contributes to reliability, and therefore it is important that such development be encouraged and its costs equitably distributed. Transmission projects such as the Frontier Line increase reliability by allowing access to new sources of generation. As FERC Commissioner Nora Brownell has said, today's economic transmission project is tomorrow's reliability project—transmission which is developed now to increase generation availability will contribute to the long-term reliability of the system. In addition to the reliability section, other provisions in EPAct support electric reliability by encouraging both development and coordination. The backstop transmission siting authority will encourage infrastructure development. The electricity title allowed further development of RTOs, which increase reliability through coordinated operation of the transmission grid. PUHCA repeal will promote increased investment in our electricity network.

Again, we appreciate the opportunity to testify and look forward to working with this Committee as you continue to address critical energy matters. EPSA stands ready to support your work forwarding the cause of electric consumers and ensuring the continued reliability of our nation's electric system.

Senator THOMAS. Very good. Thank you so much.

I would like to ask each of you a couple of short questions. If you can give me a short answer, we will all be happier.

For the purpose of mandatory regimes, NERC has proposed registering users that have material impact on the bulk power system. In your opinion, how would you determine what "material impact" is?

Mr. Owens.

Mr. OWENS. I think NERC initially said let us cast a wide net, and let us look at those entities that can impact the system. And let us decide, once we are getting information from the users, the owners, and the operators of the electric systems that impact bulk power, whether some of those entities have a material impact or not. In other words, those that will take actions that will have the potential impact of adversely impacting reliability.

I think where I might disagree with some of my panelists, Mr. Chairman, is that much like we did at 9/11 when we were most concerned about the national security, we did not start out by say-

ing let us exempt a number of entities from the requirements that our Government was taking to ensure the security of our Nation.

I would say after the blackout of 2003, we have taken a similar attitude, and we said, well, now that we know that we need mandatory standards, let us make sure that we look at those entities that impact the reliability of our overall system. So step one would be, first, to apply those standards to everyone and then, through an iterative process, decide which of those entities has or does not have a material impact on reliability.

Senator THOMAS. Mr. Mosher.

Mr. MOSHER. I took the liberty to grab a page out of the APPA membership directory and to xerox a copy and bring it over. It happened to include Illinois. The city of Albany, Illinois has annual electric revenues of $362,000. It has annual generation of zero. It has annual sales to retail customers of 4,000 megawatt hours, five or fewer employees. Albany, Illinois has no material impact on the bulk power system.

What we have now is a voluntary regime that has some serious problems. We need to move to a mandatory enforceable regime. But NERC is going to face some very significant start-up problems over the next year, and they need to focus on those entities that have a material impact, that are the larger entities. In fact, if you look back to the August 14 outage, if the entities involved that were basically the source of the problem there had trimmed their trees properly, had had adequate system awareness, had trained their staffs properly, we would not have had that outage. The voluntary standards would have worked. So downstream, we will go down lower and figure out where the line for material versus non-material is.

Senator THOMAS. Thank you.

Mr. Easley.

Mr. EASLEY. Thank you, Mr. Chairman.

I am not sure, but I think I might have just made the business case of why PRECorp could be of material impact to the system.

That being said, I think that it is important to note that it is not one-size-fits-all. Cooperatives historically have had 12 or so members under the voluntary provisions, and with the mandatory provisions, we expect that number to go to between 80 and 100.

I think that focus on accountability is important to the process, and while an electric cooperative like Powder River may likely be measured as having a material impact, I think you would agree with me, Mr. Chairman, that Garland Electric probably will not, nor would a co-op the size of Niobrara. I think that there is enough of those smaller but nonetheless important, especially to the perspective of their customers, that clearly would not be a material impact to the system.

Senator THOMAS. Thank you.

Mr. Anderson.

Mr. ANDERSON. Mr. Chairman, I think it is a very important and a very difficult question that you have asked. It highlights why we think that the ERO, NERC, should not be doing any registration until they have answered that question. It is assuming people are guilty until they are proven innocent otherwise.

Let me give you one example. They have proposed 100 kv service. If you are connected at 100 kilovolts or above, then you should be on the registry. But there are some of my members that are connected at above 100 kv because they were required to connect at greater than 100 kv by the interconnection agreement. There could be a situation where they easily could have been served at distribution voltage, but were told that they could not do that. These are the kinds of things that have to be taken care of. If one of my members has a lot of generation behind the meter, but they never sell that power to the grid, they are not going to impact the grid. If they have a lot of generation behind the meter but they sell a lot of power to the grid, they could impact the grid. At the same time, they should not be put on the registry now and then have to fight their way off later, which could be a very difficult and costly thing.

Senator THOMAS. Thank you.

Ms. Harper.

Mr. HARPER. Let me tell you who I think should be on the registry because we have talked a lot about who should not be. It is fairly clear to me that FERC has set up rules about who can be an eligible transmission customer. If you can buy transmission service on the grid today, you are deemed to be an eligible transmission customer. These include QF's, co-generators, EWG's, exempt wholesale generators, and Federal power marketers, power marketers who have Federal power marketing authorizations. I think all of those entities should clearly be registered as participants in the NERC registration.

The difficulty comes in the small generators, the small loads and it is deciding there against that margin that, unfortunately, affects a large number of entities but a very small segment of our industry. So we need to think about that in terms of the materiality. It is a little bit of a 98/2 problem, not even the old 80/20. It is probably a 98/2 problem.

Senator THOMAS. One more. Many people have raised the concern about the potential costs of the ERO. Who will bear the costs of reliability implementation? How do we ensure these costs are reasonable and implemented in the most cost effective way.

Mr. Owens, would you like to respond to that?

Mr. OWENS. My understanding is that NERC will have a transparent process. They will have to submit their budget to the Federal Energy Regulatory Commission. Like all the other panelists, obviously, we would be most concerned about costs. But the costs really relate to the standards that NERC or the ERO will be implementing. If the standards are designed to improve reliability, the cost of having a blackout far exceed any potential costs of having to make sure that NERC has the adequate budget. So I think it is an issue of transparency of the costs, the importance of the standards, and the implementation of those standards to make sure that we have a reliable grid.

Senator THOMAS. It is my understanding that the cost would go to the end users. Is that right?

Mr. OWENS. The costs all go to the end users. That is correct.

Senator THOMAS. Mr. Mosher.

Mr. MOSHER. I will actually agree in this respect with Mr. Owens on this point. It is the indirect costs of compliance that are prob-

ably most important. The direct cost of sitting in rooms to work out the standards is expensive, but not nearly as expensive as the cost of an outage or the cost of compliance here. So what we are really talking about is putting our money at the place that gets the most value for customers. That could be in investing in infrastructure directly or it could be in developing better tools for real-time awareness of what is going on in the system, something that Mr. Sergel referred to earlier.

I do not know what the right answer is. I think we have the potential tools to balance that. But what I think we are asking for is for the Commission to keep an eye on this problem, to be basically a manager of the whole regulatory budget.

Senator THOMAS. I guess inherently in the question is do you think there is an adequate control mechanism.

Mr. Easley.

Mr. EASLEY. Mr. Chairman, in the electric cooperative business model, we only have one place to get money and that is from our customers, as you well know. I do believe that however we go about recovering costs for reliability, there should be some very strong lines of accountability to the guy at the end of the line.

Senator THOMAS. Thank you.

Mr. Anderson.

Mr. ANDERSON. Once again, Mr. Chairman, this is a very important question. It is extremely clear, as you just said, who is going to pay. The law says the end use customers are going to be the ones that are going to pay.

The more difficulty is what is the level of the cost that is appropriate. In our view, though, since customers bear the brunt of that, of outages or reliability problems, and they pay all of the costs, they should at least be able to veto anything that they think is inappropriate, and that simply is not the way that it has been in NERC in the past and it is not the way that it is in the application.

I would like to leave you with a point that I would never say that reliability is like pornography, but I would certainly tell you that customers will know what is inappropriate when they see it.

Senator THOMAS. Ms. Harper.

Ms. HARPER. I am pleased that there is going to be an interesting compromise between NERC, who is going to want to ensure that there will never be a blackout, and those of us like John and like some of the others who represent native load who will not want to spend the money to have 101 percent reliability. I think, to your point, Senator, the compromise will result in accountability. I think that the process is open. I think the costs will be known to all of us.

And my big issue is much like Mr. Anderson's from his opening remarks, and that is how those costs will be allocated since there is no double-counting and making sure that these really do go to the end user in the fairest way possible.

Senator THOMAS. I will ask each of you an individual question then, if you do not mind, and then we will wrap up here pretty soon.

EEI has advocated that all users, owners, operators in the bulk power system, regardless of size or function, be required to register. Why if a user does not have material impact? Could this not lead

to unnecessary oversight with little benefit to the system? Should it not be focused on the biggest problems?

Mr. OWENS. Yes, I think we should. I do not want to leave the false impression here. Senator, what I said was you start the process off. It costs nothing to register, and by registering, you would become more informed about the evolving reliability standards. Certainly I agree with what Mr. Sergel said, that you need to reach an issue of materiality, but you cannot start out by having the entity decide that it needs to be exempted. You start out by having an all-inclusive approach, and then you use an iterative approach to define what material impact means.

Clearly, I think it is inappropriate to impose standards on a 2 megawatt system or a system that has no generation and very little distribution facilities. But you start out by identifying all those entities. Many of these entities are not familiar with the reliability standards, have had no history with the NERC or none with the ERO.

So, if we mean to have an open and informed system, you start out by having everyone file. There is zero cost to register. The burden is on the ERO to define materiality, and you have an open process where you can make your points persuasively that you are not one that materially impacts the system. That is the process that I was speaking to.

Senator THOMAS. Mr. Mosher, APPA has raised concerns of new, potentially unresponsive bureaucracies at the ERO and the regional entities. How will APPA members react to a new ERO and regional entities?

Mr. MOSHER. That is an interesting question. As Mr. Owens pointed out, many of my members do not have current relationships with NERC. The right answer probably is for most of them not to have a relationship with NERC because they have no material impact.

Those that are owners or operators of bulk power system facilities need to be in the realm discussing and developing the standards that they are going to have to live by, and then they need to go home and develop their own compliance programs within the utility and work with the regional councils to be in compliance. I see that as an ongoing iterative process. I think they will be successful in doing that, and they will be able to manage the costs in the process.

Senator THOMAS. Mr. Easley, how would you define the need and the importance of giving deference to regions?

Mr. EASLEY. Well, Mr. Chairman, the regional difference I think is very much appearing in Wyoming where one side of our State is on one interconnecting at the border. It's the other interconnecting. The regions were constructed in a hub and spoke type of manner, and in the West, with lots of distance between major points of use, as well as the significant resources that we have in Wyoming that need to be developed, I believe those are some of the very many things that need to be used to define the regional differences.

Senator THOMAS. Do you think there will be uniformity then between the regional differences?

Mr. EASLEY. Well, I think there needs to be some uniformity that also recognizes what those differences are.

Senator THOMAS. Mr. Anderson, you do not think consumers will be adequately represented in the governance of the ERO. Is that correct?

Mr. ANDERSON. That is correct, Mr. Chairman.

Senator THOMAS. Why is that?

Mr. ANDERSON. Well, right now, consumers only have maybe 15 percent of the vote. They pay 100 percent of the cost, but they have 15 percent of the vote. And in the first proposal NERC had, they increased it to 22 percent, but then in the final proposal that went to FERC, it dropped it to 11. 11 percent for large and small consumers combined is not nearly enough to be able to stop something from happening that consumers think is inappropriate for them. We just think that that does not reflect the idea that consumers are the ones that suffer the most and consumers are the ones that are paying all the bills.

Senator THOMAS. In the broader sense, who has control over FERC?

Mr. ANDERSON. That is a very good question, Mr. Chairman. Can I supply you——

Senator THOMAS. It is a government agency, is it not?

Mr. ANDERSON. Yes, it is a Government agency, certainly.

Senator THOMAS. So they could be a little discombobulated in getting there.

Mr. ANDERSON. Well, FERC begins many, many orders with the first sentence being, "we are issuing this order to benefit consumers," and then as you go through the order, you find that the consumer groups are all opposed to what is coming and there are other entities that are in favor of it. So that was my hesitancy when you first asked that question.

Senator THOMAS. Governance is a difficult thing.

Mr. ANDERSON. Yes, it is.

Senator THOMAS. Ms. Harper, you have expressed concern that some of the reliability standards may have undue adverse impacts on competition. How can we address this potential problem?

Mr. HARPER. Well, I think we are addressing it. I was actually speaking to Mr. Owens from EEI in the hall earlier and we were talking about the fact—I am not sure that I have concern that the standards will adversely impact competition, but just that I am delighted that we are going to be mindful that they not adversely impact competition.

Mr. Owens and I were talking earlier about some issues that we have known that reliability and competitive markets are at odds, and we have never had a need or a reason to compromise because there was not a stick out there waiting to hit us over the head if we did not reach a compromise. So we have always been at an impasse. Well, we are now at a place where we have to reach a compromise. We have a legislative mandate to do that. I actually believe that is going to lead to the right answer. I am just pleased that we are going to be mindful of it and we need to kind of hide and watch, I guess, and make sure that we do not have an adverse impact on competition.

Senator THOMAS. Mr. Mosher, your testimony notes two aspects of reliability, the operation of the grid and the system adequacy. What steps need to be taken to ensure adequate interstate transmission networks?

Mr. MOSHER. I think the first step is better system planning, that that would be an all-inclusive process to get all of those who have an interest in expanding the grid into the room and do that either within particular systems or States and potentially regionally to aggregate the need for new generation, and then allow those entities that have the capital that want to participate, which includes a lot of public power systems, an opportunity to get transmission rights in such facilities. There are a variety of different models and we would be happy to discuss further——

Senator THOMAS. We heard quite a little bit about the lack of generation capacity over the last number of years. Who would like to comment on why is that? We seem to have adequate supply for now. We seem to be concerned about having it because of the time it takes to create new generation. We seem to be concerned about what sort of fuel is going to be there and the environmental impacts. I guess that is a big problem. Does anybody want to comment on that?

Mr. OWENS. I will comment on it. I think you begin to hit it on the head, Senator. We are concerned about fuel diversity. Many of the facilities that we have put in service over the last several years have been primarily natural gas-fired facilities because the market dictated that. We are inclined today but we recognize that we need to rely increasingly on non-gas-fired facilities and we need to provide some level of risk mitigation for our consumers given high prices that we are paying today for natural gas.

So many companies now are looking very seriously at—aside from effective conservation and efficiency and many of the technologies, they are looking at seeking to undertake construction of major new baseload facilities, clean coal technologies. There is even tremendous movement and EPAct—and your leadership helped provide that—provides a whole array of opportunities to begin to look at other types of fuel sources, including new advanced nuclear facilities. So there is a serious dialogue occurring throughout the industry to consider these other technologies that will reduce our dependency on natural gas.

Senator THOMAS. Does anyone want to comment?

Mr. MOSHER. I agree with what Mr. Owens said. Again, we need to diversify our fuel supply. There was a trade press announcement today that municipals, cooperatives, and the large investor-owned facilities in Virginia are partnering on a new coal-fired facility, which I believe will be a clean coal facility.

Senator THOMAS. Part of the reason for the use of gas, I think, has been you can efficiently build a smaller generation plant closer to the market so the transmission becomes a very key item to some of that diversity.

Anyone?

Ms. HARPER. That was going to be my point. I believe there is generation that is going to be built. Generation has been built and generation was started and abandoned because people could not access markets from the sources of fuel and the sources of generation

that they were building. So I think transmission really is the key to deliverability of generation, and I actually think that is a much harder—that is the lowest common denominator in our universe right now, is transmission.

Senator THOMAS. Well, thank you all very much. We appreciate what you are doing and we are dealing with an issue that affects everybody and affects them a great deal. So if we have any questions from those who were not here, I hope you will respond to them if you receive them. Otherwise, thank you very much.

The committee is adjourned.

[Whereupon, at 3:50 p.m., the committee was recessed, to be reconvened on May 22, 2006.]

[The following letter was received for the record:]

NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS,
Washington, DC, May 31, 2006.

Hon. PETE V. DOMENICI,
Chairman, Senate Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: On behalf of the National Association of Regulatory Utility Commissioners (NARUC) please find attached a statement in response to the Senate Energy and Natural Resources Committee hearing held on May 15, 2006 regarding implementation of the Energy Policy Act of 2005's electricity reliability provisions. This statement details NARUC's Energy Policy Act of 2005 electric reliability implementation activities.

I respectfully request that this statement be added to the official record of that hearing. Thank you for your consideration.

Sincerely,

CHRISTOPHER MELE,
Legislative Director, Energy.

[Attachment.]

STATEMENT OF THE NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS

This statement is being submitted by the National Association of Regulatory Utility Commissioners (NARUC) to the Senate Energy and Natural Resources Committee in response to the full Committee hearing held on May 15, 2006 regarding implementation of the Energy Policy Act of 2005's electricity reliability provisions. The statement will discuss NARUC involvement in the implementation of the Energy Policy Act of 2005's electricity reliability provisions.

NARUC is the national organization of the State commissions responsible for economic and safety regulation of the intrastate operations of regulated utilities. Specifically, NARUC's members have the obligation under State law to ensure the establishment and maintenance of such energy utility services as may be required by the public convenience and necessity, as well as ensuring that such services are provided at just and reasonable rates. NARUC's members include the government agencies in the fifty States, the District of Columbia, Puerto Rico and the Virgin Islands charged with regulating rates and terms and conditions of service associated with the intrastate operations of electric, natural gas, water, and telephone utilities.

NARUC consistently supported legislation to establish a mandatory reliability regime, given the interest that all State commissions share in the preservation of a reliable bulk power system. When the Energy Policy Act of 2005 ("EPAct 2005") was signed into law on August 8, 2005, and enacted Section 215 of the Federal Power Act ("FPA") providing for the creation of an Electric Reliability Organization ("ERO") with the authority to adopt and enforce mandatory reliability standards, NARUC applauded the adoption of this reliability provision and has attempted to assist in its implementation to the greatest extent possible.

On September 1, 2005, the Federal Energy Regulatory Commission ("FERC" of the "Commission") issued a Notice of Proposed Rulemaking ("NOPR") for the purpose of developing rules governing the approval and operation of an ERO as contemplated in Section 215 of the Federal Power Act. In the NOPR, the FERC proposed regulations addressing such issues as the criteria that an entity must satisfy to qualify as an ERO, the procedures that must be followed in an enforcement ac-

tion, the criteria under which the ERO may agree to delegate authority to propose and enforce reliability standards to a Regional Entity, and the manner in which the ERO should be funded. Prior to the issuance of the NOPR, NARUC participated in discussions with other interested parties in an attempt to arrive at a consensus approach to the implementation of the reliability provisions of EPAct 2005.

On October 7, 2005, NARUC filed comments addressing the issues raised in the FERC Reliability NOPR. NARUC urged the FERC to recognize that the North American Reliability Council ("NERC") currently develops minimum national reliability standards through an open stakeholder process, that there are differences in the design of the bulk electric system in different parts of the country, that regional reliability organizations currently implement the national standards promulgated by NERC in a manner consistent with regional conditions, and that FERC should build on the existing structure in implementing the new reliability legislation.[1] Although NARUC recognized that existing regional reliability organizations will have to adopt and implement certain changes in order to be eligible to receive delegated authority from the ERO, NARUC urged the FERC to allow the existing regional reliability organizations the opportunity to transform themselves into the Regional Entities envisioned by EPAct 2005 in order to preserve the existing storehouse of regional reliability information and to provide continuity to the new organizations.

The logic behind NARUC's emphasis upon the importance of preserving a significant role for Regional Entities should be obvious. Historically, regional standards, criteria, and rules have gone beyond the level needed to prevent cascading blackouts by attempting to provide reliability requirements intended to ensure that local problems do not develop in the first instance. The current allocation of responsibilities recognizes that a national organization lacks the local knowledge of system events and conditions necessary to effectively implement and enforce reliability standards that exists at the regional level. Similarly, a national organization lacks the regional knowledge of local system design, demographics and requirements necessary for customized regional reliability rules. As a result, while NARUC fully supports enforcement of the provisions of the reliability legislation calling for the adoption and enforcement of national reliability standards, NARUC also believes that the differences among regions necessitate a significant role for Regional Entities. As such, NARUC supports the recognition of this fact in Order No. 672.

NARUC's participation in the reliability rulemaking proceeding has not been limited to the filing of comments. On December 9, 2005, Commissioner Allen M. Freifeld of the Maryland Public Service Commission participated in the FERC Technical Conference on electricity reliability standards on behalf of NARUC. At that time, NARUC stated that States have a significant role to play in the maintenance of reliable electric service and noted that EPAct 2005 specifically preserves the rights of the States to act to ensure the safety, adequacy and reliability of electric service within their boundaries so long as such State action is not inconsistent with any reliability standard developed by the ERO and approved by FERC. As a result, in NARUC's view, responsibility for the maintenance of a reliable bulk power system is shared among State, regional, and Federal authorities.

On April 4, 2006, NERC filed an application to the Commission for certification as the ERO. While NARUC generally supports the certification of NERC as the ERO, on May 4, 2006, NARUC filed comments addressing the issues raised in the NERC Certification Application.[2] Also, on April 4, 2006, NERC filed a petition at the Commission seeking approval of its current voluntary reliability standards as the mandatory standards specified in FPA Section 215. On April 18, 2006, the Commission requested comments addressing NERC's proposed reliability standards and a FERC Staff preliminary assessment of the proposed reliability standards. NARUC will continue to participate constructively in the process, through the above proceedings, for the purpose of assisting in the implementation of the reliability provisions of EPAct 2005.

[1] A copy of the NARUC comments in the FERC Reliability proceeding have been retained in committee files.

[2] A copy of the NARUC comments in the NERC Certification Application proceeding have been retained in committee files.

NUCLEAR POWER PROVISIONS

MONDAY, MAY 22, 2006

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

The committee met, pursuant to notice, at 2:35 p.m., in room SD–366, Dirksen Senate Office Building, Hon. Pete V. Domenici, chairman, presiding.

OPENING STATEMENT OF HON. PETE V. DOMENICI, U.S. SENATOR FROM NEW MEXICO

The CHAIRMAN. Senator Bingaman will be along here in just a moment. The committee will please come to order.

The purpose of this hearing is to evaluate the developments in nuclear energy since passage of the energy bill and the status of the implementation of the nuclear related provisions from the energy bill, or the Energy Policy Act of 2005, EPAct.

Currently, there are 103 nuclear powerplants operating in the United States. These reactors provide 20 percent of the electric power needed for the Nation—that's 20 percent of our total electric generation that's free of greenhouse gases.

In this age of concern over our Nation's energy security, the price of energy, and the worries about destructive results that might be caused by climate change, I'm confident that Congress did the right thing in providing incentives for new nuclear generation in the Energy Policy Act of 2005.

Nuclear plants: One, provide the Nation's lowest cost electricity other than hydro power; two, emit no greenhouse gases; three, excel at providing steady baseload power, essential to anchoring grid stability; have demonstrated outstanding reliability; and last, have a superb safety record.

However, the last completed nuclear plant in the United States was ordered in 1973, 32 years ago. A combination of issues have contributed to perceived financial risks and have precluded new plant orders. These issues include high up-front capital costs and an unproven regulatory framework for new plants.

In the energy bill, we tackled these issues and I worked with my colleagues to include in the final bill a production tax credit, standby support or risk assurance, loan guarantees, and renewal of Price-Anderson for an additional 20 years. Specifically, the production tax credit for nuclear energy put it on an equal footing with other sources of emission-free power, including wind and closed-loop biomass. These other sources have received a production tax credit since 1992.

I authored and worked with my friend Senator Bingaman and then between us, we had much support from the entire committee for a loan guarantee provision to support the development of innovative energy technologies and I quote, "that avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases—this includes new nuclear powerplants."

The bill offers for the first time a new plant investment protection in the form of standby support or risk assurance to offset the financial impact of delays beyond industry's control that may occur during construction and during the initial phases of plant startup for the first six new reactors.

The act provides the framework for immediate, no-fault insurance coverage for the public in the event of a nuclear reactor accident, also known as Price-Anderson. I've just repeated that up above.

Senator Bingaman, I welcome you and I would now note your presence and thank you for coming. My good friend from the Nuclear Regulatory Commission today will tell us how many utilities have been knocking on his door since the signing of the bill in Albuquerque, New Mexico last August by the President of the United States.

I have said it before and I will say it again, that nuclear renaissance is here, not only in our country, but in India, China, Russia, Turkey, France, and in a dozen other countries. The biggest difference is that construction on these new plants has begun in some of these countries. And today, I hope we can gain a clear perspective of how close we are in the United States to the happening of that kind of event.

Some say that the spent fuel question must be answered 100 percent before we build new plants in America. I strongly disagree. Last week, this committee held its first hearing in a very long time on the Yucca Mountain program. We learned that program needs work; it needs to be placed back on a track to a more real progress. We are working to help the DOE do that. It is no secret that this Senator is a fan of nuclear recycling. As much as 90 percent of a fuel rod's energy is still in the rod when it is removed from a nuclear reactor. I think we can one day recover more of that energy and reduce both the toxicity and the volume of the waste that we're putting in Yucca Mountain. I am delighted that the administration shares this vision and has announced the GNEP initiative to move toward that goal.

I realize that these ideas are changes in long-held doctrine for some. But let me be clear, we need Yucca Mountain. I am firmly committed to completing the mountain, but I think Yucca Mountain's role as a permanent storage site may evolve as our technology evolves. That is as it should be. On an issue as important to the future of this country as nuclear energy, we should never say never. We should never lock the door and throw away the key on new ideas and emerging technologies.

President Bush, myself, and many of my Senate colleagues, and Secretary Bodman have repeatedly called for more nuclear power in recent years. Last week, Prime Minister Tony Blair joined the growing global chorus. He said in a speech that new nuclear power-

plants in the United Kingdom are "back on the agenda with a vengeance."

Now, let me introduce our witnesses. Before that, I'll obviously call on the Senators who are up here and then we'll be ready for you to testify. And we will start with Dennis Spurgeon, Assistant Secretary once we have heard from the Senators on my left and on my right. And we'll start with you Senator Bingaman.

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

Senator BINGAMAN. Thank you, Mr. Chairman, for having this hearing. This is a very important issue; one that obviously you provided great leadership in the construction of this energy bill that we passed last year. I'm anxious to hear from the witnesses as to what they perceive is the progress being made under the provisions of the Energy Policy Act and problems that they still see in moving ahead with additional power production from nuclear energy.

I think that nuclear power does play a critical role in supplying electric power in this country and that needs to continue and hopefully increase. And so, I'm anxious to hear the testimony. Thank you.

The CHAIRMAN. Thank you, Senator.

Senator Thomas.

STATEMENT OF HON. CRAIG THOMAS, U.S. SENATOR FROM WYOMING

Senator THOMAS. Thank you, Mr. Chairman. I, too, want to thank you for having this hearing. This is the fifth hearing you've had on Mondays and I think that's excellent to move forward in this whole energy area we are in. I think it is particularly important to deal with this question of nuclear power. I don't think frankly, people understand the importance of nuclear power now and certainly don't understand the opportunities that we have in the future both for a clean source and for a continuing source as we have it available. It provides nearly 73 percent of the emission-free energy we have now. So, it is something that is very good and it is safe, thanks to you folks. There are standards provided there.

One of the problems with nuclear power of course, is that people hear nuclear, and they get a little spooky about that and the fact is, that we're producing a good deal of it now. It's very reliable. And one of the things that I think is interesting about it is the availability of the uranium supply. And of course in Wyoming, we are one of the strongest holders of supplies for that. And so, I look forward to hearing from the testimony also, and I think this is a great opportunity for us to look at alternative sources.

We're going to look at making coal into other kinds of fuels. And coal of course, has been—and gas unfortunately, has been the greatest producer of electricity in the past and it's so much more possible to use it on other things and the same with coal.

So now, uranium, I think is a great one and nuclear power. So thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much. We're going to proceed now with Assistant Secretary Dennis Spurgeon. Will you proceed to lead off?

STATEMENT OF DENNIS SPURGEON, ASSISTANT SECRETARY, OFFICE OF NUCLEAR ENERGY, DEPARTMENT OF ENERGY

Mr. SPURGEON. Thank you, Mr. Chairman, Senator Bingaman, Senator Thomas, members of the committee, it's a great pleasure to be here today to discuss the administration's progress implementing the provisions contained in the Energy Policy Act of 2005 that encourage building new advanced nuclear powerplants in the United States. As my first opportunity to testify since being sworn in as Assistant Secretary for Nuclear Energy, I can think of no better topic for discussion than the efforts of this committee and the administration to stimulate more nuclear power.

I have submitted written testimony for the record and would like to summarize it briefly. The President has stated a policy goal of expanding nuclear power in the United States and around the world. This is a key component of President's Advanced Energy Initiative and a key objective of the President's National Energy Policy. The reasons for this are obvious. As we enter a new era in energy supply, our need for energy—even with ambitious energy efficiency and conservation measures—will continue to grow as our economy grows. While nuclear is not the only answer to maintaining our economy and our way of life, there is no plausible solution that does not include it.

Last year, Deputy Secretary Sell testified before this committee on DOE's Nuclear Power 2010 program and the financial and regulatory risks associated with building new plants. Since then, Congress and the administration worked together to enact landmark legislation that addresses our Nation's energy security that encourages a new generation of nuclear powerplants by removing the last barriers to their deployment.

The Energy Policy Act of 2005 extended Price-Anderson indemnification, reauthorized Nuclear Power 2010, and created Federal risk insurance and production tax credits for advanced nuclear plants, and loan guarantees for projects that avoid emissions and use advanced technologies, including nuclear.

EPAct reauthorized Nuclear Power 2010, a key administration initiative aimed at addressing regulatory and financial risk associated with building new advanced nuclear plants. The program is a 50/50 cost share with industry to demonstrate the NRC "one step" licensing process and bring advanced standard plant designs to the market.

Since 2002, DOE and industry have invested more than $270 million on this initiative and the President's request proposes to invest $54 million in fiscal year 2007. Under Nuclear Power 2010, the Department is sponsoring development of combined Construction and Operating License applications or COL's, for two power company-led consortia, Dominion Energy and NuStart. These consortia have cast a wide net involving more than two-thirds of the current operators of U.S. nuclear plants as participants.

Nuclear Power 2010 is on track for COL applications to be submitted to the NRC by the end of 2007. Industry is expecting the NRC will issue licenses by the end of 2010. We have every indication that following the initial submittals of these first COL applications, industry will quickly follow with another 12 COL applications, building on the work done in NP 2010.

Last year, the President proposed and Congress created Federal Risk Insurance—or Standby Support—to protect first "movers" of new nuclear plants from regulatory or litigation related delays that are outside their control. Earlier this month, the Department issued the interim final rule for the Standby Support program on schedule, establishing the requirements and the process for obtaining risk insurance for costs associated with covered delays. We expect the final rule to be issued by August 8, the one-year anniversary of EPAct.

Under EPAct, advanced nuclear plants can claim a production tax credit of 1.8 cents per kilowatt-hour of electricity produced for 8 years. The provision applies to 6,000 megawatts of electricity produced annually. The Department of the Treasury is the lead Federal agency for this provision, with the assistance of DOE.

On May 1, 2006, Treasury published a final notice containing guidelines for allocating and approving production tax credits. To qualify, plant construction must begin prior to 2014 and the plant must be placed in service prior to 2021. These 6,000 megawatts would be distributed on a pro-rata basis across all qualified plants.

Finally, EPAct authorized loan guarantees for projects that avoid, reduce, or sequester air pollutants or emissions of greenhouse gases and that use advanced energy technologies including nuclear. I understand that Under Secretary Garman recently updated the committee on the Department's efforts to establish loan guarantee program. While I have provided the details in my testimony, I would simply say that the Department is proceeding to form a new organization within the Office of the Chief Financial Officer for that purpose and we're working to put the policies and procedures in place for a Credit Review Board.

From my perspective, I believe that loan guarantees can be a very effective tool for mitigating the financial risk associated with building new nuclear plants.

Mr. Chairman, I thank you and the committee for being an early and serious voice for building a new generation of nuclear plants in the United States. The EPAct provisions that we are discussing today are already doing their job of removing the final barriers associated with building new plants. We're making good progress and I believe we will see new plants ordered before President Bush leaves office. I pledge to this committee that I will do all that I can to make this a reality.

Thank you, Mr. Chairman. I would be pleased to answer questions.

[The prepared statement of Mr. Spurgeon follows:]

PREPARED STATEMENT OF DENNIS SPURGEON, ASSISTANT SECRETARY, OFFICE OF NUCLEAR ENERGY, DEPARTMENT OF ENERGY

Chairman Domenici, Senator Bingaman, and members of the committee, it is an honor and a great pleasure for me to be here today to discuss the Administration's progress implementing the provisions contained in the Energy Policy Act of 2005 (EPACT 2005) that encourage building new advanced nuclear power plants in the U.S. As this is the first hearing at which I have testified since being sworn in as Assistant Secretary for Nuclear Energy six weeks ago, I can think of no better topic for discussion than efforts of the Administration and this committee to stimulate more nuclear generating capacity to meet our growing demand for energy.

The President has stated a policy goal of expanding nuclear power in the U.S. and around the world. The resurgence of nuclear power is a key component of President

Bush's *Advanced Energy Initiative* and a key objective contained in the President's National Energy Policy. The reasons for this are obvious. As we enter a new era in energy supply, our need for energy—even with ambitious energy efficiency and conservation measures—will continue to grow as our economy grows. While nuclear is not the only answer, there is no plausible solution that does not include it.

Just over a year ago, Deputy Secretary of Energy Clay Sell testified before this committee on the Department's *Nuclear Power 2010* program and the risks associated with building the first few nuclear plants. Since then, significant progress has been made, in both Nuclear Power 2010 and in terms of mitigating the risk associated with building the first few new nuclear plants.

Last year, President Bush proposed and Congress created Federal risk insurance, called *Standby Support,* as part of EPACT 2005 to protect first movers of new nuclear plants from regulatory or litigation-related delays that are outside of the control of these first movers. I am pleased to report that earlier this month the Department issued the interim final rule for the Standby Support program on-schedule, establishing the requirements for risk insurance to cover costs associated with covered delays. We look forward to receiving comments on the interim final rule over the next month and issuing the final rule by August 8, 2006, the one-year anniversary date of EPACT's enactment.

In addition, EPACT 2005 contains other key provisions aimed at addressing economic and regulatory risks associated with building new nuclear plants—extension of Price Anderson Act indemnification, creation of a production tax credit program for new advanced nuclear generation, and creation of a loan guarantee program for advanced low-emissions energy systems, including nuclear energy.

With enactment of these provisions and the continued work of the Department and industry, I am confident that we will have these programs fully in place on a schedule that supports the construction schedule for the first movers of new advanced nuclear power plants. I firmly believe that we will see new plants ordered before President Bush leaves office. It is a key priority for the President, for the Department, and for me. Today, it is appropriate that we pause to review what has been accomplished and where we go from here. I would like to thank you for holding this hearing.

NUCLEAR ENERGY, KEY TO U.S. ENERGY SECURITY

Benefits, Challenges, and Opportunities

The Energy Information Administration forecasts that U.S. energy demand will increase by one-third between 2004 and 2030, climbing to 134 quadrillion British thermal units (Btu). At the same time, most of the growth in energy demand will occur in the petroleum and electricity sectors. Electricity sales, which are most germane to nuclear, are forecast to increase from 3,567 billion kilowatt hours in 2004 to 5,341 billion kilowatt hours in 2030, more than 50 percent over the next 25 years. At the same time, carbon emissions from combustion of fossil fuels are forecasted to increase by more than one-third over present levels, from 5,900 million metric tons in 2004 to 8,114 million metric tons in 2030.

Nuclear energy is an important technology for maintaining our economy and our way of life with minimal impact on the environment. Nuclear power is the only mature technology with significant potential to deliver large amounts of emissions-free baseload power to meet projected demand for electricity. In the future, as the country turns to other sources of energy for transportation, such as hydrogen, nuclear energy may also be an important technology for producing hydrogen without carbon emissions. While this hearing is focused on near-term deployment of new nuclear plants, it is important to recognize that the benefits of nuclear extend beyond electricity, to medicine, space exploration, and possibly in the future, through hydrogen production, to transportation.

In the U.S. today, 103 nuclear plants provide one-fifth of the nation's electricity. These plants are emissions-free, operate year round in all weather conditions, and are among the most affordable, reliable, and efficient sources of electricity available to Americans. Nuclear, like coal, is an important source of base-load power and is the only currently available technology capable of delivering large amounts of power without producing air emissions. Last year, the operation of U.S. nuclear power plants displaced 681.9 million metric tons of carbon emissions, which is almost as much carbon as released from all passenger cars combined.

Over the last 15 years, as ownership of nuclear plants has been concentrated, industry has done an exceptional job improving the management and operation of the plants. In this country, nuclear plants have an outstanding record of safety, reliability, availability, and efficiency. In fact, the operation of these plants over the last

15 years added the equivalent of 26[1]-1,000 megawatt units without building a single new plant. Longer periods between outages, reduction in the number of outages needed, power up-rates, use of higher burn-up fuels, improved maintenance, and a highly successful re-licensing effort extending the operation of these plants another twenty years, have collectively improved the economics of nuclear energy. Today, nuclear energy is among the cheapest electricity available on the grid, at 1.8 cents per kilowatt-hour. Public acceptance of nuclear energy is also higher than it has been at any time in the last 25 years—industry studies indicate more than three-quarters of Americans are willing to see a new reactor built near them and the vast majority (83%) of those living in the vicinity of a nuclear plant favor nuclear power.

Yet, despite these successes and growing recognition of the benefits and need for more nuclear energy, industry has not ordered a new nuclear plant since 1973 (an additional plant ordered in 1978 was subsequently cancelled). In fact, not much base-load capacity—whether nuclear, hydro-electric, or coal—has been ordered since the 1970s, other than some mine-mouth coal-fired plants located in the western United States.

While today's nuclear plants are economic, during their construction, the sponsors and owners of many of these plants experienced major financial and regulatory challenges that significantly drove up the capital cost of the plants and delayed their initial start-up. Although this is partially attributed to the recession of the 1970's, significant challenges were brought about by a difficult, uncertain, and often contentious regulatory process for siting and commissioning the plants. In addition, investment premiums were so high that capital markets could no longer support nuclear power plant projects. As a result, by the 1980's a large number of commercial orders were cancelled and no new orders were placed.

The Energy Policy Act of 1992 (EPACT 1992) authorized a "one-step," streamlined licensing process for construction and operation of new nuclear plants (also promulgated through Nuclear Regulatory Commission (NRC) regulations in 10 CFR Part 52). The combined Construction and Operating License (COL) process established by EPACT 1992 was intended to resolve all public health and safety issues associated with the construction and operation of a new nuclear power plant before construction begins. The process remained untested for the next decade as industry viewed the combination of high up-front capital costs and difficult-to-control regulatory risks as show stoppers to building new nuclear plants. In addition, during this time period there was surplus electricity, fuel costs of fossil fuels remained relatively stable, and additional base-load power was not needed.

The conditions are significantly different today, with rising fossil fuel costs, increased price volatility of fossil fuels, and increasing demand. As such, to address the economic and regulatory risks associated with new nuclear plants, in February 2002, the Department launched the Nuclear Power 2010 program. In July of that year, the Department issued a report on the critical risks associated with deploying new nuclear plants, and additional approaches that could be used for mitigation of the risks. More importantly, Congress and the Administration began working together to enact landmark legislation to address our nation's long-term energy security. Finally, EPACT 2005, enacted last summer extended Price Anderson indemnification, reauthorized Nuclear Power 2010, and created incentives that could remove the last barriers to deployment of a new generation of nuclear plants.

NUCLEAR POWER 2010

Demonstrating Regulatory Certainty

Nuclear Power 2010 addresses the regulatory and financial uncertainties associated with siting and building new nuclear plants by working in cost-shared cooperation with industry to identify sites for new nuclear power plants, by developing and bringing advanced standardized plant designs to the market, and by demonstrating untested regulatory processes. Nuclear Power 2010 is focused on Generation III+ reactor technologies, which are advanced, light water reactor designs, offering advancements in safety and economics over the Generation III designs certified by the Nuclear Regulatory Commission (NRC) in the 1990's.

Since the program was launched in 2002, DOE and industry have provided more than $270 million for the activities under this initiative. The Department has requested $54 million in Fiscal Year 2007 to continue the work under this program. While the funding requested for Fiscal Year 2007 is less than the current year appropriation, at the time of the request, the Department believed that the combination of the requested funding and projected carryover would provide the funding needed in FY 2007 to keep the program on schedule. However, at the end of Decem-

[1] Increase in nuclear generation between 1990 and 2005 with a 90% capacity factor.

ber 2005, one of the consortia refined its estimates and submitted its project baselines, shifting a number of key milestones forward, including the submittal of applications for combined COL a year earlier than envisioned by the original project plan. The consortium also proposed submitting an additional COL application to the NRC for a reactor technology already included in the program but at a different site. We did not request funding for these new proposals, which we estimate would cost an additional $34.2 million in Fiscal Year 2007.

The Department is currently sponsoring cooperative projects for preparation of Early Site Permits (ESP) for three commercial sites. The ESP process includes resolution of site safety, environmental, and emergency planning issues in advance of a power company's decision to build a new nuclear plant. The three ESP applications are currently in various stages of NRC review and licensing decisions are expected by the end of 2007.

In Fiscal Year 2005, the Department established competitively selected, cost-shared cooperative agreements with two power-company led consortia to obtain COLs. The Department selected Dominion Energy and NuStart, a consortium of nine electric generating companies, to conduct the licensing demonstration projects to obtain NRC licenses and operate two new nuclear power plants in the U.S. Dominion is examining North Anna in Virginia and NuStart is examining Bellefonte in Alabama and Grand Gulf in Mississippi. The two project teams involved in these two licensing demonstration projects represent power generation companies that operate more than two-thirds of all—the U.S. nuclear power plants in operation today. Already this approach has encouraged nine power companies to announce their intention to apply for COLs. Several have specifically stated that they are building on work being done in the Nuclear Power 2010 program as the basis for their applications. In addition, UniStar, a consortium of Constellation, AREVA and Bechtel Power, announced plans to pursue new nuclear plants. The design and engineering activities necessary to finish the preparation of the first COL application for submittal to the NRC will be completed in Fiscal Year 2007.

These projects include design certification and completion of detailed designs for Westinghouse's Advanced Passive Pressurized Water Reactor (AP 1000), General Electric's Economic Simplified Boiling Water Reactor (ESBWR) and site-specific analysis and engineering required to obtain COLs from the NRC. Under the Nuclear Power 2010 program, two COL applications are planned for submission to the NRC in late 2007. Industry is planning for issuance of the NRC licenses by the end of 2010. Several nuclear utilities have announced plans to quickly follow these with an additional 12 COL applications. It is possible that a utility decision to build a new plant could be announced as early as 2008 with construction starting in 2010 and a new plant operational by 2014.

STANDBY SUPPORT

Addressing Licensing Risk for First Purchasers

Last year, the President proposed and Congress established the Standby Support provisions of EPACT 2005 (section 638) to encourage building of new nuclear power plants in the U.S. by addressing financial risks to first "movers" of these new advanced plants. Under section 638, the Secretary can enter into contracts to insure project sponsors against certain delays that are outside the control of the sponsors and to provide coverage for up to six reactors but for no more than three different designs. The level of coverage is distinguished between the first "initial two reactors," for which the Secretary will pay 100 percent of covered costs up to $500 million per contract and "subsequent four reactors," for which the Secretary will pay 50 percent of covered costs up to $250 million after a 180-day delay. EPACT 2005 required the issuance of an interim final rule by May 6, 2006, and the issuance of the final rule by August 8, 2006.

As you know, the Department issued the interim final rule on May 6, 2006, establishing the requirements for risk insurance to cover costs associated with certain regulatory or litigation related delays in the start up of new nuclear power plants. The Department will receive comments on the rule over the next thirty days and issue the final rule by August 8, 2006.

The interim final rule establishes a two-step process for obtaining risk insurance. First, the project sponsor of a new advanced nuclear facility may seek to enter into a conditional agreement with DOE after the sponsor has an application docketed by the NRC for a combined construction and operating license for an advanced nuclear facility. Second, after all applicable requirements have been satisfied, including the issuance of a license by the NRC, the project sponsor and DOE may enter into a standby support contract.

The project sponsors for the first six reactors to satisfy the requisite conditions can qualify for reimbursement of certain losses that are associated with covered delays. The rule identifies events that would be covered by the risk insurance, including delays associated with the NRC's review of inspections, tests, analyses and acceptance criteria or other licensing schedule delays, and certain delays associated with litigation in state, federal, or tribal courts. Insurance coverage would not be available for the sponsor's failure to take actions required by law or regulation, events within the sponsor's control, and normal business risks such as employment strikes and weather delays. Covered losses would, subject to satisfaction of all requirements, include principal or interest on debt (subject to the Federal Credit Reform Act of 1990) and losses resulting from the purchase of replacement power to satisfy certain contractual obligations.

PRODUCTION TAX CREDITS

Addresses Economic Risk for First Purchasers

EPACT 2005 (section 1306) permits a taxpayer producing electricity at a qualified advanced nuclear power facility to claim a credit equal to 1.8 cents per kilowatthour of electricity produced for eight years. The provision also specifies a national megawatt capacity limitation of 6,000 megawatts. Only capacity up to this limitation will qualify for the credit. The tax credit is administered by the Department of Treasury, in consultation with the Department of Energy. The Department of Treasury has asked the Department to assist by developing a "certification process" under which the Secretary of Energy certifies that a facility is an advanced nuclear facility, that construction is proceeding on schedule, and that it is feasible to place the facility in service before 2021. The Secretary of Treasury will allocate the national megawatt capacity limitation of 6,000 megawatts only to facilities that have received such a certification.

On May 1, 2006, the Department of Treasury published a notice in the Internal Revenue Bulletin providing guidance on the production tax credit for advanced nuclear facilities. The notice specified the method that will be used to allocate the 6,000 megawatt capacity limitation and prescribed the application process by which taxpayers may request an allocation. It is anticipated that the notice will be subsequently converted to regulations.

LOAN GUARANTEES

Addressing Financial Risk and Promoting Emissions Free Technologies

EPACT 2005 (Title 17) authorizes the Secretary of Energy to enter into loan guarantees. The loan guarantees may be provided for projects that avoid, reduce, or sequester air pollutants or emissions of greenhouse gases and that use new and significantly advanced energy technologies, including advanced nuclear power plants.

The challenge that confronts the introduction of new nuclear generating capacity is the same challenge that confronts many energy systems—the up-front capital costs are substantial and the financial community views them as risky. In addition, the uncertainties caused by possible regulatory delays or delays from potential litigation, particularly as associated with new nuclear plants, further increase the risk to sponsors of new plants and their investors. While these licensing risks will be mitigated by the standby support program, loan guarantees potentially provide a tool for addressing risks associated with major energy projects.

Therefore, consistent with the new authorities provided to us by EPACT 2005, we are establishing a loan guarantee program within DOE for energy technologies that avoid, reduce or sequester pollutants or greenhouse gases. We are mindful that the Department does not have an enviable record of accomplishment with loan guarantees issued in the past, but we will follow the Federal Credit Reform Act of 1990 (FCRA) and the Office of Management and Budget (OMB) guidelines issued since our last experience with loan guarantees, and we will emulate the best practices of other Federal agencies. We will move prudently to ensure that the program objectives are achieved while meeting our responsibilities to the taxpayer. Toward that end, the Department has established a small loan guarantee office under the Department's Chief Financial Officer and is proceeding to staff that office with staff detailed from other programs and possibly staff from other agencies with experience in Federal loan guarantee programs. DOE staff is currently developing the overarching policies and procedures to implement the program and establish a credit review board. Finally, we will employ outside experts for financial evaluation, construction engineering evaluation, and credit market analyses to assist in the evaluation of loan guarantee applications.

We are proceeding but doing so with the appropriate measure of caution and prudence. While these provisions of EPACT 2005 provide a "self-pay" mechanism that

may reduce the need for appropriations, they do not eliminate the taxpayer's exposure to the possible default of the total loan amount. It is possible that the ultimate cost to the taxpayer could be significantly higher than the cost of the subsidy cost estimate. Therefore, DOE's evaluation of loan guarantee applications will entail rigorous analysis and careful negotiation of terms and conditions.

It is also our view that the Federal Credit Reform Act of 1990 contains a requirement that prevents us from issuing a loan guarantee until we have an authorization, such as a loan volume limitation, to do so in an appropriations bill. We do not believe we have the authority to proceed with an award without having explicit necessary authorizations in an appropriations bill.

CONCLUSION

Nuclear power is not the only answer to maintaining our economy and our way of life, but there is no plausible solution that does not include it. Mr. Chairman, I thank you and the Committee for being an early and serious voice encouraging the country to consider building more nuclear plants. This is a unique moment in time in which key drivers of new nuclear plants—increasing demand, price volatility in other electricity sectors, performance of the last decade, supportive government policies, and strong bi-partisan and public support have converged to create a foundation for a new generation of nuclear power plants in the United States. I pledge to this Committee that I will do all that I can to make this a reality.

The CHAIRMAN. Thank you very much. I'm sure we have questions, but we're going to proceed right down the line. We have now, the very distinguished and Honorable Chairman of the Nuclear Regulatory Commission, Chairman Diaz. I note that you have present somebody who is very dear to you, who must be here because she and you anticipate this may be your last appearance as Chairman. Thank you so much for joining us. Senator Bingaman, Zena is here. That is the wife of the Chairman, and we're very glad to have her. We're sorry that this is the occasion that brings you here. We would like him to be appearing for many more hearings, but you have twisted his arm one way and I have twisted it the other, and it's just about broken.

[Laughter]

The CHAIRMAN. So now, it's going to go your way, but we did get him for awhile for which we thank you. Mr. Chairman, please tell us how you think things are going with the passage of the act of the law and we thank you for helping us with the law. And we hope we did most of what you think we should've done.

STATEMENT OF DR. NILS J. DIAZ, CHAIRMAN, U.S. NUCLEAR REGULATORY COMMISSION

Dr. DIAZ. Thank you, Mr. Chairman, Senator Bingaman, Senator Thomas. It's really for me, a pleasure for me to appear before you today on behalf of the Commission to discuss the U.S. Nuclear Regulatory Commission's preparations and programs to exercise our statutory responsibility for comprehensive and timely licensing reviews of new nuclear powerplant applications.

The Commission appreciates the support we have received from the committee. I would also like to thank the Congress for the continued budgetary support we have been receiving. These resources are needed for the Agency to achieve earlier completion of enhancements to safety and security programs and to prepare and structure the Agency for reviewing many new reactor applications concurrently.

On a personal note, Mr. Chairman, I'm grateful for the opportunity to serve this great country of ours for almost 10 years. First as a Commissioner and then as Chairman of the best nuclear regu-

latory agency in the world, and during extraordinary times. It has been my privilege to have worked with you and the members of the committee, to better serve the well being of our people.

The NRC is dedicated to the mission mandated by Congress and we are committed to exercising this mandate with a licensing and oversight regulatory framework that is effective, predictable, and continues to meet the changing demands of the country. In fact Mr. Chairman, we've just done that for the existing fleet of nuclear powerplants, including responding to the need for license amendments, license renewals, and powerplant applications. These experiences have prepared the NRC and I believe have prepared the industry to address the new work before us with better programs and better accountability.

10 CFR Part 52 established a framework for new reactor licensing reviews including early site permits, design certifications, and combined license applications. Reactor licensing is not all new for the NRC or the industry. Although reviewing combined license applications will use a new and different framework consistent with the law to conduct safety licensing reviews. This framework is intended to result in a combined one step construction and operating license. The NRC continues to put in place a comprehensive licensing infrastructure to conduct the review of anticipated combined license applications including the 13 announced combined licenses for a probable 20 units, beginning in 2007. We're also aware of three additional applications for a probable five units that have not yet been publicly announced. And the graph that is right in front of you shows an anticipated workload and when they're expected to arrive.

The staff is planning to implement a design-centered approach to efficiently review multiple combined license applications in parallel. We believe this approach is crucial to completing timely reviews for multiple applications and is founded on the concept of "one issue, one review, one position for multiple applications." It will optimize the review effort and the resources needed. The benefits of a design-centered licensing review would be enhanced by the full participation of multiple entities in ensuring that pertinent components of the applications are standardized. A schematic representation of the sequencing and use of the design-centered review approach is shown in the second graph.

Mr. Chairman, I just returned from California where I had the opportunity to address both senior and new leaders of the nuclear industry. The Nuclear Energy Assembly was challenged by many distinguished speakers including the President and both the chairman and ranking member of this committee. In the regulatory arena I presented a key challenge to applicants: first, the early site permit, design certification, or the combined license application must be acceptable for docketing by the staff and that implies that applications must be of high quality. But that is not sufficient, Mr. Chairman. The industry should ensure that the application contains the necessary and sufficient documentation for the review to be finished in a timely manner. With such an application in hand, I am convinced that the agency has the safety decision-making capability to act in a timely manner and serve the needs of the American people.

The NRC understands and is committed to fulfill its role in new reactor licensing, without missing a step in ensuring the safety and security of the 103—probably next year, 104 operating reactors. I truly appreciate the opportunity to appear before you today, and I look forward to continuing to work with the committee. I welcome your comments and questions. Thank you, sir.

[The prepared statement of Dr. Diaz follows:]

PREPARED STATEMENT OF DR. NILS J. DIAZ, CHAIRMAN, U.S. NUCLEAR REGULATORY COMMISSION

INTRODUCTION

Mr. Chairman and members of the committee, it is a pleasure to appear before you today to discuss, on behalf of the Commission, the U.S. Nuclear Regulatory Commission's programs for new reactor regulation. We appreciate the support that we have received from the Committee, and we look forward to working with you in the future. We would also like to take this opportunity to thank Congress for the additional budgetary support that was provided last year. These resources are allowing the Agency to achieve earlier completion of safety and security programs and to begin structuring the Agency for reviewing new reactor applications. On a personal note, Mr. Chairman, I am grateful for the opportunity to serve this great country of ours for almost 10 years, first as a Commissioner and then as Chairman of the best nuclear regulatory agency in the world, and during extraordinary times. It has been my privilege to have worked with you to better serve the well-being of our people.

The NRC is dedicated to the mission mandated by Congress—to ensure adequate protection of public health and safety, promote the common defense and security, and protect the environment—in the application of nuclear technology for civilian use. We are committed to exercise this mandate with a regulatory framework that is effective, predictable, and that continues to meet the changing demands of the country. To achieve this goal, we have made preparations and continue to put in place the infrastructure needed to review the announced new reactor licensing and certification work, including the 13 announced combined license (COL) applications beginning in 2007. I would like to highlight our current and anticipated new reactor regulatory activities, a new system for licensing reviews, and new human capital and space planning initiatives designed to meet the new challenges posed by the dynamic nature of today's nuclear arena. The continued safe and secure operation of the current fleet of operating nuclear power plants remains the Agency's top priority; therefore, the new reactor licensing activities are being carefully planned to ensure the continued safe operation of these facilities.

NEW REACTOR LICENSING WORKLOAD

The Commission's Strategic Plan establishes a fundamental objective to:

> Enable the use and management of radioactive materials and nuclear fuels for beneficial civilian purposes in a manner that protects public health and safety and the environment, promotes the security of our nation, and provides for regulatory actions that are open, effective, efficient, realistic, and timely.

Consistent with this objective and our statutory responsibility, the NRC has been conducting reviews of Early Site Permit (ESP) and Design Certification (DC) applications, and is developing an efficient infrastructure to conduct the review of anticipated combined license (COL) applications in the future.

As a result of the passage of the Energy Policy Act of 2005 and concurrent developments in U.S. energy demands, the NRC is preparing for an increased number of potential COL, ESP and DC applications. The Energy Policy Act incentives for new reactor construction established a highly dynamic environment in which new nuclear power plants are being seriously considered to meet future generation capacity, the need for which is expected to increase by the year 2015. Last year at this time, the NRC had been notified of three potential COL applications in the next few years. Today, the number of expected COL applications is 13 for a total of 19 units, and the number of applications is expected to increase in the near future. Some of these applications are expected to reference reactor designs already certified by the NRC, while others are expected to reference designs that are currently under NRC review. We also expect to be conducting reviews of additional ESP applications, or equivalent environmental reviews. We are preparing to review and act

on applications anticipated to be submitted in the 2007-2008 time frame, and are organizing accordingly. We continue to assess our resource needs, which have increased significantly, in light of the very substantial increase in the number of anticipated COL applications and related work. The attached graph 1* shows the anticipated work schedule based on industry submittals, public announcements, and expected but as yet unannounced applications.

CURRENT NEW REACTOR LICENSING ACTIVITIES

Current new reactor licensing activities are expected to follow the processes established under 10 CFR Part 52. Part 52 establishes the framework to review ESP, CD, and COL applications.

The Commission recently proposed a revision to 10 CFR Part 52, to clarify it and enhance its usability. The proposed amendments incorporate the lessons learned from previous regulatory reviews, to enhance regulatory predictability at the COL stage. Furthermore, in the Part 52 rulemaking, the Commission is soliciting comments on an approach that would facilitate amendments to design certification rules after the initial certification. With such a provision, a detailed standard certified reactor design would be able to incorporate additional features that are generic to the design and thereby encourage further standardization. Also, changes to the limited work authorization process are being considered to expand the ability to initiate site preparation work in advance of COL issuance. The Commission plans to issue the final rule by January 2007.

NRC's licensing reviews are supported by regulatory guides and standard review plans. The NRC staff is reviewing and revising the regulatory guidance documents associated with new reactor licensing. These guidance documents include a planned combined license application regulatory guide which contains the information that COL applicants need to provide in their applications, and an update of pertinent standard review plan (SRP) sections for use by NRC staff reviewing COL applications. The Draft Regulatory Guide, which has been the subject of numerous public meetings and workshops, will be formally issued for comment in June 2006. The NRC staff estimates that the final regulatory guide will be completed by December 2006, to support prospective applicants who are planning to submit COL applications in late 2007 and 2008. This schedule is consistent with the schedule for the promulgation of the revised Part 52 rule. Complementary to the COL application regulatory guide, the NRC staff is updating the standard review plan to support the anticipated new site and reactor licensing applications. The staff is working with the industry to complete the standard review plan updates by the Spring of 2007.

To date, the NRC has received three ESP applications, focusing on environmental implications and emergency preparedness, for sites in Virginia, Illinois, and Mississippi which currently have operating reactors on them. The NRC staff has prepared safety evaluation reports for all three sites, and has issued draft environmental impact statements for public comment for two of the sites and has issued a final environmental impact statement for one of the sites. The agency will complete its remaining regulatory reviews in an effective, efficient, timely, and predictable manner. I note that additional work is being performed in connection with one application that was recently significantly revised and resubmitted by the applicant. Adjudicatory proceedings associated with the ESP applications are currently ongoing. From our experience with the ESP reviews, we have identified numerous lessons learned, for both the NRC and industry, that will be used to improve the staff's new reactor licensing process in the future and will be implemented prior to the next ESP application, expected during the summer of 2006.

The agency's work on new reactor standardized design certification has also intensified. Three designs were previously certified: General Electric's Advanced Boiling Water Reactor, Westinghouse's AP600, and System 80+ designs. The NRC recently certified the Westinghouse API 000 reactor and codified it in the NRC's regulations, as Appendix D to 10 CFR Part 52. The NRC is currently reviewing the General Electric Economic Simplified Boiling Water Reactor (ESBWR) design certification application and is on schedule with respect to its review. The NRC is conducting pre-application activities for AREVA's U.S. Evolutionary Power Reactor (EPR) design whose design certification application is expected in 2007. The NRC is also conducting limited pre-application work for the Pebble Bed Modular Reactor (PBMR) and the International Reactor Innovative and Secure (IRIS), and is expecting additional design certification applications in the future.

To effectively review multiple COL applications in parallel, the staff is planning to implement a design-centered review approach. We believe this approach is crucial

*Graphs 1 and 2 have been retained in committee files.

to achieving effective, efficient, and timely reviews for multiple applications. This approach is founded on the concept of "one issue-one review-one position for multiple applications" to optimize the review effort and resources needed to perform these reviews. The NRC staff would use a single technical evaluation for each reactor design to support reviews of multiple COL applications for the same technical area of review, assuming that the relevant components of the applications are standardized. The design-centered approach will focus its reviews by: 1) using standardization and coordination of approaches and applications; 2) requiring complete and high-quality applications; 3) increasing the use of the DC rulemaking to codify issue closure; and 4) using single technical evaluations to support multiple COL applications. In addition, to achieve consistency of the staff reviews, the process for implementing the design-centered review program will require a multi-layered project management team for each design, and will use dedicated technical review resources. The plans and schedules of these reviews include an increased level of detail and integration to achieve the requisite level of control and documentation. The benefits of this approach would be enhanced by the full participation of multiple entities in ensuring that pertinent components of the applications are standardized. A schematic representation of the sequencing and use of the design-centered review approach is shown in graph 2. Significant efficiencies are expected to be gained through the use of the design-centered approach.

NEW REACTOR CONSTRUCTION OVERSIGHT

To prepare for the construction of new reactors licensed in accordance with 10 CFR Part 52, a new construction inspection program (CIP) is being developed. The new CIP builds on the lessons learned from the construction of the existing fleet of operating reactors. The CIP comprises four different parts, early site permit inspections; pre-combined license (Pre-COL) inspections; inspections, tests, analyses and acceptance criteria (ITAAC) inspections; and non-ITAAC Inspections. These inspections will cover all aspects of new plant construction and operation from early site preparation work, through construction, to the transition to inspections under the reactor oversight process (ROP) for operating reactors. Half of the associated inspection procedures are in place and the remaining procedures are under development and are scheduled to be in place well before the start of on-site construction activities.

Successful implementation of the CIP will require four main functions: 1) day-to-day inspections at the construction site by resident construction inspectors; 2) on-site inspections by specialist inspectors; 3) off-site inspections (e.g., vendor inspections); and 4) documentation of inspection results and public notification of the successful completion of the ITAAC. ITAAC are part of the combined license and define specific requirements to be met prior to operation. To gain staff efficiencies and facilitate knowledge transfer, all construction inspection management and resources will be located in a single region which will schedule all construction inspectors nationwide.

The NRC performed an initial assessment of the existing ROP for use with new reactor designs which confirmed that the overall ROP framework could be used, including utilizing performance indicators and the significance determination process for evaluating inspection findings. The Construction Inspection Program will specifically address each new reactor to be built, detailing the steps that will be employed to integrate that plant into the ROP as it transitions from the construction phase into the startup and operations phase.

MULTINATIONAL DESIGN APPROVAL PROGRAM (MDAP)

The NRC is working with international regulators on a multinational design approval program intended to leverage worldwide nuclear knowledge and operating experience in a cooperative effort to review reactor designs that have been or are being reviewed and approved in other countries. The first stage of the MDAP has already begun. It involves enhanced cooperation with the regulatory authorities in Finland and France to assist NRC's future design certification review of the US EPR. Follow-on stages of the MDAP could foster the safety of reactors in participating nations through convergence on safety codes and standards, and other technical matters while maintaining full national sovereignty over regulatory decisions. Preliminary work to more fully develop the framework for consideration of a Stage 2 is underway at the NRC and the Organization for Economic Co-operation and Development's Nuclear Energy Agency.

CHALLENGES TO SUCCESS

The NRC recognizes that many challenges for new reactor licensing activities exist. Key challenges include effective communication between the NRC and the applicants, and the interrelationship between the technical review and the associated adjudicatory process. To successfully complete the reviews within the anticipated schedule, continuous clear, effective, and timely communication between the NRC and the applicant must occur. Delays in providing or responding to requests for information must be avoided and any modifications to the application need to be conveyed immediately so that products can be appropriately coordinated. In addition, the technical review and adjudicatory process for the application are interrelated and both are required for the final decision making process. Multiple products are also needed to maximize the early resolution of issues leading to a final determination, including an ESP, DC and COL. An applicant may decide to submit a license application in a manner different from the originally contemplated sequence, such as choosing not to apply for an ESP prior to applying for a COL or selecting a design that has not been certified through rulemaking. In such cases, the technical review and adjudicatory process performed for an ESP or DC review will need to be included in the COL review and could challenge the predictability of the process and the application review schedule. To meet these challenges, we have implemented organizational changes in our legal and technical organizations, recruited personnel, and are developing an integrated planning tool to assist in coordinating the applicant schedules.

The NRC has completed substantial preparation activities and executed reviews of supporting elements for COL applications. We continue to incorporate the lessons learned from current reviews into the regulatory process to create a stable and predictable regulatory process. As such, the NRC is preparing to conduct thorough and timely reviews of ITAAC and, therefore, the use of the Energy Policy Act Risk Insurance Program, due to NRC delays should not be necessary. As noted previously, when COL applications are submitted, they should be high quality, essentially standardized applications that contain the safety case and other required components in the level of detail that will support staff review and the adjudicatory process. Anything less may challenge the predictability of the licensing process.

The NRC understands and accepts its role in new reactor licensing, the success of which depends on many factors, most notably the submittal of high quality applications by the industry. With the continued support of Congress, we will carry out our responsibilities and meet the challenges ahead.

HUMAN CAPITAL AND SPACE PLANNING

As you know, the NRC's ability to accomplish its mission depends on the availability of a highly skilled and experienced work force. In a recent ranking of the Top 10 Federal Work Places by the Partnership for Public Service and American University's Institute for the Study for Public Policy Implementation, the NRC was designated one of the top three places to work in the Federal government. In addition, the NRC was ranked first by people surveyed who are under 40 years of age. The Commission is very proud of these rankings and strives to improve the quality of the work environment for NRC employees. Nonetheless, the NRC continues to be challenged by the substantial growth in new work at a time when increasing numbers of experienced staff are eligible to retire. To address these challenges, the agency has developed human capital strategies to find, attract, and retain staff with critical-skills and has developed a space acquisition plan to accommodate these additional employees.

The NRC is aggressively recruiting a mixture of recent college graduates and experienced professionals to meet the agency's emergent work activities. The current projection is that over 400 additional FTEs will be devoted to new work by FY 2008. The Commission is striving to hire approximately 350 new employees in FY 2006 to cover the loss of personnel and to support growth in new work. To date during this fiscal year, we have already succeeded in recruiting and hiring almost 300 new employees toward this goal. Our aggressive efforts to recruit, hire, and develop staff will continue throughout Fiscal Year 2007 as we prepare for receipt of the first COL applications. The agency expects to have a critical hiring need for at least the next five years.

The NRC closely monitors its voluntary attrition rate including retirements, which has historically been below six percent, and will continue to monitor this rate because it could increase as industry competition for skilled individuals increases and as eligible staff retire. The agency uses a variety of recruitment and retention incentives to remain competitive with the private sector. We continue to experience success utilizing the provisions of the Federal Workforce Flexibility Act of 2004 and

the Energy Policy Act of 2005. The NRC has budgeted for continued and increased use of these recruitment and retention tools in the coming years.

Our steady growth and accelerated hiring program have exhausted available space at our Headquarters buildings. We have developed and are implementing strategies to obtain adequate space to accommodate our expanding work force. We are creating additional workstations within our Headquarters buildings, including building workstations in conference rooms, and are moving our Professional Development Center off-site to use the space it currently occupies for new employees. We are also seeking additional office space in the immediate vicinity of our headquarters complex to support the expected growth of the agency.

The NRC will be continually challenged to maintain adequate infrastructure and the personnel needed to accomplish its mission. However, with Congress' help, the Commission is poised to meet these challenges successfully through the ongoing human capital planning, implementation, and assessment process, the space planning program, and the various tools provided by the Energy Policy Act of 2005.

CONCLUSION

The Commission continues to be committed to ensuring the adequate protection of public health and safety and promoting common defense and security in the application of nuclear technology for civilian use. To that end, the Commission is dedicated to ensuring that our agency is ready to meet the expected demand for new reactor licensing. NRC's Part 52 processes are safety focused and are stable, efficient, and predictable. We have taken action to clarify Part 52, to ensure a clear regulatory and oversight framework; to reorganize the Agency and put in place the processes to ensure timely review; to meet the NRC's human capital and office space needs, and to seek additional funding as necessary. The Agency is prepared to meet the challenge associated with new reactors while maintaining strong oversight of the current operating reactors. I am convinced that the Agency has the technical and legal know-how to make the right decisions in a timely manner.

I appreciate the opportunity to appear before you today, and I look forward to continuing to work with the Committee. I welcome your comments and questions.

The CHAIRMAN. Thank you very much, Mr. Chairman. What a pleasure it has been. Now James Asselstine, we would like to hear from you. And please tell us a little bit about your background and then deliver your comments. Your statement will be made a part of the record.

STATEMENT OF JAMES K. ASSELSTINE, MANAGING DIRECTOR, LEHMAN BROTHERS, INC., NEW YORK, NY

Mr. ASSELSTINE. Thank you, Mr. Chairman. I'm managing director at Lehman Brothers, where I work with large institutional investors who have traditionally financed the power and the generation industry. So my comments today will provide a frame of reference from the financial community on where we are with the implementation of the Energy Policy Act.

Mr. Chairman, although we are still at an early stage in the process and no company has yet placed a firm order for a new nuclear unit, there's clear evidence from the level of activity within the industry over the past 9 months that the nuclear power provisions in the Energy Policy Act are having their intended effect of facilitating and encouraging new plant development.

Over the past 9 months, those of us in the financial community have become increasingly familiar with the level of activity and the seriousness of the industry's efforts, leading toward plant commitments. From a financing perspective, investors will need confidence that a new nuclear plant can be built on a predictable schedule and for a predictable cost, that the cost will be competitive with that of other available base-load generating alternatives such as coal, and that they will be protected against the risk of licensing and

litigation delays at least until the new NRC licensing process has demonstrated a track record of successful performance.

Mr. Chairman, enactment of the provisions in the Energy Policy Act was the first critical step in meeting these financing requirements, and I believe that they provide the essential building blocks, but much of the detailed work remains ahead of us. It is therefore critically important for this committee and other committees of the Congress to continue monitoring and oversight of the implementation of the provisions of the act.

With your permission, I'll touch on just a few of the implementing provisions that have taken place to date. With regard to the production tax credit, on May 1, the Internal Revenue Service issued a bulletin providing interim guidance on the eligibility and allocation of the production tax credit for new nuclear plants. The guidance has the effect of encouraging the early filing of combined license applications before 2009, but of allocating the available tax credits proportionately among all of the plants that begin construction by 2014. This should have the beneficial effect of encouraging a larger number of new applications, although the economic benefit on a per plant basis could be reduced if the total generating capacity of the eligible plants exceeds 6,000 megawatts.

Issuing final regulations for implementing this interim guidance will provide certainty and predictability for financing purposes. In addition, in order to maximize the availability of alternative financing sources, it would be helpful if the final regulations permit the transfer of the production tax credits to passive equity partners who may not be utilities or electric generating companies.

Concerning the standby support insurance provision, the Department of Energy has done substantial work, as the Assistant Secretary described, to develop its implementing regulations. This is a complex rulemaking, and the current public comment period should provide an opportunity to ensure that the provisions in the rule are clear and workable. The risk of cost increases due to regulatory and litigation delay is a significant concern for investors, and the Department's final regulations will likely be a critical ingredient in the ability to finance the initial new plants. One missing element in the Department's implementing regulations is the methodology for determining the cost to the project sponsor of providing this delay risk insurance. This will be an important component in calculating the overall project cost and in assessing the value and availability of the risk insurance provision.

With regard to the loan guarantee provision in the act, the Department of Energy has not yet issued proposed regulations. The availability of Federal loan guarantees, in conjunction with the production tax credit, offers the greatest potential to reduce the cost of the initial new nuclear plants to levels that are competitive with other baseload generating alternatives.

In addition, for certain financing models for a new nuclear plant, a Federal loan guarantee may be required to provide the debt component of the financing. Further, as is the case with the standby risk insurance, the methodology for determining the cost of the loan guarantee to the project sponsor will be an important factor in assessing the availability and value of the loan guarantee. For these reasons, the Department's implementation of the loan guar-

antee provision is likely to be an important component in ensuring the availability of financing for the initial plants. Given the importance of the loan guarantee provision, the Department may wish to consider a more open and collaborative process for the loan guarantee regulations similar to the one that it used in developing the standby risk insurance regulations.

Finally, Mr. Chairman, I want to offer a few comments on the NRC licensing process. Although the standby insurance provisions are very helpful for the initial plants, it is clear that investor confidence needed to support the financing of a number of follow-on new nuclear units will depend upon the successful operation of the NRC licensing process in these early cases. It is apparent that the Commission could well face, as Chairman Diaz has described, the need to review a sizable number of new applications of differing types—design certifications, early site permits, and combined licenses—concurrently.

Moreover, the NRC has begun a major revision of its regulations, regulatory guides, and standard review plans for new combined licenses at the same time that the industry is preparing its applications. The potential number of applications, the interaction of the various types of approvals, the potential for duplication of effort, and the need to coordinate the development of new regulations and regulatory guidance with the industry's license application preparation work all pose substantial challenges. If this process is to work smoothly and efficiently, we will need stability and continuity within the NRC, active management involvement by the Commission and the senior NRC staff, and close coordination between the NRC staff and the industry. The NRC will also need sufficient resources to conduct its reviews in an efficient and timely manner.

Mr. Chairman, thank you for the opportunity to testify and this completes my testimony.

[The prepared statement of Mr. Asselstine follows:]

PREPARED STATEMENT OF JAMES K. ASSELSTINE, MANAGING DIRECTOR, LEHMAN BROTHERS, INC., NEW YORK, NY

Mr. Chairman and members of the Committee, thank you for the opportunity to appear before you today.

My name is Jim Asselstine. I am a Managing Director at Lehman Brothers, where I am the senior fixed income research analyst responsible for covering the electric utility and power sector. In that capacity, I provide fixed income research coverage for more than 100 U.S. electric utility companies, power generators, and power projects. As a research analyst, I also work closely with the large institutional investors who. have traditionally been a principal source of debt financing for the power industry.

I appreciate your invitation to testify at today's hearing regarding the nuclear power provisions contained in the Energy Policy Act of 2005. My testimony will provide a financial community perspective on the current industry activities that may lead to applications to construct and operate new nuclear power plants, and the efforts by the federal government to implement the nuclear power provisions in the Energy Policy Act of 2005.

Mr. Chairman, I believe that you, the Ranking Minority Member, and the other members of this Committee deserve enormous credit for your efforts leading to the enactment of comprehensive energy legislation last year. Thanks to many of the initiatives and incentives in the Act, the industry is now embarking on a new construction cycle including investments to upgrade and expand transmission and distribution system reliability, to ensure environmental compliance for our large coal-fired generation fleet, and to add much-needed new baseload generating capacity. These new investments will require new sources of financing for the industry.

The Energy Policy Act contained four provisions that were intended to facilitate and encourage industry commitments to build and operate new nuclear power plants in this country. First, the Act included a 20-year extension of the Price-Anderson Act, which provides insurance protection to the public in the event of a nuclear reactor accident. With the previous expiration of the Price-Anderson Act, insurance coverage for the public remained in place for our existing 103 operating nuclear units, but that coverage would not have been available for new plants. The 20-year extension of the Price-Anderson Act corrected this problem. Second, the Act provided a production tax credit of 1.8 cents per kilowatt-hour for up to 6,000 megawatts of generating capacity from new nuclear power plants for the first eight years of operation. This production tax credit is subject to an annual cap of $125 million for each 1,000 megawatts of generating capacity. A similar production tax credit was provided, and has historically been available, for certain renewable energy resources. Third, the Act provided standby support or risk insurance for a new nuclear project's sponsors and investors against the financial impacts, including financing costs, of delays beyond the industry's control that may be caused by delays in the Nuclear Regulatory Commission's licensing process or by litigation. This standby risk insurance for regulatory and litigation delays provides protection for the first six new nuclear units built. Up to $500 million in protection is provided for the first two new units, and 50 percent of the cost of delays up to $250 million, with a six-month deductible, is provided for units three through six. Finally, the Act provided for federal loans and loan guarantees for up to 80 percent of the project's cost. These federal loan guarantees were made available to support the development of innovative energy technologies, including advanced nuclear power plants, that avoid or reduce certain air pollutants and greenhouse gas emissions.

Mr. Chairman, although we are still at an early stage in the process and no company has yet placed a firm order for a new nuclear unit, there is clear evidence from the level of activity within the industry over the past nine months that these provisions in the Energy Policy Act are having their intended effect of facilitating and encouraging new plant development. Three companies, Exelon, Dominion Resources, and Entergy, have filed applications with the Nuclear Regulatory Commission for early site permits (ESPs), and the NRC review process is now underway. Other companies have announced that they are planning or considering early site permit applications as well. Of the three new plant designs that appear to be of the greatest interest to the industry, one has received its design certification from the NRC, and the review processes for the remaining two are either underway or will begin within about a year. Finally, nine companies have announced that they are preparing a total of 11 applications for a combined license (COL) for as many as 19 new units, to be submitted to the NRC in 2007-2009. Taken together, the industry is investing more than $1.5 billion in the engineering, design, license preparation, and long-lead time procurement activities needed to support these applications. Over the past nine months, those of us in the financial community have become increasingly familiar with the level of activity and the seriousness of the industry's efforts leading toward new plant commitments.

Mr. Chairman, the process of planning, developing, licensing, building, and financing a new nuclear plant is likely to be very complex. From a financing perspective, investors will need confidence that a new nuclear plant can be built on a predictable schedule and for a predictable cost, that the cost will be competitive with that of other available baseload generating alternatives such as coal, and that they will be protected against the risk of licensing and litigation delays at least until the new NRC licensing process has demonstrated a track record of successful performance. Enactment of the provisions in the Energy Policy Act was the first critical step in meeting these financing requirements, but much of the detailed work remains ahead of us. It is therefore critically important for this Committee and other relevant committees of the Congress to continue to actively monitor and oversee the implementation of the provisions in the Energy Policy Act. To that end, I would offer a few comments on the implementation of the provisions in the Act to date.

With regard to the production tax credit, on May 1, 2006, the Internal Revenue Service issued a bulletin providing interim guidance on the eligibility and allocation of the production tax credit for new nuclear plants. Under the Service's interim guidance, in order to qualify for the tax credit, a company must file an application for a combined license by the end of 2008. Allocations of the tax credits for the 6,000 megawatts would subsequently be made for the plants which commence construction by the start of 2014. The Service's interim guidance seems to be sensible and practical, and consistent with the objectives of the statute. The guidance has the effect of encouraging the early filing of COL applications before 2009, but of allocating the available tax credits proportionately among all of the plants that begin construction by 2014. This should have the beneficial effect of encouraging a larger number of

new applications, although the economic benefit on a per plant basis could be reduced if the total generating capacity of the eligible plants exceeds 6,000 megawatts. Issuing final regulations implementing this interim guidance will provide certainty and predictability for financing purposes. In addition, in order to maximize the availability of alternative financing sources, it would be helpful if the final IRS regulations permitted the transfer of the production tax credits to passive equity partners who may not be utilities or electric generating companies.

Concerning the standby support or delay risk insurance provision, the Department of Energy has done substantial work to develop its implementing regulations. The Department has conducted an open and collaborative process, starting with the publication of its Notice of Inquiry and a public workshop last year, and more recently, with the publication of its interim final rules. This is a complex rulemaking, and the current public comment period should provide an opportunity to ensure that the provisions in the rule are clear and workable. The risk of cost increases due to regulatory and litigation delay is a significant concern for investors, and the Department's final regulations will likely be a critical ingredient in the ability to finance the initial new plants. One missing element in the Department's implementing regulations is the methodology for determining the cost to the project sponsor of providing this delay risk insurance. This will be a component in calculating the overall project cost and in assessing the value and availability of the risk insurance protection.

With regard to the loan guarantee provision in the Act, the Department of Energy has not yet issued a Notice of Inquiry or proposed regulations designed to implement this provision. The availability of federal loan guarantees for up to 80 percent of a project's cost, in conjunction with the production tax credit, offers the greatest potential to reduce the cost of the initial new nuclear plants to levels that are competitive with other baseload generating alternatives. In addition, for certain financing models for a new nuclear plant, such as ownership by an unregulated generating company or use of a single asset, non-recourse project finance structure, a federal loan guarantee may be required to provide the debt component of the financing. Further, as is the case with the standby risk insurance, the methodology for determining the cost of the loan guarantee to the project sponsor will be a factor in assessing the availability and value of the loan guarantee. For these reasons, the Department's implementation of the loan guarantee provision is likely to be an important component in ensuring the availability of financing for the initial plants. Given the importance of the loan guarantee provision, the Department may wish to consider an open and collaborative process for the loan guarantee regulations similar to the one it used in developing the standby risk insurance regulations.

Finally, Mr. Chairman, I wanted to offer a few comments on the NRC licensing process. Although the standby delay risk insurance provisions are very helpful for the initial plants, it is clear that investor confidence needed to support the financing of a number of follow-on new nuclear units will depend upon the successful operation of the NRC licensing process in these early cases. Chairman Diaz and his colleagues on the Commission invited me to participate in a Commission meeting last fall with industry representatives to discuss the types and timing of new applications that may be submitted for NRC review. It was apparent from that meeting that the Commission could well face the need to review a sizable number of new applications of differing types—design certifications, early site permits, and combined licenses—concurrently. Moreover, the NRC has begun a major revision of its regulations, regulatory guides and standard review plans for new combined licenses at the same time that the industry is preparing its applications. The potential number of applications, the interaction of the various types of approvals, the potential for duplication of effort, and the need to coordinate the development of new regulations and regulatory guidance with the industry's license application preparation work all pose substantial challenges. I am confident that the NRC can and will exercise its independent health and safety responsibilities. But if this process is to work smoothly and efficiently, we will need stability and continuity within the NRC, active management involvement by the Commission and the senior NRC staff, and close coordination between the NRC staff and the industry. The.NRC will also need sufficient resources to conduct its reviews in an efficient and timely manner.

Mr. Chairman, again, thank you for the opportunity to testify today, and this completes my testimony.

The CHAIRMAN. Thank you very much. Those are very, very good comments.

Senator Bingaman.

Senator BINGAMAN. Thank you very much, Mr. Chairman. Let me start with Mr. Asselstine. There's been some discussion that perhaps Yucca Mountain would start being seen as a spent fuel repository or excuse me, that there's a developing view that perhaps Yucca Mountain would not be developed as a spent fuel repository and rather that the administration's global nuclear energy partnership would be seen as causing a transformation of Yucca Mountain into a location that would receive only waste left after the spent fuel had been reprocessed and recycled in fast reactors.

In the distant future, how do you view that prospect? How do you view that prospect as it might affect future nuclear powerplant construction in this country?

Mr. ASSELSTINE. Well Senator, the long term solution for the spent fuel or waste is an important consideration for the financial community and it's also an important consideration for the industry as they look at new plant commitments. I agree with the chairman's comments earlier, that I don't believe that we actually have to have a repository or a long-term offsite storage facility in operation before the industry will be in a position to commit to build nuclear plants and before the financial community will be willing to finance them, but I think we do need to make continued progress.

The NRC, over the years, has periodically reviewed the ability to store spent fuel safely at the reactor sites and the NRC has consistently been able to determine that there is no safety reason why spent fuel cannot continue to be stored at plant sites. And I expect that that will be the case certainly, going forward. I don't see any safety problem or issue with storing the spent fuel at the reactor sites. But, there is a great deal of frustration within the industry and among State regulators and within the financial community about our inability to make further progress toward the Federal Government taking responsibility for the spent fuel, which is really part of the bargain in the Nuclear Waste Policy Act. And so I think we do need continued progress toward a longer term solution.

Ideally, starting to move some spent fuel off the reactor sites and having the Federal Government take direct responsibility for the fuel would be an important step in the right direction. Continued progress around Yucca Mountain, I think is also an important component. Some utilities may well decide that if they have to store spent fuel at the reactor site for an extended period of time, that that may be a problem in terms of new plant commitments.

In the case where you have regulated utilities, State regulators may decide that that is a problem. So, some degree of progress toward getting Yucca Mountain in operation or some alternative that provides for the Federal Government taking long-term responsibility for the spent fuel, I think is an important consideration.

Senator BINGAMAN. Thank you very much. Let me ask one other question. And this, I would direct to Dr. Diaz, but I know in your testimony you alluded to this also, Mr. Asselstine. So you might want to comment too, and that is simply does the NRC have the resources it needs to do all of these things that you've listed for us here? It looks to me like you have a very major increase in the workload at the NRC facing you over the next few years.

Dr. DIAZ. Senator, with your support we should have the resources that we need. We have been preparing for this every day, with a little more intensity. We received the support we needed last year. We received the support that we thought we needed this year from OMB and right now, we realized that we needed some additional support. The House just passed an additional potential appropriation of $40 million that we need to be able to get the space, the people, the infrastructure, and the computers in place to be able to take care of this work load.

This work load has changed. It changed dramatically in the past few months. The result obviously of the Energy Policy Act and the commitment of the industry to finally come forward and say, we're going to do this. We are getting ready. We have the things in place. We believe that with the additional support that we have requested, we will have what we need to take the necessary processes and put them in place on a timely schedule.

Senator BINGAMAN. Mr. Asselstine, did you have a comment?

Mr. ASSELSTINE. Yes, Senator Bingaman. Just a couple of brief comments. I think the Commission understands the magnitude of this task and certainly the chart that I think Chairman Diaz pointed to, points out the substantial licensing workload that will be involved. Given the industry interest here, we haven't done this in more than 30 years, as the Chairman pointed out.

So it will require resources and it will require the right kinds of resources, both within the industry and within the NRC. So that will be—it will be a challenge. People who understand the licensing process can work through this, develop the applications in sufficient level of detail, and processing those applications will be a challenge. This is, as I mentioned, a complex undertaking and a complex task, and it's one that we haven't done in a considerable period of time. So it is important that the Agency have the resources and the right resources in terms of people with experience to make this process work smoothly.

Senator BINGAMAN. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Bingaman.

Senator Thomas.

Senator THOMAS. Thank you. Well gentlemen, thank you and you're all experts in this field. Let me ask you a little more general questions that people probably have in their minds, how long has it been since there's been a nuclear plant put into production?

Dr. DIAZ. Ten years, 1996.

Senator THOMAS. Pardon me? Oh, 1996?

Dr. DIAZ. Yes, 1996.

Senator THOMAS. Actually, it's been longer than that since there's been much volume put into place. Isn't that correct?

Dr. DIAZ. That is correct. The number of plants started to wind down in the middle 1980's and the last plant——

Senator THOMAS. Why is that? Why haven't we had construction of nuclear plants right up until now? What has been the problem?

Mr. SPURGEON. Well I think we go back in history, Senator. During the late 1960's, early 1970's, there was a substantial increase in the number of plants ordered. There was a great optimism at the role that nuclear energy would play in our Nation's energy future during that period. And we seemed to—I remember the period.

I think we use to have a plant ordered about—perhaps every other month, almost. There would be some sort of an announcement of a new project. But then we had the Arab oil embargo of 1973, that created greatly increased cost of energy. We saw no elasticity of demand, where demand for electricity was reduced.

As that demand was reduced, plants were stretched out and some were cancelled. And in that process then, we began down a slope of longer construction times. And then as you know in the late 1970's, we had interest rates that went up to the 20 percent area in the United States and a recession. What that did is with a capital-intensive plant, which a nuclear plant is, caused the economics of nuclear power to be lessened. And then of course, toward the late—which is sort of like strike two in the nuclear business, strike three occurred. When we had the accident at Three Mile Island, and then basically, things came to a stop while we reevaluated safety systems. When plant construction schedules were stretched out even more, the inherent cost then continued to go up because interest rate during construction is the biggest cost of a nuclear plant. That sort of started us down the planned path of plant stretch outs and cancellations, which really put us in the doldrums, where we have been in the nuclear business until just recently. And I'll stop there, because I think you know the reasons why we're now turning back up.

Senator THOMAS. But do you think we are doing things that caused the difference now? Isn't it true that kilowatt-hour for nuclear is more expensive than coal?

Mr. SPURGEON.No, sir. I believe that——

Senator THOMAS. In the construction?

Mr. SPURGEON. Well in construction, capital cost for a nuclear plant is probably the most expensive unless you look at a coal plant that may have things like the latest in technology and perhaps, carbon sequestration. Now you're looking at something that—I'm not an expert in the cost of a coal plant, but I think you might get in the—a more comparable range, let me say, between coal and nuclear.

Senator THOMAS. We need to think a little bit why we don't have it. There are reasons. And see if we've done the things that need to be changed to cause this to happen.

Very quickly, what is the energy industry part of this from uranium standpoint, is what's going to happen to the stockpile? What is the position of DOE with respect to selling out of the stockpile, as opposed to what I might produce as a uranium producer?

Mr. SPURGEON. Well Senator, we don't sell out of the stockpile without doing an analysis, that would tend to show that we are not being detrimental. That is probably not the right word, but to the uranium industry, I've just met with representatives of the uranium industry. I don't know if you know, but I used to be in the business. We had a subsidy area in Casper, Wyoming.

Senator THOMAS. Used to be?

Mr. SPURGEON. Used to be.

Senator THOMAS. That's what I'm talking about.

Mr. SPURGEON. Well, that's why I think we are very sensitive. I'm pleased to see the price of uranium today is back to just about where it was before Three Mile Island. In the 1979 time frame,

that's the last time we saw $40 uranium and we're now getting back to the point.

Senator THOMAS. We're still not producing it.

Mr. SPURGEON. I think you have.

Senator THOMAS. Because people are concerned about the stockpile.

Mr. SPURGEON. Sir, the Department of Energy does not want to do anything to inhibit the development of domestic sources, production sources of uranium and there's been very little material that's actually been sold. In only one instance, where it was for a barter arrangement or to facilitate a barter arrangement.

Senator THOMAS. Thank you. Thank you, sir.

The CHAIRMAN. Senator Alexander.

Senator ALEXANDER. Thank you, Mr. Chairman. I was tardy because I was in Nashville on a biodiesel, trying to take a look at the impact of the tax incentive that the Senate gave to that form of alternative energy in the energy bill last year, which was another thing that the Congress has already done to work on energy. But even though I missed the testimony, may I ask one question? If it's already been answered, I'll just start listening.

The Tennessee Valley Authority is reopening the Browns Ferry Nuclear Plant. It looks to be on target, on budget for April 2007. And I believe it's about 1,200 megawatts of energy. What is the significance of that to the work you're doing, Secretary Spurgeon? If that does happen, what will that do to the renewal of interest in nuclear power?

Mr. SPURGEON. It is one more positive step, sir. It's the first one to actually be restarted after having been suspended, if you will. Personally, I would hope that perhaps the same sequence of events might happen at Watts Bar, for the unit that was suspended there. But it's very positive, I think. It shows that you can restart some of these construction projects that were suspended, that they can be completed. And while I don't know the exact number, I think the cost of power coming out of Browns Ferry is going to be very competitive.

Senator ALEXANDER. The Tennessee Valley Authority is also considering, as you indicated, the possibility of another unit at Watts Bar or new nuclear power facilities at Bellefonte. And as we search for a way to restart the nuclear industry in the United States, I have tried to encourage the TVA Board, that they're not just any old utility, they're a public utility. And a public utility ought to take some steps that a private utility might find more difficult to take, at least in the early stages.

What can we do, if anything, to create an environment that would make it easier for this large public utility to open one, two, maybe three nuclear powerplants? And in doing so, provide some momentum to the resurgence of interest in nuclear power?

Mr. SPURGEON. TVA is obviously a key player in the NuStart consortium as well, and I don't pretend to know all of the limitations of TVA, but I understand that they do have a loan limitation that might be somewhat constraining in terms of what participation they can have in new nuclear facilities.

But as you mentioned, the Bellefonte site is an excellent site. It is the one, or one of two, that are the principal sites for the

NuStart consortium with a pressurized water reactor, the other being Grand Gulf. So, I would hope that they would be in the center of this in terms of their participation. Now, how much they can participate with their loan limitation, that is one that I can't answer.

Senator ALEXANDER. Well they have a cash loan limitation, although this new plant is being paid for entirely out of revenues, not out of borrowing, perhaps because of the loan limitation. But it's always seemed to me, that TVA, because of its autonomy, had an ability to be a part of entities that were interested in moving ahead. And TVA, either because it had sites, or because it had a different sort of regulatory structure, might be able to contribute those aspects to a consortium and make it more comfortable for a private investor to move ahead. TVA can do some things because of those two aspects, at least, that a private investor might be reluctant to do as the industry restarts.

Dr. DIAZ. Senator, I just want to point out that the case of Browns Ferry is in many ways, an extraordinary case. It is a plant that operated for many years and was shut down, and has an operating license. And TVA decided, they needed the base load power and decided to put the $1.7—$1.8 billion into refurbishing that plant. In many ways, I think Browns Ferry points out the need for a regulatory process that is supported by the industry's high quality applications that will result in timely reviews, because the key reason for Browns Ferry to proceed was they had a license. And so, it was a less riskier path for them to actually go ahead and make that investment, because they have a license.

I believe that what we have done with the Energy Policy Act of 1992, is create a new framework that would allow the development of a regulatory infrastructure that needs to be very well supported by the industry to be able to avoid those issues, so no longer is not having an operating license an impediment. We need to be able to make sure that we have the capability to license these new facilities.

Senator ALEXANDER. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much, Senator.

Mr. Asselstine, did you have some comment?

Mr. ASSELSTINE. Just maybe one additional comment, Mr. Chairman. I think TVA does have considerable flexibility in terms of its ability to contribute assets and resources. Certainly the Bellefonte site and some of the development work that went on at Bellefonte is an asset that they can contribute.

I would also say, that I thought TVA was quite creative in working with its customers to help with the financing of the refurbishment of Browns Ferry Unit 1. I think that was a very successful element here and perhaps something similar could be done, either for Bellefonte, or potentially for an add-on unit at Watts Bar, as well.

Senator ALEXANDER. Thank you for that suggestion.

The CHAIRMAN. Well let me proceed for a little while on this issue of nuclear power and the Nation. First of all, as I see it, there need not be any worry about competition between coal and nuclear, as sources of powering of electric generating powerplants for America's future; we need both. There is no question our future is built

around diversity of energy sources and not around singularity; having said that—is that a true statement, based upon what you all know?

Mr. ASSELSTINE. Yes, Mr. Chairman.

Mr. SPURGEON. Yes.

The CHAIRMAN. Mr. Chairman, is that correct?

Dr. DIAZ. Yes, Mr. Chairman.

The CHAIRMAN. Now having said that, let's leave history aside. Let's assume that we've overcome hurdles that have caused nuclear to be in doldrums or put it this way, have we—with the passage of the act, assuming that we can rectify whatever problems exist with reference to the issuance of a good program for loan guarantees, which has a hiccup that we'll try to fix. Assuming that's done, is it fair to say then, that we have eliminated the problems that existed in the past and we're ready to go? The United States has made the decisions in this Energy Policy Act to proceed forthwith. Is that how you see it, Mr. Secretary?

Mr. SPURGEON. Mr. Chairman, I do. Obviously, we still have some heavy lifting to do to make that happen. And to succeed in all of the elements of the Energy Policy Act in getting the first plants licensed, but based on success in carrying it out, we have what we need. And I believe the industry is prepared to move forward.

The CHAIRMAN. Mr. Chairman, do you see it that way?

Dr. DIAZ. Sir, what I see is that the Energy Policy Act was a catalyst for something that I think is dear to your heart and mine. It moved the industry in many ways. But in one particular way that is critical, they decided that standard plants were the only way to go. The vendors know that standard plants are the only way to go. Architect engineers know that standard plants are the only way to go and we immediately developed a process that will be able to license standard plants better, faster, with better safety for the American people and in a more timely manner.

The CHAIRMAN. Now even with that, Mr. Chairman, the licensing and construction of a new nuclear powerplant in the United States takes between 12 and 13 years. In other countries it takes between 6 and 8 years. Why the disparity and what steps can be taken by you the Commission, to make the process as efficient as the licensing process of other countries?

Dr. DIAZ. Well I can't talk about other countries, but I can tell you, Mr. Chairman, we have taken the steps necessary and we believe that the Department of Energy and the industry have taken the steps necessary to reduce the amount of time that it takes. But one more step was necessary before that and that was what the previous Energy Act and the President wanted. What it actually did, is created a process that puts most of the financial risk after a license has been issued. That was what the Congress mandated. That is what we are doing.

Fundamentally, the amount of risk at the beginning of a process is small. But it takes time. It takes time because we are putting everything on the very beginning. Once that review is conducted and if a license is given, then the financial risk diminishes. Therefore, the industry will be able to take the necessary or make the necessary decisions once they see how the process has taken place.

I thought that was fundamental, Mr. Chairman. We had too much risk. The Congress mandated that we put a process in place that minimizes the risk, but that process, at the beginning takes time. However, sir, it doesn't have to take as much time as it's going to take. If you allow me, I will flip to charts in here for you. Would you please flip those charts on the back.

The present process calls for about 42 months for the review of the applications. In there, there's 12 to 18 months of what I call "the give and take" between the Commission and the industry, meaning that we put questions and get answers. And for questions and answers, it depends upon where questions and answers are put together.

If we have very complete applications, if we work with the industry, and we are working with the industry ahead of time, those time periods get reduced. I am confident that once we go through the first bow wave, the NRC can actually provide a process in about 24 months to actually provide the review for a combined license application including the hearing, assuming we receive high quality applications, and early site permits, and a certified design.

The CHAIRMAN. Let me ask Mr. Spurgeon, it is not quite fair to push you too hard on this issue of loan guarantees, because they're really not within your jurisdiction. They belong to another department, within the Department, or another part of the Department. But, you can't proceed without it, so you're intimately involved, right?

Mr. SPURGEON. Yes, sir.

The CHAIRMAN. Now, there's no question that the Department has to be committed to getting loan guarantees on the table, where industry understands it and where it is workable, do you agree with that?

Mr. SPURGEON. Yes, sir.

The CHAIRMAN. And it cannot be so complicated that it won't be used, it that correct?

Mr. SPURGEON. Yes, sir.

The CHAIRMAN. Now we thought, we wrote a law that made eminent sense and that we understood. I understand. I used the word hiccup a while ago, because the eminent experts at OMB have said we have to fix it. Is that correct, Mr. Spurgeon?

Mr. SPURGEON. Yes, sir.

The CHAIRMAN. And we know how it has to be fixed and you do too, don't you?

Mr. SPURGEON. Yes, sir.

The CHAIRMAN. We also know how to fix it and all three of you, plus many in the industry know we're going to fix it and it will be fixed on a bill that is going through here with just a couple of statutory language perfections, Senator Thomas, and we will get that done. I think it properly is called hiccups. With that, do I understand Mr. Spurgeon, that from your information, so the Congress knows, because this is an open hearing before the Congress, to your knowledge, with that being fixed, there are no delays within the Department, to your knowledge, with reference to getting those on the table ready to go.

Mr. SPURGEON. I know they're working very hard right now within the administration—between the Department and OMB—to get

the guidelines put together so that they can be put out for comment and discussion as soon as possible.

The CHAIRMAN. Now Mr. Asselstine, I never understood when we wrote this law that this entire loan guarantee was part of an innovation that Senator Bingaman and I came up with for the entire funding of innovative technology. It wasn't just for nuclear, right?

Mr. ASSELSTINE. Yes.

The CHAIRMAN. You know that as you read the statute?

Mr. ASSELSTINE. Exactly.

The CHAIRMAN. I didn't think it was that important. I thought the other assets were sufficient for nuclear. But I understand from you, that it is very important that we have the loan guarantees for the nuclear industry, is that correct?

Mr. ASSELSTINE. Yes, it is, Mr. Chairman.

The CHAIRMAN. Tell us again for the record, so there's no misunderstanding, why is that important?

Mr. ASSELSTINE. For two reasons: first, it's important to get the cost of nuclear units, particularly the initial ones where there are somewhat of a kind higher cost associated with them, down to levels that are competitive with other alternatives. And you can do that in part with the production tax credit. But also in part, because the loan guarantee will likely provide lower cost financing for new nuclear units. And so, the combination of the production tax credit and the loan guarantee can be important in getting the cost down to a level that is competitive with other alternatives, particularly coal.

The second element has to do with the financing model. Some nuclear plants will likely be built as part of traditional regulated utilities. That's the way the 103 plants we have in operation today were all built and financed. For those plants, the loan guarantee can help in terms of the economics. But it probably is not essential in terms of financing, because the financing will be done as part of an existing company with a substantial amount of assets and existing cash flow. And investors probably will not insist upon the loan guarantee to provide the debt financing for a utility financed nuclear project going forward.

However, we've deregulated about half of the power markets in this country. And in those States, the companies that will build a new nuclear plant will be an unregulated generation company. And those companies don't necessarily have the same amount of assets or cash flows that a regulated utility does, and they in particular, do not have the ability to simply put the investment in a new nuclear plant into rate base and earn a regulated return.

So for those generation companies, financing a new nuclear plant is a higher risk enterprise and in that instance, the loan guarantee is very valuable in terms of providing the debt financing. In particular, it may be possible to use a very efficient financing tool. That is, financing just the individual nuclear plant in and of itself. And then the loan guarantee, in my view, is really essential to provide the debt financing.

The CHAIRMAN. So essentially, it may never be used, but it is an additional tool that the industry would have under circumstances you've just described and others, in many instances, it would never be used.

Mr. ASSELSTINE. It's an important tool in terms of the requirement that the Government actually has to step in for the guarantee. I agree with you. I think it is unlikely that the guarantee would ever have to be exercised. But it provides an important assurance to investors in terms of financing a nuclear plant under any of the various alternatives that might be used.

The CHAIRMAN. Now I'm going to close the hearing with a final question regarding cost of the delivery of a unit of electricity by various sources of power. I understand that today we know what the cost of a unit of electricity is from coal, from whatever sources we're using, from natural gas, but is it not true that today, the cheapest unit cost is nuclear?

Mr. SPURGEON. Other than hydro, yes, sir.

The CHAIRMAN. Other than hydro, the cheapest electricity that American people are getting in their homes, forgetting about government involvement or the special advantages that might be available for being in Lamar Alexander's State and having whatever they've got there, the cheapest going in the country comes from nuclear, is that correct?

Mr. SPURGEON. Yes.

Senator THOMAS. I don't understand that.

The CHAIRMAN. It's true.

Senator THOMAS. Well then, why is it that this hasn't been used in the past? It hasn't been able to compete with other sources?

The CHAIRMAN. Well Senator, we've been here discussing all day long the reasons. The reasons we're talking about, when I asked that last question, we talked about existing powerplants that have already been built.

Senator THOMAS. I'm talking about the same thing. These new ones are more expensive if they're nuclear, isn't that correct?

The CHAIRMAN. These old ones are already built and they've already been financed.

Dr. DIAZ. It is the production cost.

Senator THOMAS. But when you're talking about the price to the consumer, you have to talk about the capital investment as well as the production cost. I was going to ask and you kind of messed with it a little bit, that these advantages are available and I'm for nuclear power, but these questions are not very clear. If you're going to have production from coal, is that more economic than this?

Mr. ASSELSTINE. Senator, let me see if I can help. First of all, if you look at——

Senator THOMAS. Get to the point. Don't go through all of the details, you're dazzling us all with that.

Mr. ASSELSTINE. If you look at variable production cost, that is fuel cost, and operating, and maintenance cost, what it takes to physically run an existing plant, and to produce electricity -

Senator THOMAS. And to produce the power, which is capital investment also.

Mr. ASSELSTINE. If you separate out the capital investment.

Senator THOMAS. How can you do that? If you're running a business, you can't separate the two.

Mr. ASSELSTINE. I agree with you completely. But from a dispatch perspective, if you look at today, nuclear plants run all of the

time because they are the lowest cost producers, except for hydro, where your fuel cost is basically free. Coal is the next lowest in terms of fuel and operating cost and then, gas fire generation is the more expensive because the higher component of your cost——

Senator THOMAS. But there are smaller plants near to the market, so you don't have to have transmission.

Mr. ASSELSTINE. Now if you're building new plants, you obviously have to take into account the capital cost of the plant. So if you look today at a coal plant and building a new coal plant, a good benchmark, one of the largest utilities in the country TXU, about a month ago announced a program to build 11 new coal plants by 2010. So they're going to build 11 plants concurrently over the next 4 years, and put those plants into operation by 2010. They used as a reference point, about $1,500 per kilowatt as the installed capital cost for what they thought a new coal plant would cost. Now they're building their plants on existing sites. They're taking advantage of the fact that they already have spent a fair amount of money on the existing plant in terms of transmission access. They also own coal. So when you add in the fact that they're building 11, they're building them at existing sites, and they're contributing the coal assets that they already own. They believe that the cost of building those plants will be about $1,200 per installed kilowatt. They also believe the all-in cost to actually produce electricity from those plants will be about $30 per megawatt-hour or 3 cents per kilowatt-hour including the capital investment for the plant.

Most of the industry at this point, is thinking in terms of a new nuclear plant being somewhere in the range of $1,500 to $2,000 per installed kilowatt compared to that $1,500 and with the benefits that we've been talking about. The production tax credit and the loan guarantee provision, having an all-in delivered cost of around $45 per megawatt-hour, 4½ cents per kilowatt-hour. That's well within what customers today are paying for electricity in the market. That would make nuclear competitive with the new coal plants.

Senator THOMAS. But the other sources are also entitled under title 17 to have some of these benefits as well.

Mr. ASSELSTINE. That's correct. The coal numbers that I mentioned from TXU are for a pulverized coal plant if you use IGCC, which has greenhouse gas.

Senator THOMAS. My only point is we ought to be talking about the competitive future here.

Mr. ASSELSTINE. You're absolutely right, Senator.

Senator THOMAS. We're talking about different kinds of things, and there are other options. I think this is a great one, but we need to ensure that it can be done at a relatively competitive rate and you all haven't really bottom lined that I don't think.

Mr. ASSELSTINE. I think with the production tax credit and with the loan guarantees, you get the cost of those initial nuclear units down to around that $1,200 per installed kilowatt, which is very competitive with any other generating alternative.

Senator THOMAS. Good. It took awhile to get there, but we got there.

The CHAIRMAN. You got there. Very good. The problem is it takes a little longer to get it done. Just as the conversation took longer,

it takes a little longer to get it built. And that means the expenditure of money is out there for a longer period of time, which puts your part of it, Mr. Asselstine and those who are looking at building them and paying for them, makes it a little bit more difficult. And you've got to factor that all in and make sure it's right or else you won't do it because it takes too long.

Mr. ASSELSTINE. That's exactly right, Mr. Chairman. It was a lot easier to build gas plants, which is why we built so many of them.

Senator THOMAS. And a lot of that is smaller ones could be done easier with gas and they're closer to the market and you don't have to have the transmission problem. And that still exists, so we have to deal with those too.

Mr. ASSELSTINE. But a higher portion of your all-in cost is the fuel cost there. And as we've seen, you can expose yourself to considerable place fluctuations.

Senator THOMAS. And we need to get away from using the gas for that, there's no question.

The CHAIRMAN. I was going to ask, just in closing, of the Chairman, with all of this that we've done to encourage the nuclear industry to get ready and produce the right kind of applications and get before the Commission, can we summarize so we close, where is the industry now? How many have—are ready, in your opinion, are in a position that you can tell the American people, there are this many that want to build new nuclear powerplants and we know about them, and we know they're getting ready to do it, and explain that to the American people?

Dr. DIAZ. Yes, sir. The numbers that I have as of Friday, is that there are 16 companies with strong interest in pursuing an application for a nuclear powerplant, for a total 25 units. Some of those have been announced. Some of them have announced partially, not selecting the technology. But one thing to me, Mr. Chairman, is that they are very serious. This is no longer a flash in the pan. People are putting their resources, they are doing the work, and I, for the first time in my long years in the Commission—maybe too many years, Mr. Chairman, I have seen that they are very serious about doing things together. This no longer is an industry in which one is trying to get ahead and doing something.

They are working together to provide standard plants. They are working with us to make sure that they understand what our requirements are. They are working with the vendors, with the architect engineers, with the suppliers. And so, the infrastructure is getting there. And these people are very serious. And I can assure you, the Commission is also very serious about paying attention, sir.

The CHAIRMAN. All right. With that, I want to thank the three witnesses and those in attendance. I have no idea why such a big audience is here. It is Monday, and there's no other game in town, or this has been a good show, or whatever. There are lots of people who want to lobby this event. It's been very good. I think we've put before the American people we're glad to have television here and thank them very much. We hope it gets exposed. And the other print media that are covering, I think we gave you some answers.

With that, we are in recess. Thank you.

[Whereupon, at 3:45 p.m., the hearing was recessed, to be reconvened on June 12, 2006.]

[The following statement was received for the record:]

STATEMENT OF KEVIN J. PHILLIPS, MAYOR, CALIENTE, NV, AND CHAIRMAN, "FOR A BETTER NEVADA"

Mr. Chairman and Members of the Committee: I am Kevin J. Phillips, serving in my thirteenth year as Mayor of Caliente, Nevada. I am also chairman of "For A Better Nevada", a group of civic, business, and labor leaders in Nevada who believe that this nation must be energy independent and energy secure. We believe that nuclear energy represents the best option to provide for our base-load energy requirements. We also believe that Nevada can and should play a major role in meeting our nation's needs.

Nevada's leadership would like the Congress to believe that all Nevadans adamantly oppose the development of the Yucca Mountain Repository. This is not true. I personally know that most Nevadans are truly ill-informed as to the facts of this subject, and simply respond negatively to polls asking if they are in favor of the "dump". Who wouldn't respond this way when the question is framed in this manner, and in the context of their lack of knowledge regarding the issue.

"For A Better Nevada" represents a cross-section of the citizens of Nevada who want to help solve the national energy crisis and lead Nevada to become one of the most technologically and scientifically advanced regions in the world. The members of "For A Better Nevada" are pragmatic, solution-oriented leaders who first and foremost want to ensure that the Yucca Mountain project is constructed in accordance with sound science and operated in a way that safety is always the number one consideration. We agree with the President and with Congress that the science conducted at Yucca Mountain confirms it to be a suitable site for a geologic repository.

Congress has a tremendous opportunity to make Yucca Mountain one of the most important and successful public works projects in the history of human existence. Washington has been given all the information it needs to make smart decisions that accomplish this goal. You need to create an opportunity for real, meaningful economic diversification and you need to start doing real things now rather than later. This project is far from being broken. Some synergy from you nudging this along is all that is required. If the Congress is truly committed to ultimate energy independence and energy security this can be achieved.

We respectfully suggest that the Congress take the following steps:

- Change the name of the site at Yucca Mountain to The National Energy Reserve at Yucca Mountain. This modification highlights the value of what we truly are dealing with. This name change, coupled with the following additional suggestions, changes the way this project is viewed by the citizens of Nevada.
- Build the railroad from the City of Caliente to The National Energy Reserve at Yucca Mountain. The Record of Decision issued by the Department of Energy DOE refers to this route as the "Caliente Cooridor". The Department can rather quickly finish the rail alignment EIS and build the railroad. The railroad must be in place if significant amounts of used fuel are to be shipped in order to alleviate the liability for the U.S. not meeting her contractual obligations.
- Ship used fuel to the National Energy Reserve. Here the fuel can further cool in a remote protected environment. Litigation pressures are relieved. Enhanced safety is achieved. The fuel is collected in a central location awaiting re-use.
- Change the name of the "Caliente Cooridor" to the "Central Nevada Energy Cooridor". Numerous sites along this new rail line are prime locations for placement of new electrical generation power plants of various types. These "energy zones" could be pre-licensed, and would provide for great incentive for companies to build new electrical generation resources, including nuclear, clean-coal, solar, wind, and geothermal.
- Designate The National Energy Reserve as the location for the nations used fuel recycling facilities. Build such facilities as soon as time and technology permits. Do this in conjunction with Nevada's university system. The Nuclear Waste Policy Act gives Nevada "preference" for such things. It makes total sense. Move the used fuel once. Recycle it. Place the small amount of "waste" leftover deep underground in the repository. Move the new fuel assemblies to a nearby generation facility on the Central Nevada Energy Cooridor and produce electricity.

As the President's legislation to amend the Nuclear Waste Policy Act is considered, I hope that I and other like-minded leaders in Nevada will be invited to pro-

vide the solutions we formulated. We have a unique local perspective that is invaluable in making the Yucca Mountain project a true success.

NEXT GENERATION NUCLEAR PLANT

MONDAY, JUNE 12, 2006

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

The committee met, pursuant to notice, at 2:32 p.m., in room SD–366, Dirksen Senate Office Building, Hon. Larry E. Craig presiding.

OPENING STATEMENT OF HON. LARRY E. CRAIG, U.S. SENATOR FROM IDAHO

Senator CRAIG. Good afternoon, ladies and gentlemen. The Committee on Energy and Natural Resources will be convened. I see my colleague Senator Crapo in the audience. Mike, if you would like to come forward and join me here on the dais.

He is a very reserved person. I am glad to have my colleague from Idaho join me because he and I have been partners as we have moved our national laboratory forward, and certainly the Secretary knows we are here to discuss today how the laboratory in Idaho has the opportunity, as do many of our labs, to play a major role in.

On August 8, 2005, President Bush signed the Energy Policy Act of 2005 into law. That act authorized the construction of a Next Generation Nuclear Plant—we refer to it as NGNP project—at the Idaho laboratory. The NGNP will operate at very high temperatures, capable of highly efficient electricity and hydrogen production, along with the supplying of a major heat source to our Nation's needs.

So we are here today to review with DOE and others where this legislation and now law is taking us. EPAct, as we call that law, directed the Secretary to seek international cooperation in developing NGNP. What is the progress in that area, if any?

EPAct directs the Nuclear Regulatory Commission will be licensing and regulatory authority for an NGNP reactor. To what extent has DOE engaged the NRC on this issue?

EPAct 2005 directs the Secretary and the NRC Chairman to submit to Congress a licensing strategy for the prototype nuclear reactor not later than 3 years after the date of the enactment of the Energy Policy Act. Are we on target? Can it be done earlier?

EPAct 2005 directs the Secretary to make a technology selection to be used by the project no later than September 30, 2011. Has progress begun on that date?

EPAct 2005 directs the Secretary to find up to four teams for up to 2 years to develop detailed proposals for competitive evaluation

and selection of a single proposal and concept for future progress. Where is DOE on that issue?

Those are just some of the questions that are asked by the enactment of this legislation as we begin to move the nuclear industry and nuclear generation of electricity and, as I say, for heat source and other uses forward in our economy and for the world itself.

So with that opening comment, let me first turn to members of the committee. I have been joined by Senator Lamar Alexander. Lamar, do you have any opening comments you would like to make at this time?

[The prepared statement of Senator Thomas follows:]

PREPARED STATEMENT OF HON. CRAIG THOMAS, U.S. SENATOR FROM WYOMING

Good Afternoon. I'd like to thank the witnesses for appearing before the Committee.

We're meeting every Monday afternoon to be sure that our Energy Bill accomplishes what we intended. This is the 6th hearing that the Committee has held on the progress made in implementing that energy policy.

Today we are talking about the next generation of nuclear power.

Right now, we get 20 percent of our electricity from nuclear plants. We need more of them.

The Energy Policy Act of 2005 went a long way towards advancing this clean, safe and reliable source of power. The next generation of nuclear plants will be even more impressive.

The Energy Bill includes a demonstration plant to show our ability to make hydrogen with nuclear plant heat. Hydrogen will fuel the cars of the future. This is just one of the many benefits that can be had by using nuclear power.

The Energy Bill does a good job of making sure we're on the cutting edge in all of these areas.

I thank the Chairman for holding this hearing and look forward to hearing from the witnesses.

STATEMENT OF HON. LAMAR ALEXANDER, U.S. SENATOR FROM TENNESSEE

Senator ALEXANDER. Thank you, Senator Craig, and thank you for your leadership in having the hearing. I am here to listen. It is clear to me that if we want large amounts of clean carbon-free energy, which we do, then the technology that will produce the largest—that has the best chance to do that is nuclear power. So after conservation, nuclear power is next, and the new generation of nuclear plant is something that we badly need.

So I an anxious to hear the testimony and look forward to the hearing.

Senator CRAIG. Thank you very much.

Now let me turn to my colleague Senator Mike Crapo for any opening comment he would like to make.

STATEMENT OF HON. MIKE CRAPO, U.S. SENATOR FROM IDAHO

Senator CRAPO. Thank you very much, Senator Craig. First of all, let me thank you for allowing me to join you here even though I am not a member of this committee. As you know, the INL is located in my home town and so this hearing is very important to me, and the issues of nuclear energy are very critical. So again, thank you for allowing me to join you. I will be very succinct.

I think we can all agree that this is an exciting time for the future of nuclear power in our Nation and around the world. The

Bush administration as well as Congress has demonstrated a clear commitment to nuclear power and additionally, amid concerns about climate change, global instability, and rising fuel costs, public support for the domestically produced clean, renewable energy of this type has markedly increased.

While the reinvigoration of nuclear power is under way, our success will be dependent on all the sectors—government, industry, and investors—working together. Nuclear energy has long met the need for safe, clean, and reliable sources of power. In recent times, nuclear power has become recognized as a key component of a strategy that increases our domestic energy security. It provides emission-free renewable power and diversifies our overall energy profile.

However, we must also recognize that no new nuclear plant has been ordered in this country in over 30 years. During that period, U.S. demand for energy has outpaced our population growth and it is expected that U.S. energy demands will continue to increase by 33 percent over the next 15 years. Accelerated development of nuclear power, which accounts for 20 percent of our current domestic energy production, is crucial toward meeting those needs.

To maintain nuclear power's position in our overall energy mix, we must have new reactors coming on line to replace decommissioned ones. Other nations have recognized this fact and it is clear to me that the United States needs to aggressively pursue nuclear power and that the Next Generation Nuclear Plant, or NGNPs, are a critical part of our Nation's nuclear future.

The NGNP program is particularly exciting as it is positioned to positively affect both the electricity and transportation fuel sectors. NGNPs have the potential to generate not only electricity, but also hydrogen for transportation fuel, which is emission-free. This program, for which legislative authority and its appropriations were provided by Congress last year, significantly due to Senator Craig's leadership, closely fits the President's ambitious vision of a hydrogen economy while continuing to provide clean power to our Nation.

Of particular importance to me, this exciting program is taking place at the INL, which as I indicated is at my home town in Idaho Falls. I am proud of the ground-breaking work that we have undertaken at that lab and hope that you will join me in continuing to support the INEL as our Nation's premier nuclear energy research laboratory.

At our hearing today we will take stock of the current state of the NGNP program and determine the ability of our regulatory agencies and industry to meet the goals set forth in last year's energy bill. I look forward to examining with you those issues which were foreseen as well as those that are unexpected that are presenting challenges at this time. I am also looking forward to learning how we in Congress can help to support the efforts to provide meaningful solutions to those problems.

Again, Senator Craig, I thank you and the committee for allowing me to join you today and for your attention to this very critical issue.

Senator CRAIG. Mike, thank you, and thank you for your partnership and leadership in this important issue.

Now let us turn to our first panel. I am pleased that the Honorable Dennis Spurgeon, Assistant Secretary for Nuclear Energy, U.S. Department of Energy, has joined us today, along with Dr. Douglas Chapin, principal officer, MPR Associates, member, Nuclear Energy Research Advisory Committee, of Alexandria, Virginia.

Mr. Secretary, welcome before the committee. The Secretary and I have just come from an open discussion with a group of industry leaders in the area of, I guess the way of saying it is new heat source and energy needs. With that, Dennis, please proceed.

STATEMENT OF DENNIS SPURGEON, ASSISTANT SECRETARY, OFFICE OF NUCLEAR ENERGY, DEPARTMENT OF ENERGY

Mr. SPURGEON. Thank you, Senator Craig, Senator Alexander, Senator Crapo. I am pleased to be here today to discuss the administration's progress toward implementing the provisions of the Energy Policy Act of 2005 pertaining to the Next Generation Nuclear Plant, NGNP. I recognize that NGNP is an important priority to you, Senator Craig, as well as to this committee, and the Department is working to implement the NGNP provisions that were included in EPAct.

First and foremost, I would like to thank the committee for its leadership in encouraging the Department to pursue the use of clean, abundant, and affordable nuclear energy to meet not just growing demand for electricity, but also our future needs for process heat, hydrogen, and other energy products.

I have submitted a statement for the record and I would like to briefly summarize those remarks.

Senator CRAIG. Without objection, both of your full statements will be a part of the record. Please proceed.

Mr. SPURGEON. Thank you, sir.

As you know, over the last several years under the Generation IV program, the Department has been pursuing development of a very high temperature reactor as an efficient, emission-free technology for electricity, and process heat for the production of hydrogen and other energy products. Also, we have been pursuing development of a range of high temperature hydrogen production technologies through the Nuclear Hydrogen Initiative, or NHI.

We are presently planning for integrated laboratory-scale demonstrations of two such technologies, sulfur iodine and high temperature electrolysis. To date, the Department has expended just over $120 million on these efforts and we are requesting $42 million for NGNP research and development and NHI in fiscal year 2007 to continue this work. Consistent with the direction of Congress in opportunity, the Idaho National Laboratory is leading the NGNP effort.

EPAct divides the NGNP initiative into two distinct phases. Phase one, to be completed by 2011, is to inform a decision on a hydrogen production technology and complete initial design parameters for the reactor system. Phase two, to be completed by 2021, will complete the design and construction of a prototype plant at the Idaho National Laboratory.

Senator Craig, one of the first priorities after being sworn in as Assistant Secretary for Nuclear Energy was to travel to Idaho to

meet with the lab and to review the NGNP research and development program and the lab's preliminary plans for conducting the activities necessary to make a decision in 2011 on the technologies and reactor design parameters.

In support of this, I reviewed the recommendations made by the Nuclear Energy Research Advisory Committee, which include recommendations on how to achieve nearer term deployment and greater industrial participation, two objectives with which I agree. I believe significant progress is being made toward informing a decision in 2011 on a hydrogen production technology and the functional requirements for a reactor technology, but there is still much that remains to be done.

Much of our current reactor development effort is aimed at reestablishing a domestic capability for manufacturing high burnup particle fuel, which must be qualified and licensed by the Nuclear Regulatory Commission prior to the start of reactor operations. In fact, the performance of this fuel is crucial to the safety case for the reactor, which is why it has been given great emphasis in our program today.

The development of a licensing strategy early in the program is a key priority. Licensing a prototype reactor by the NRC and obtaining certification of the nuclear system design may be very difficult to accomplish in light of the commercial plant licenses that will be under NRC review during this time period. We have had several meetings with the NRC on NGNP and we will begin in earnest this year to work with the NRC to develop the licensing strategy.

Drawing on my own experience with commercial gas-cooled reactors in the United States, in order to develop technologies that are economically viable and to successfully move technologies to the market we need to bring the industrial end users into the initiative at the earliest possible time. This includes the petrochemical industry, chemical processing industry, the manufacturing industry, and electric utilities. Those entities that will directly benefit from the technologies must drive the technology requirements.

I applaud Senator Craig's efforts in this regard and I intend to build on current efforts to work with the Idaho National Laboratory to bring end users into the initiative. As an initial step, this fall, my office and the Office of Energy Efficiency and Renewable Energy will sponsor a workshop with end users to focus on functional requirements for production of process heat from nuclear reactor technology.

I also believe that we need to determine if there are more near-term approaches that would lead to earlier commercialization within the planning horizon of industry. If while working with industry we can develop hydrogen production technologies that, when coupled with very high temperature reactor or more conventional reactors, can produce hydrogen at a cost of $3 per gallon of gasoline equivalent or less, I believe we will have economically viable nuclear technologies that are ready for commercialization.

The key to our success will be our ability to draw the industry and end users into the initiative and our ability to effectively address the regulatory process.

I would be pleased to answer any questions, sir.

[The prepared statement of Mr. Spurgeon follows:]

PREPARED STATEMENT OF DENNIS SPURGEON, ASSISTANT SECRETARY, OFFICE OF NUCLEAR ENERGY, DEPARTMENT OF ENERGY

Senator Craig, Chairman Domenici, Senator Bingaman, and Members of the Committee, it is a pleasure for me to be here today to discuss the Administration's progress in implementing Subtitle C, Sections 641 through 645 of the Energy Policy Act of 2005 (EPACT 2005) pertaining to the Next Generation Nuclear Plant (NGNP).

I would like to thank the committee for its leadership in encouraging the Department to pursue the use of clean, abundant and affordable nuclear energy to meet not just demand for electricity, but our future needs for clean, emissions-free, efficient process heat for hydrogen production and other energy uses.

EPACT 2005 Sections 641 through 645 establish expectations for research, development, design, construction, and operation of a prototype nuclear plant which will provide electricity and/or hydrogen. This plant will include a nuclear reactor based on research and development activities supported by the Generation IV Nuclear Energy Systems Initiative.

These provisions establish two distinct phases for the project. In Phase I, to be completed by 2011, DOE is directed to select the hydrogen production technology and develop initial reactor design parameters for use in Phase II. Phase I is the research and planning part of the initiative and it is the phase in which the Department is currently engaged. As contemplated in Phase II, the Department would complete the design and construction of a prototype plant at the Idaho National Laboratory by 2021. EPACT 2005 also establishes expectations for NGNP program execution, including industry participation and cost-share, international collaboration, Nuclear Regulatory Commission (NRC) licensing, and review by the Nuclear Energy Research Advisory Committee.

As I indicated at my confirmation hearing, I recognize the NGNP is an important priority for Senator Craig and this committee and Congress as a whole. Shortly after being sworn in as Assistant Secretary, I traveled to the Idaho National Laboratory, the lead laboratory for development of the NGNP, to meet with laboratory officials on the research program, to better understand the work that has been accomplished to date and to better understand the laboratory's detailed plans to meet the expectations set by EPACT 2005.

Over the last four years, through the *Generation IV* initiative and the *Nuclear Hydrogen Initiative,* which is part of the President's Hydrogen Fuel Initiative, the Department has conducted a research and development program for a very high temperature gas-cooled nuclear system with the capability to produce hydrogen and/or electricity. The Nuclear Hydrogen Initiative is broadly aimed at developing hydrogen production technologies that can be coupled with nuclear systems, including a very high temperature reactor as contemplated in EPACT 2005. The efforts pursuant to EPACT 2005 ongoing today consist of research and development on a reactor and the coupling of the reactor to a hydrogen production system. More than $120 million has been expended by DOE on the NGNP and Nuclear Hydrogen initiatives since fiscal year 2003. The Department has requested more than $42 million in fiscal year 2007 for NGNP research and development and the Nuclear Hydrogen Initiative.

With the enactment of EPACT 2005, the efforts over the next several years will be focused on the research, development, establishment of initial design parameters, functional requirements, a licensing strategy, and other activities necessary to complete the Phase I scope of work. Where possible, we are collaborating with our international partners via the Generation IV International Forum to maximize the value of our R&D investments and minimize duplication of efforts.

Much of the current reactor development effort is aimed at developing a high burn-up particle fuel. The fuel development effort builds on the prior successful efforts by the U.S. and international research community with gas-cooled reactors and coated particle fuel development.

To support the completion of Phase I in 2011, work is progressing in developing design data needs for key components of the reactor heat transport and other major systems. In particular, we are working to qualify materials for use in the high temperature and high radiation environment of the NGNP. Significant efforts are also underway to develop and demonstrate at the laboratory scale, high temperature technologies capable of converting process heat from a nuclear reactor to hydrogen.

This year, we will begin working in earnest with the Nuclear Regulatory Commission (NRC) to develop a licensing strategy for the technology, which pursuant to EPACT 2005 must be submitted to Congress by August 8, 2008. Licensing a proto-

type reactor by the NRC and obtaining certification of the nuclear system design will present a significant challenge and may be very difficult to accomplish in the timeframe contemplated. It is likely that, at the same time we are seeking a license for a first-of-a-kind reactor, the NRC may receive twelve Construction and Operating License applications to build approximately 21 new nuclear plants. This estimate may change with time. While the focus of the Office of Nuclear Energy is on renewed deployment of commercial reactors, it is important that we begin discussions with NRC as early as possible on the licensing strategy and associated staffing resources.

My prior professional experience with commercial-scale gas-cooled reactors in the U.S. suggests that to be successful in developing an economic and efficient reactor that can produce higher temperature process heat (on the order of 850-950 degrees centigrade) than current generation light water reactors, and successful in moving the technology to the market, we need to bring the end users into the initiative at the earliest possible time—the petrochemical industry, the chemical processing industry, the manufacturing industry, and electric utilities. I firmly believe that those entities that will directly benefit from the technologies must drive the technology requirements.

I also believe that we need to focus the NGNP effort on determining if there are more near-term approaches that would lead to earlier commercialization, within the planning horizon of industry. My objective would be to establish a public-private partnership with end users to complete the development of technologies and do so early, allowing the technology to be moved to the market sooner. The Nuclear Energy Research Advisory Committee reached similar conclusions in its assessment of the NGNP Program Plan that was required by EPACT 2005 and delivered on schedule to Congress in April 2006.

I applaud the efforts of Senator Craig and this committee in this regard, as expressed in EPACT 2005 and I thank Senator Craig for holding this hearing. I intend to build on current efforts to work with the Idaho National Laboratory to bring end users into this initiative. As an initial step, this fall, my office and the Office of Energy Efficiency and Renewable Energy, which leads the President's Hydrogen Fuel Initiative, will sponsor a workshop with end users to focus on the functional requirements for production of process heat from nuclear reactor technology.

More information concerning the Department's ongoing research and development effort is summarized below in context of research elements that are identified in EPACT 2005: high temperature hydrogen production technology, energy conversion technology development and validation; nuclear fuel development, characterization and qualification; materials selection, development, testing and qualification; reactor and balance-of-plant design; and engineering, safety analysis and qualification. As discussed above, the Department is making good progress. Completing the research and development is critical to proceeding to the next phase of the initiative, detailed design and construction.

BACKGROUND

In 2001, the Department led an international effort to develop a roadmap for the next generation of nuclear energy systems. This roadmap, published in December of 2002, identified the six most promising Generation IV reactor systems for international development. Of these six systems, the United States placed early emphasis on the very high temperature gas-cooled reactor concept—also referred to as the Next Generation Nuclear Plant—because of its potential for enhanced safety and economical production of process heat that could be used for various energy products, e.g., hydrogen, electricity, and process heat for manufacturing.

For a hydrogen end use, the Department has for the last few years, pursued the development of a range of high temperature hydrogen production technologies. We are presently conducting or planning for integrated laboratory-scale demonstrations for two such technologies sulfur-iodine and high temperature electrolysis. While EPACT 2005 would require us to choose a single technology for hydrogen production by 2011, at this time we believe both technologies merit development support and in fact require it to prove economic and technical feasibility. We feel we can economically support multiple technology success paths and meet our overall requirement for demonstrating nuclear hydrogen production as part of NGNP.

Development of the very high temperature gas-cooled reactor is part of a broader international effort to cooperate on the development of the next generation of reactor technologies—technologies that are safer, more proliferation resistant, sustainable, and less waste intensive than current generation technologies. Under the Generation IV International Forum or GIF, ten nations and the European Union collaborate in the development of the six promising technologies identified in the Gen-

eration IV Roadmap. One of these six is the very high temperature gas-cooled reactor. Also of interest to the U.S. is the sodium-cooled fast reactor for its ability to help close the fuel cycle. International interest in the very high temperature gas-cooled reactor is high among the GIF member nations. GIF member nations are currently establishing bi-lateral and multi-lateral agreements for cooperation on those technologies that each country is interested in pursuing, including the very high temperature reactor. France, Japan, and South Africa are among the GIF countries interested in the very high temperature reactor.

The very high temperature gas-cooled reactor concept that we are investigating through the NGNP is a helium-cooled, graphite-moderated, thermal neutron spectrum reactor. Of the six Generation IV technologies, the GIF judged it to be the most promising concept for an economically competitive nuclear heat source. In order to produce process heat of sufficiently high temperature needed for use in producing other energy products such as hydrogen, the Department believes the reactor outlet temperature would need to be in the range of 850 degrees centigrade to 950 degrees centigrade. This is a key consideration in the design and performance of the reactor.

The reactor core would be either a prismatic block or pebble bed concept. The reactor could produce both electricity and hydrogen using an indirect cycle with an intermediate heat exchanger to transfer the heat to either a hydrogen production facility or a gas turbine. The basic technology builds on the Fort St. Vrain and Peach Bottom Unit 1 reactor work. Presently, a pebble bed reactor with characteristics consistent with the very high temperature gas-cooled reactor design goals is in commercial development in South Africa with construction set to commence next year, as you will hear today in testimony from Mr. Regis Matzie.

HIGH TEMPERATURE HYDROGEN PRODUCTION TECHNOLOGY

The development of a portfolio of hydrogen production technologies, including nuclear energy technologies, is an important component of strengthening the United States' energy, economic, and national security. The Department has defined an aggressive path to demonstrate hydrogen production from nuclear energy by the end of the next decade. The technical challenges to achieving this goal are significant, but the development of emission-free hydrogen production technologies is an important component of the long-term viability of a hydrogen economy.

Nuclear energy has the potential to play a major role in assuring a secure and environmentally sound source of transportation fuels. The fundamental challenge is to focus finite research resources on those processes which have the highest probability of producing hydrogen at costs that are competitive with gasoline. Both thermochemical and high-temperature electrolysis methods have the potential to achieve this objective. Small-scale experiments have operated successfully to date and show promise for integrated laboratory and other larger-scale system demonstrations.

We are building a basis for making research and development funding decisions by conducting a research effort involving laboratory-scale demonstrations and analytical evaluations. This will be followed by integrated laboratory-scale experiments to confirm technical viability and provide information needed to reach informed decisions on whether to conduct larger scale demonstrations. Pilot plant demonstrations of the selected processes would confirm engineering viability and establish a basis for process costs. We would propose to perform independent analyses of performance and costs to support the comparative assessments required for technology selection and scaling decisions, and establish effective interfaces with industry and international partners.

In fiscal year 2006, components for the two baseline thermochemical cycles (sulfur-iodine and hybrid sulfur) are being constructed and tested individually. In fiscal year 2007, components for the sulfur-iodine cycle will be brought together for integrated laboratory-scale experiments, and a laboratory-scale electrolyzer for the hybrid sulfur cycle will be designed and constructed.

In the area of high-temperature electrolysis, a successful bench-scale test of a 25-cell electrolyzer stack was completed in February 2006. This test produced over 100 liters per hour of hydrogen for 1,000 hours. A module is currently being constructed to examine multi-stack electrolysis operations, and in fiscal year 2007, the Department will complete construction of an integrated laboratory-scale experiment utilizing a 60-cell electrolyzer module.

In parallel with these activities in fiscal years 2006 and 2007, the Department continues to examine materials and components needed to interface the hydrogen production processes under development with the nuclear heat source, and to ensure

that these materials and components withstand the nuclear heat and radiation environments.

By 2010, the Department anticipates completing integrated laboratory-scale experiments of thermochemical cycles and high-temperature electrolysis technologies for producing hydrogen to confirm technical feasibility of the closed loop processes. Results of these experiments will inform the selection of the high-temperature hydrogen production technology required by the EPACT 2005 by the end of fiscal year 2011. For the process or processes selected for further development, design activities will be initiated by 2011 for pilot-scale experiments at higher power levels to evaluate scalability of the processes for eventual commercial use.

NUCLEAR FUEL DEVELOPMENT, CHARACTERIZATION, AND QUALIFICATION

Advanced gas-cooled reactor fuel is being developed for use in the NGNP. This fuel development program is aimed at re-establishing the core capability for producing coated particle fuel in the United States. Fuel kernels are being manufactured by the BWXT Corporation in Lynchburg, Virginia, and coated at the Oak Ridge National Laboratory (ORNL).

Testing of the particles is slated to begin at the end of fiscal year 2006 at the Advanced Test Reactor (ATR) at the Idaho National Laboratory. This first test will shake-down the test equipment and generate useful data on four different coated particle fuel variants. There are eight in-reactor tests planned, with the final test to be completed in 2019. General Atomics of San Diego, California, the last gas reactor and fuel vendor in the United States (for the Fort St. Vrain reactor) is providing technical assistance. By 2011, we expect to complete the second and third irradiation campaigns that will test the fission product retention and performance of the fuel.

MATERIALS SELECTION, DEVELOPMENT, TESTING AND QUALIFICATION

This work involves the identification and qualification of suitable materials for use in the high temperature and high radiation environment of the NGNP system and components.

Nuclear-grade graphite suitable for NGNP has been identified and specimen procurement is underway. Experiment design for creep-irradiation testing using the ATR will be completed in fiscal year 2006. ATR irradiations are anticipated to begin in late fiscal year 2007. We will also begin the irradiation of South African graphite samples in the ORNL High Flux Irradiation Reactor early next fiscal year.

Materials for use in the intermediate heat exchanger have been selected and are being procured. The intermediate heat exchanger isolates the reactor coolant from the secondary working fluid needed for process heat industrial applications or electricity production. Aging and mechanical testing of material specimens is ongoing. Code qualification work has been initiated with the American Society of Mechanical Engineers. Research on suitability of ceramics and composites for use in safety and control rods in the reactor core is ongoing. The development of codes and standards for these ceramics is being explored.

REACTOR AND BALANCE-OF-PLANT DESIGN, ENGINEERING, SAFETY ANALYSIS AND QUALIFICATION

Design studies are being performed to inform the direction of research and development in materials, fuel development and codes and methods. Design studies have been completed for both prismatic core and pebble bed gas-cooled reactors. Trade studies specific to various components are underway, including the reactor vessel and the intermediate heat exchanger. Prior to 2011, a detailed specification for the NGNP will be developed for inclusion in the Request for Proposals for NGNP design.

For design, safety analysis and qualification, there is a need to modernize analytical codes and methods to reduce uncertainty and enhance safety in the NGNP design. This research focuses on defining the margin that exists between the limiting or design values versus the calculated results for any operating scenario. Work is underway on the modeling and codes associated with the reactor physics and thermal-hydraulics. A test plan is being developed to use the Argonne National Laboratory Natural Convection Shutdown Heat Removal Test Facility to obtain experimental data to analyze how to provide cooling for the reactor vessel under postulated accident conditions. Testing is also underway to validate computer models associated with computational fluid dynamics. An international standard problem set for code verification and analysis is expected to be assembled by 2011.

ENERGY CONVERSION TECHNOLOGY DEVELOPMENT AND VALIDATION

The current energy conversion research activity is a relatively small effort at this time and is aimed at aligning reactor output with the most appropriate power conversion system to optimize the electrical output at the highest efficiency and lowest cost. Presently, the Department's efforts are focused on conducting engineering and comparative studies to ascertain the pros and cons of various designs. This area will receive greater attention from the reactor vendors as the NGNP program moves forward with design activities in 2011.

CONCLUSION

The Department is making steady progress toward meeting the requirements established by EPACT 2005, but there is clearly significant work to be done. The NGNP target dates present some schedule risk for the Department, especially in light of the challenges involved in certifying a new reactor technology.

If these or other hydrogen-producing technologies when coupled with the very high temperature reactor or even more conventional reactors can be proven to produce hydrogen at a cost of $3.00 per gallon of gasoline equivalent, delivered and untaxed, or less, I believe we will have nuclear technologies that are economic and viable for commercialization. The key to our success will be our ability to draw the end users into the initiative and our ability to effectively address the regulatory process.

Again, I would like to thank Senator Craig for holding this hearing and in particular, for bringing the perspective of end users to this important discussion. I would be pleased to answer your questions.

Senator CRAIG. Mr. Secretary, thank you very much.

Dr. Chapin, before we turn to you, we have been joined by another one of our colleagues from the committee, Mary Landrieu, Senator from Louisiana. Senator, thank you for coming. Do you have any opening comment you would like to make? Your statement will become a part of the record.

STATEMENT OF HON. MARY L. LANDRIEU, U.S. SENATOR FROM LOUISIANA

Senator LANDRIEU. Thank you, Mr. Chairman. Just a statement for the record, but I want to thank you for your leadership on this very important matter. I think it is very important for our country to move forward in a very deliberate direction and I am looking forward to the panel and will submit a statement for the record.

Thank you.

[The prepared statement of Senator Landrieu follows:]

PREPARED STATEMENT OF HON. MARY L. LANDRIEU, U.S. SENATOR FROM LOUISIANA

Mr. Chairman, I would like to extend a warm welcome to each of the witnesses appearing before the committee today and thank them for coming to address the committee on such an important topic.

I would also like to thank both you and Senator Craig for your excellent leadership on this critical issue, and for the invitation to participate.

The importance of nuclear power to the nation's energy independence, economy, and the environment cannot be overstated.

By 2025, the Department of Energy forecasts a 50 percent increase in electricity demand.

Nuclear power currently accounts for about 19 percent of our electricity-generation capacity. But if we are going to get serious about the dangers of climate change, that number needs to grow.

In my view, energy is going to be the defining issue of the 21st Century.

This country has a choice: we can get serious about addressing our skyrocketing energy needs through serious investment, careful research, and long-term planning—or we can strap ourselves in for a very bumpy economic roller-coaster ride.

Energy is what drives economic growth. We need to figure out how to produce energy in ways that are both efficient and environmentally sensitive.

We cannot afford to rely on any single energy source. Today, our over-reliance on oil has our markets stretched so tight that a single refinery outage sends prices shooting up across the country.

How we confront the energy challenge today will do much to determine what kind of world our children and grandchildren will live in. Will they live in a world where nations are driven into fierce competition for ever-scarcer resources? Or will they live in a world where energy is plentiful, reliable and affordable?

It is for this reason, Mr. Chairman, that I am glad that we are holding this hearing today.

I believe that the Next Generation Nuclear Power Plant is extremely promising, and I hope that we can get it up and running as quickly as possible in Idaho so that it can be replicated elsewhere.

We need to do everything we can to encourage technologies that make the country less reliant, and strong enough to set its own course on energy.

I think that the Next Generation Nuclear Power Plant may help us achieve a greater degree of self sufficiency in a number of ways:

There is significant potential for this technology to drive the Hydrogen Economy of the future. The two things nuclear reactors do best—generate both electricity and very high temperatures—are exactly what it takes to produce hydrogen most efficiently. Last year, the DOE's Idaho National Engineering and Environmental Laboratory showed how a single Next Generation nuclear plant could produce the hydrogen equivalent of 400,000 gallons of gasoline every day. That is the kind of innovation that could change our lives.

Until the Hydrogen Economy takes root, Next Generation Nuclear Power may also help with the petroleum economy, by dramatically increasing the efficiency with which we are able to produce oil from tar sands and oil shale.

And, not least of all, Next Generation Nuclear Power may help us to produce nuclear power much more safely and efficiently, and with less risk of its byproducts being used for the proliferation of nuclear weapons.

But I am concerned that the United States may already be behind the curve in developing Next Generation Nuclear Power. China and Japan have already designed advanced, high temperature, gas-cooled reactors that use uranium 60 times more efficiently than today's reactors.

I am going to want to hear what steps we are taking to put U.S. companies squarely back on the cutting edge of nuclear power research, development and deployment.

Mr. Chairman, that concludes my opening remarks. I look forward to hearing from our panelists.

Senator CRAIG. Senator, thank you.

Now, Dr. Chapin. Welcome before the committee. Please proceed.

STATEMENT OF DR. DOUGLAS M. CHAPIN, PRINCIPAL OFFICER, MPR ASSOCIATES, ALEXANDRIA, VA, AND MEMBER, NUCLEAR ENERGY RESEARCH ADVISORY COMMITTEE GENERATION IV SUBCOMMITTEE

Dr. CHAPIN. Thank you, sir. Mr. Chairman and other Senators, I am honored to be here to present the results of the NERAC Generation IV Subcommittee review of the Next Generation Nuclear Plant project. In 2002 the Department of Energy's Office of Nuclear Energy completed a technology roadmap project plan that provided an overall plan supporting an enhanced future role for nuclear energy systems. The DOE-NE plan placed top priority on the successful development of a high temperature fission reactor system, the NGNP.

In August 2005, the Congress passed and the President signed the Energy Policy Act of 2005. One of the key provisions of that act was that it established the NGNP project, designated an overall plan and timetable, with operation intended by the end of fiscal year 2021. The EPAct also specifically required a prompt review of the project and its associated R&D plan by DOE's Nuclear Energy Research Advisory Committee.

In September of that year, the NERAC chair and co-chair charged a Generation IV Subcommittee, which was an existing committee of NERAC, to complete that review. That subcommittee had six members. Four are members of NERAC and those are: Mike Corradini of the University of Wisconsin, who was the chair of the committee and was unable to be here today; Neil Todreas of MIT; Harold Gray of Southern California Edison; and Joe Rempe of Idaho National Laboratory.

There were two additional nuclear experts assigned to the committee, acting as unpaid consultants. One is Chuck Boardman, who is retired from General Electric, and the other is me from MPR.

At the time the review was conducted in the fall of 2005, DOE was in the midst of replanning their project to decide how to proceed with the NGNP to reflect the guidance from the EPAct. As a result, the subcommittee focused on just the first phase of the NGNP program, which was to take place between 2005 and 2011. That first phase includes determining whether the NGNP should produce electricity, hydrogen, or both, selecting and validating a hydrogen generation technology, conducting R&D on associated technologies and components, such as the energy conversion system, the nuclear fuel development, material selection, reactor plant systems, and then initiating the design activities for the prototype powerplant.

The subcommittee completed its review and formally reported to the full NERAC in February 2006, and the NERAC approved the report and forwarded it over to DOE and it has been eventually submitted to the Congress. The committee had a number of recommendations, but there are four major recommendations.

The first one was that the original mission proposed for the NGNP was a full-scale prototype of a commercially cost-effective machine producing both hydrogen and electricity. The subcommittee recommends that that mission not be continued by default and that alternate missions be evaluated. The subcommittee's other major recommendations address key aspects of the alternate missions.

The second recommendation is that the DOE-NE staff should conduct, with the assistance of key industry representatives, economic and engineering trade studies that consider the targets for hydrogen production for various scenarios over the next few decades, the DOE target for hydrogen production via nuclear power, and the likely hydrogen production and electricity production activities and how those might be factored together to determine the proper mission for the NGNP.

Since the selection of the ultimate NGNP mission can drive the reactor design in different directions, the subcommittee recommends that these trade studies be completed as soon as practicable and as soon as funding becomes available.

The third recommendation is that the overall cost of the NGNP be shared with the U.S. industry as well as members of the international community. However, the subcommittee believes that a completion date of 2021 greatly decreases the chances of substantial industrial and international contributions. The subcommittee recommended that DOE consider developing the NGNP as a reactor facility that can be built soon to gain experience and then up-

graded as the technology advances. Conceptually, the reactor would be built as a technology demonstrator, that is a smaller machine, carefully choosing the scale to be the smallest machine that could be reasonably extrapolated to support full-sized commercial applications.

The fourth recommendation was that the DOE staff should update its R&D plans and develop options that can support reactor deployment much before the 2017-21 time frame. Further, these plans should adopt and enhance the independent technical review group perspective to achieve a successful project even in the later time period that we need to establish less aggressive project objectives, for example for reactor outlet temperature, fuel selection, and performance.

The subcommittee notes that at the time of our review the DOE-NE had already begun to address the ITRG recommendations and we urge them to continue with their refinements and revisions to that.

In summary, the subcommittee supports the construction of NGNP as a closely coupled activity of DOE-NE, Idaho National Laboratory, the industry, and our international partners, and we recommend going ahead as soon as practical as being the preferred route.

Thank you for inviting me and I will be pleased to address any questions that you might have.

[The prepared statement of Dr. Chapin follows:]

PREPARED STATEMENT OF DR. DOUGLAS M. CHAPIN, PRINCIPAL OFFICER, MPR ASSOCIATES, INC., ALEXANDRIA, VA, MEMBER, NUCLEAR ENERGY RESEARCH ADVISORY COMMITTEE GENERATION IV SUBCOMMITTEE

Mr. Chairman and members of the Committee, I am honored to be here to present the results of the NERAC Generation IV subcommittee review of the Next Generation Nuclear Plant Project.

In 2002, the Department of Energy Office of Nuclear Energy (DOE-NE) completed a technology roadmap project that provided an overall plan supporting an enhanced future role for nuclear energy systems. The DOE-NE plan placed top priority on the successful development of a high-temperature fission reactor system, the Next Generation Nuclear Plant (NGNP). In August 2005, the U.S. Congress passed and the President signed the Energy Policy Act of 2005 (EPACT). One of the key provisions of the EPACT established the NGNP project, and designated an overall plan and timetable for it, with operation by the end of FY 2021. The EPACT also specifically required a prompt review of the NGNP project and its associated R&D plan by DOE's Nuclear Energy Research Advisory Committee (NERAC).

In September 2005, the NERAC chair and co-chair charged the Gen-IV subcommittee to conduct the EPACT-required review. The subcommittee has six members: four are members of NERAC (Mike Corradini of the University of Wisconsin and Chair of the Subcommittee, Neil Todreas of MIT, Harold Ray of SCE, and Joy Rempe of INL). There are two additional nuclear engineering experts from the industry, acting as unpaid consultants (Chuck Boardman, retired from GE, and Douglas M. Chapin of MPR).

At the time the review was conducted in the fall of 2005, DOE-NE was in the midst of a major review of the NGNP to reflect the guidance from EPACT. As a result the subcommittee focused on the first phase of the NGNP program; i.e., between 2005 and 2011. This first phase includes:

- Determining whether the NGNP should produce electricity, hydrogen, or both;
- Selecting and validating a hydrogen generation technology;
- Conducting R&D on associated technologies and components (energy conversion, nuclear fuel development, materials selection, reactor and plant systems development); and
- Initiating design activities for the prototype nuclear power plant.

The subcommittee completed its review and formally reported to the full NERAC in February 2006. The full NERAC approved the report and forwarded it to DOE for eventual submittal to the Congress.

The subcommittee had four major recommendations:

Recommendation (1): The original mission proposed for NGNP was a full-scale prototype of a commercially cost-effective machine producing both hydrogen and electricity. The subcommittee recommends that mission not be continued by default and that alternate missions be evaluated. The subcommittee's other major recommendations address key aspects of those evaluations.

Recommendation (2): To support the mission redefinition, the DOE-NE staff should conduct, with the assistance of key industry representatives, economic and engineering trade studies that consider:

- The targets for hydrogen production for various scenarios over the next few decades;
- The DOE target for hydrogen production via nuclear power in this overall context;
- The likely hydrogen production and electricity production alternatives and how those alternatives would be factored into determining the proper mission for the NGNP.

Since the selection of the ultimate NGNP mission can drive the reactor design in different directions, the subcommittee recommends that these trade studies be completed as soon as funding becomes available.

Recommendation (3): EPACT requires the overall cost of the NGNP project be shared with U.S. industry as well as members of the international community. However, the subcommittee believes that a NGNP completion date of 2021 greatly decreases the chances of substantial industrial and international contributions. The subcommittee recommends that the DOE consider developing the NGNP as a reactor facility that can be built soon to gain experience and then upgraded as the technology advances. Conceptually, the reactor would be built as a "technology demonstrator" that is, a smaller machine, carefully choosing the scale to be the smallest machine that could be reasonably extrapolated to support full size commercial applications.

Recommendation (4): The DOE-NE staff should update its R&D plans and develop options that can support reactor deployment much before the 2017-2021 timeframe. Further, these plans should adopt and enhance the Independent Technical Review Group (ITRG) perspective that to achieve a successful project even in the later time period, less aggressive project objectives must be adopted; e.g., for reactor outlet temperatures, fuel selection and performance. The subcommittee notes that the DOE-NE has already begun to address the ITRG recommendations and urges continued refinements and revisions.

In summary, the subcommittee supports the construction of the NGNP as a closely coupled activity of the DOE-NE, INL, the industry and our international partners and considers that going ahead as soon as practical is preferred.

Thank you again for inviting me and I will be pleased to address any questions that you may have.

Senator CRAIG. Doctor, thank you very much for that testimony. Again, I appreciate both of you being here today.

Mr. Secretary, let me start with a question of you. The Congress gave the Department $40 million for NGNP in 2006 and yet in 2007 you suggested only $23 million. I think we all understand tight budgets and that we are starting a new reprocessing program, GNEP. However, in the energy bill the Congress authorized the construction of NGNP. So it would seem that you would spend more, not less, in relation to other programs.

My question, and I say this in all due respect. You were not here when that 2007 budget was prepared. You are not new to the broad scene. You are new to this scene and we are very pleased you are here. But do you think the Department could accomplish more towards construction of the NGNP in a more timely fashion? You already hear industry and observers beginning to say that timing is important in relation to the success of and the need for this type

of new heat source, energy source. Your reaction and comments to that?

Mr. SPURGEON. Well, Senator, I would never be one to say that more money could not be used in a program, speaking parochially. However, the amount of money that was requested does provide for us to meet the requirements of EPAct at this stage in the program and to be able to carry out the critical irradiation work that needs to be done for graphite and fuels activities, as well as to get us along the way toward preparing for those decisions relative to the licensing strategy and so forth.

The keys here, in the beginning, as we have emphasized and you have emphasized certainly, are being able to frame the program with industry and with the consumer of hydrogen and other process heat applications such that we can use that as a way of informing our direction as we proceed forward, not only with the final technology development but with the actual commercialization, to make sure that we are meeting the need as it is defined in the marketplace.

Senator CRAIG. With NP2010, Yucca, NGNP, and GNEP all in your shop, you have expressed some concern about this already, the concern as it relates to whether NRC will have the licensing capacity or capabilities to do all four jobs adequately and in a timely fashion. Would you please report back to us if you feel that there is a need for more funding as it relates to these important missions or any cracks that might appear in the process as it relates to timeliness and the NRC's capability in dealing with it?

Mr. SPURGEON. I will, sir.

Senator CRAIG. Thank you much.

Dr. Chapin, I understand that NERAC reviewed a plan for the NGNP that was prepared by DOE based simply on meeting milestones of the energy bill, but that the plan was not a full-blown work plan. I understand that recently the Idaho National Lab with DOE have prepared a more detailed milestone work plan that coincides with simply meeting the energy bill milestones, but backloading construction spending, and they prepared a balanced risk work plan that pursues construction more aggressively by frontloading the spending so that the reactor will be ready for commercial use several years earlier. I think you reflected the need for maybe looking at a sooner rather than later date.

Can the NERAC review this more detailed work plan to see how they comply with your earlier recommendations?

Dr. CHAPIN. I think as a matter of ability, can this NERAC committee do that, I think they could do that. At this point the subcommittee has not been charged with doing the full—a more complete review of the later plan. The review we did was of the plan at the time it existed in late fall of last year and the new plan has come out since we completed the report. So I think if we receive such an assignment the subcommittee could execute it, but we have not received such an assignment yet.

Senator CRAIG. Is it appropriate for NERAC to provide regular oversight of the work plans for the NGNP? Could NERAC report back to us on an annual basis regarding whether the NGNP work plan has taken into account your suggestions, and if not why, as a kind of an overview for the general progress of this effort?

Dr. CHAPIN. Senator, I am really not in a position to speak for the NERAC since I am not an actual member of the NERAC committee. I think that they do as a matter of course provide reviews on an ongoing basis. I would be glad to take that question back to the NERAC and get a more complete answer for you. But I am simply not in a position to address that at this time.

Senator CRAIG. I am questioning in my own mind whether that is an appropriate role and as we move collectively together on this issue how we do so in a way that we make sure that we get everything lined up appropriately that fits the needs of where we want to take this, where industry wants, needs it, and that cooperative relationship that the Secretary speaks to, which I think all of us recognize as being tremendously important in this particular project.

Dr. CHAPIN. Senator, there is another review which has been authorized for the National Academy of Sciences to do a review of the DOE-NE R&D program, and that committee has been appointed and work on that will start this summer. So there is another, in addition to NERAC, there is another ongoing review of Mr. Spurgeon's program, which will start this summer.

Senator CRAIG. Thank you.

Senator Alexander.

Senator ALEXANDER. Thank you, Mr. Chairman.

Dr. Chapin, basically you say we should speed this up if we want to get substantial industrial and international contributions.

Dr. CHAPIN. Yes, sir.

Senator ALEXANDER. We hear a lot of speeches, we make a lot of speeches, around here about global warming, about the need to reduce our dependence on foreign oil, about the price of gasoline. This is one of the solutions, it seems to me, particularly the possibility of clean hydrogen. In your recommendations, to what extent did contributions from the automotive industry that they might make to this process as we search for a different sort of engine, fuel cell hydrogen, to what extent are you talking about that when you say we need to speed up this project if we want to attract substantial industrial contributions to the project?

Dr. CHAPIN. Yes, sir, I understand the thrust. We are very much aware of that and that was one reason in our recommendations we said we needed to tie what was being done in the DOE-NE program with regard to NGNP to what was being done in the other DOE programs regarding the National Hydrogen Initiative.

I think in the next panel in fact you will hear from some representatives of the automotive industry who will talk about how they would use the hydrogen. But we think the use of this reactor as a pilot for the hydrogen production is a very important use.

Senator ALEXANDER. Mr. Spurgeon, the Oak Ridge National Laboratory is the lead laboratory for the development and testing of materials that can withstand extreme environments of the kind that would be part of the Next Generation Nuclear Plant. We have talked about this before in this committee, of how the competencies at Oak Ridge would be employed in Idaho in this very important project. How do you see using Oak Ridge National Laboratory's competencies in the deployment of the Next Generation Nuclear Plant initiative?

Mr. SPURGEON. Well, Senator, you spoke of materials and I think you probably know, going back more than say 35 years, when I was with one of the manufacturers of high temperature gas-cooled reactors we did much of our fuels development work at Oak Ridge. Folks probably all—most of them are retired at this point, but we still have a great deal of capability there and that capability is being used in this current program. A good bit of the budget, as you know, for the program is directed toward work that is done at Oak Ridge.

Senator ALEXANDER. What other places in the world is this sort of project, Next Generation Nuclear Plant, being pushed ahead? What is the competition?

Mr. SPURGEON. Well, competition, not cooperation, I would say at this point, because the Next Generation Nuclear Plant, the high temperature reactor, the gas-cooled reactor, is part of the Generation IV International Forum. The principal countries that we are working with in that regard are France and Japan, and this summer we believe that both Russia and China will be invited to join the Generation IV International Forum. Russia in particular has proposals for a gas-cooled reactor program very similar to the one we are talking about here with NGNP.

So we do have partners in this through the Generation IV International Forum through which we can cooperatively develop technology and in some cases share the financial burdens of completing the technology and as well as inform the decision as to what the ultimate users will be for the technology. So it is a cooperative effort and it is ongoing.

Senator ALEXANDER. Thank you, Mr. Chairman.

Senator CRAIG. Senator, thank you very much for those questions.

Senator Landrieu.

Senator LANDRIEU. Thank you.

Mr. Secretary, you noted how critical it is to bring end users, such as the petrochemical industry and chemical industries, into the early development phase of this project. Can you talk a little bit for the record about how the Department is actually doing that at this early stage, because there are some obvious technological benefits to that industry as well.

Mr. SPURGEON. Well, one thing that happened—and you are going to hear from some of the people that were involved in it in the next panel—were the meetings that were conducted this morning. Let me not step on the information that they are about to provide to you. So the answer is it is beginning there.

We are cooperating with our own Office of Energy Efficiency and Renewable Energy within the Department of Energy, which has direct relationships with many of these end users. So our cooperative effort is that we can be the source of the hydrogen and they have the major relationship with the users of the hydrogen.

But going back in history, the oil and gas, the petrochemical industry, have been major supporters of gas-cooled reactors. The owner of one of the U.S. companies, General Atomics Company, was Gulf Oil Corporation at one point in time, and it then became a joint venture with Royal Dutch Shell. So our energy companies have been in the nuclear business. Exxon was one that had pro-

posed to build a reprocessing plant at one point in time. Allied Chemical was a partner in the Barnwell reprocessing plant.

So we need to bring back the major players in the oil and gas industry.

Senator LANDRIEU. Well, I just want to follow up on a comment to the committee. I think it is very, very important for the Department of Energy to play that coordinating role because, as Lamar suggested with his line of questioning, they are a tremendous amount of benefits to what we are hopefully getting ready to do, not only to get a different generation of nuclear powerplants on line, but the added benefit for the fuel of the future for transportation and also the benefits to the petrochemical industry are really enormous.

So if we can coordinate this up front as we move forward, I think that is very, very important, and I appreciate you stating for the record that you are—I do not want to put words in your mouth, but—recognize that role and are moving forward pretty aggressively in that way.

Mr. SPURGEON. It is critical.

Senator LANDRIEU. Could you, just for the lay people here, including myself, explain the differences between the prismatic block and pebble bed reactor? We are having a little hard time understanding that.

Mr. SPURGEON. Well, I will try, and let me try not to be too simplistic. Actually, you are going to hear from some people that are involved directly today in developing those. But going back 35 years, I was involved as well.

A prismatic core and gas-cooled reactor, both are moderated by graphite. In one, there is a graphite block and in that block are drilled holes, and into those holes are inserted fuel elements that are made up of very tiny spheres of uranium that are coated with silicon carbide. It is a "triso" fuel, so there is more than one coating, but let me just put it this way, it is a fuel particle that is coated with silicon carbide, then put in a matrix in a fuel piece that is then inserted into this graphite block.

Helium is circulated through other holes in that graphite block and removes the heat of fission, and then that helium goes off and is either used to go through a secondary loop and generate steam or it could go through a direct cycle loop and produce electricity directly through a gas turbine.

So that is basically it. You have a block, tiny little fuel particles inserted into that block, with helium flowing through other holes in the block.

A pebble bed reactor has a larger sphere of uranium that is again coated with this silicon carbide type coating that forms the barrier to fission products getting out of that fuel element. Those spheres are themselves the core of the reactor and those spheres are done in a way that allows them to be replenished into that core area, where some can come in and others can go out.

Senator LANDRIEU. Now, in your view—and I know there will be others that are considered—but are there safety advantages and tradeoffs between these two approaches and that is what is generally under discussion now?

Mr. SPURGEON. Yes, there always are tradeoffs, and there are proponents of each of those two design approaches. These two design approaches have been around really for the last 35 or so or more years. One was developed in Germany and one was developed in the United States.

Senator LANDRIEU. Are there other design approaches that this committee should know about, or these are the two main design approaches out there?

Mr. SPURGEON. I think those are the two main. There are differences between, for example, the detail of what is being developed in France and what is being developed in the United States or Japan and what is being developed in South Africa, certainly with the pebble bed design.

Senator LANDRIEU. Just one more real quick. Dr. Chapin, the Generation IV Subcommittee recommends that we develop a reactor that can be built sooner. Of course, we funded it and are very supportive of what Senator Craig led in the last energy bill. But there are some that think that the planning process needs to go on a little bit longer, we might not be able to meet these schedules because there may be upgrades or new technology.

How do you defend those of us—or would you defend or how would you go about it, those of us that want to press forward pretty quickly, thinking that we could always make modifications at the back end if we needed to? But perhaps you have a different view. Do you understand what I am asking of you?

Dr. CHAPIN. Yes, ma'am. I agree. I think that one of the advantages of at least the nuclear part of the powerplant is that the fuel is largely replaceable. It's either in the form of these balls about the size of a softball or a tennis ball or it is in the form of these blocks. So for example, if we picked a relatively practical near-term operating temperature, 900 degrees Centigrade, and we used a fuel that we know how to make now, if we went ahead and started the reactor up, we would learn a lot from operating the reactor and from experimenting in a safety and an operational sense. Then if we had better fuel at a later date, we could replace the fuel with the more developmental fuel.

So I think the subcommittee, the NERAC subcommittee, is very much on the track that building a machine which is a practical test device which we can upgrade later would both help us deal with the issues of how good the plant is and how quickly we can build it.

Senator CRAIG. Let me recognize, before I turn to Senator Crapo for any questions, we have just been joined by our colleague from Wyoming, Craig Thomas. Senator, welcome.

Senator THOMAS. Thank you, sir.

Senator CRAIG. Senator Crapo.

Senator CRAPO. Thank you very much, Senator Craig.

Secretary Spurgeon, again I thank you for your efforts in this regard. I want to go back briefly to the questioning that Senator Craig began when he talked about budget. I know we are working on the 2007 budget now. I hope and assume that the Department is working on its 2008 budget. The question that I want to just be very direct with you about is that some of us, as we have seen what Congress appropriated and then what the Department has

utilized and what it is requesting in subsequent years, have wondered whether the priority—whether the adequate priority is being given to this project by the Department of Energy and by the administration.

I will just be direct with you. Do you believe that the administration, with its admittedly scarce dollars in the budget, is giving the priority to the NGNP that it deserves in context with the other nuclear initiatives that you have, such as GNEP and NP2010 and so forth?

Mr. SPURGEON. Well, Senator, it is always a tough challenge, especially, and we are in the 2008 budget process as we speak here. But I believe that there have been adequate resources provided to do the basics that we need to accomplish—to move forward with the objectives that are contained in EPAct.

Senator CRAPO. In other words, we are achieving the objectives on time and we have adequate resources to the project to meet those objectives?

Mr. SPURGEON. To this point, yes, sir.

Senator CRAPO. Now, I want to talk to Dr. Chapin for just a moment, but before I do, as you note, he has made some recommendations or the committee has made some recommendations about speeding things up. Would it take extra budget dollars to accomplish those objectives if we were to move in that direction, in terms of speeding up along the lines that have been suggested?

Mr. SPURGEON. I will not put words in Dr. Chapin's mouth, but he is really talking about getting to construction earlier, and any time you get to construction earlier then you are going to be expending more funds than an R&D program would in those early years. So it is a difference—it is skewing of the funding and it is skewing it earlier rather than later.

Senator CRAPO. Well, I guess I will stick with you right now, then. What do you think of those recommendations?

Mr. SPURGEON. The recommendation to be able to get data and to be able to move with a technology that we might be able to commercialize earlier I fully agree with. Some of that has to do with just our objectives relative to temperature and how high a very high temperature reactor we need, because there is a relationship in hydrogen production between temperature and efficiency of the process. But there is also a very definite relationship between how high you go in the temperature and how difficult the problem you have from a reactor development standpoint, which could also translate into a more expensive reactor. So there is definitely a tradeoff. On the one hand, you may not be as efficient in hydrogen production, but have a less expensive reactor. On the other hand, you may be more efficient, but it costs you a whole lot in very exotic materials technology to be able to get to that temperature.

So again, the recommendation was to start with what we can do and then move later to improve on that, and I certainly agree with that approach.

Senator CRAPO. Thank you very much, Mr. Secretary.

Dr. Chapin, I also agree with the notion in general, although I do not have the expertise to be able to understand the tradeoffs that we are talking about, but I agree with the notion that you

have talked about in terms of the need to speed up the process of getting to construction and getting reactors on line.

I have one question in that context, however. That is, in your recommendation, the third recommendation, where you would like to see a technology demonstrator on a smaller scale being developed soon, I am told that recognizing the economies of scale may greatly affect the demonstrated efficiency of the reactor. First I would like you to comment on that, because the concern that that raises is if we build a smaller reactor that shows less efficiencies then perhaps that would impact the ultimate decisionmaking process on whether to proceed with larger reactors.

Is that a valid concern?

Dr. CHAPIN. Yes, sir, it is. The subcommittee's view was that we were trying also to find this balance, that if one—and our thinking went sort of along these lines. We thought that with a level budget funding for the DOE the dollars would be scarce, and that if we tried to build a full-scale machine which was commercially attractive in the sense that it demonstrated economic viability that would drive us to very high temperatures, to more demanding fuel, and to a physically much larger machine.

So the subcommittee's judgment was that on balance we thought it might be better to build a simpler machine to begin with, which would get us in the game and would begin to gather the information that we needed. The recommendation is carefully stated. It says the smallest machine that can be built with a reasonable chance of extrapolating it to the larger size. In chemical engineering terms, most people think in a factor of ten, whether we can go a factor of ten, as large a scale-up of a factor of ten with a nuclear reactor, is a discussion.

So yes, we are in the midst of that tradeoff. It is a very difficult one. We decided to err on the side of the smaller rather than the larger machine.

Senator CRAPO. Thank you very much.

I see my time has expired. May I submit some additional questions, Mr. Chairman?

Senator CRAIG. Please do. We will leave the record open for that purpose.

Senator CRAPO. Thank you.

Senator CRAIG. Thank you.

Senator Thomas.

Senator THOMAS. Thank you. Just one question as I came in late. I am sorry, I was presiding and did not get here.

Just in the conversation I have heard, you guys are talking about experimenting and finding ways to get into nuclear power and all that sort of thing. It is my understanding that we now produce half of the energy in Illinois with nuclear power. Why is it such an experiment? Why do we not know what we are doing and move forward a little more quickly with what we have already proven to work?

Mr. SPURGEON. Senator, we have two different programs here that we are dealing with. Relative to producing the kind of power in reactors that are used in Illinois, it is exactly what we are looking at accelerating and using on a large scale in the United States today.

Senator THOMAS. Good.

Mr. SPURGEON. Our nuclear utilities have, as was testified to here, I forget when it was, about 3 weeks ago when we were before you with Chairman Diaz, that we discussed and Chairman Diaz indicated there were preliminary projects or that discussion of projects on the order of 25 new nuclear plants being proposed by 16 different organizations in the United States right now.

So the answer is yes, we are moving forward. But what we are talking about here is really the ability to use a new generation of nuclear reactors to produce process heat, high temperature reactors that will allow us to split water into hydrogen and oxygen, and be able to use that hydrogen for many things, including being able to make—being able to hydrogenate hydrocarbons, whether it be heavy oil or coal or other petrochemical uses that can use a source of hydrogen, including perhaps using it for transportation. You will be hearing from that in a subsequent panel.

Senator THOMAS. Of course, we already know how to do that with coal and some other activities. What we need to do is get some electric power generation going in different places.

Mr. SPURGEON. I have to tell you, sir, our number one priority is just exactly that.

Senator THOMAS. Good.

Mr. SPURGEON. It is electric power generation. But we hope to help you a little bit with some of that coal.

Senator THOMAS. I guess you know my concern, and my friends know this. We have two things to talk about in the future in terms of energy, it seems to me. One is 20 years out from now and another is 5 years out from now, 4 years out from now, next year out from now. So I think we have to kind of divide those. Sometimes we get kind of wrapped up in all the very long future stuff, when the fact is we also need to be doing some things that will have an impact on our energy availability 2 or 3 years from now. So I hope we do not forget those two different aspects.

Thank you.

Mr. SPURGEON. Thank you, sir.

Senator CRAIG. Well, gentlemen, thank you very much. Mr. Secretary, thank you for being here. One of the things both Senator Domenici and I and the committee said after the writing and the passage of EPAct was that we would now stay with it and watch it on a day-by-day, week-by-week, month-by-month basis, to keep our government on course, on track, and in many instances ahead of schedule.

I think most of us recognize that this Nation is in an energy crisis, and to get us back into production, as Senator Thomas speaks about, in all segments of our energy, while looking over the horizon to the next generation is a role that is our job and yours and all of your associates. We thank you so much for being here. Dr. Chapin, thank you for being here.

Dr. CHAPIN. Thank you, Mr. Chairman.

Senator CRAIG. Let us call our second panel up.

[Pause.]

Senator CRAIG. Let me introduce to the committee our second panel: Tom Christopher, vice president-chief executive officer of AREVA, Incorporated, Lynchburg, Virginia; Dr. Regis Matzie, sen-

ior vice president, chief technology officer, Westinghouse Electric Company, Windsor, Connecticut; Dan Keuter, vice president, nuclear business development, Entergy Nuclear, Jackson, Mississippi; Dr. Lawrence Burns, vice president, research and development and strategy planning, General Motors Corporation, Warren, Minnesota; and Jeff Serfass, president, National Hydrogen Association, Washington, DC.

Gentlemen, again thank you for your time and preparation in coming to this committee. We look forward to your testimony.

Tom, let us start with you.

STATEMENT OF THOMAS A. CHRISTOPHER, CHIEF EXECUTIVE OFFICER, AREVA, INC.

Mr. CHRISTOPHER. Thank you, Mr. Chairman, members of the committee, Senator Crapo. I am Tom Christopher, CEO of AREVA, Inc., which is the U.S. subsidiary of the global AREVA company. We do appreciate the opportunity to testify before you today.

As background, AREVA is an American company headquartered in Maryland, with 5,000 employees in 40 locations across 20 States. We are part of the global family of AREVA companies, which have 58,000 employees worldwide. We are proud to lead the Nation and the world in nuclear power and we are the only company to cover all the industrial aspects in the field from uranium mining to fuel reprocessing and recycling.

Last year our U.S. operations generated revenues in the United States of $1.8 billion, 9 percent or about $160 million of which were exports from the United States to foreign countries. We provide nuclear powerplant services, components and fuel to America's electric utilities. We have been a long-time partner with DOE. Today we jointly operate the successful Blended Low Enriched Uranium program in Erwin, Tennessee, for example, where we convert problematic highly enriched uranium waste materials from Savannah River site into safe and inexpensive fuel for Tennessee Valley Authority reactors.

With the hard work this committee put into authorizing and shepherding into law the Energy Policy Act of 2005, we are poised to build the country's newest fleet of commercial nuclear reactors, of course using our advanced U.S. Evolutionary Power Reactor design. In fact, just weeks following the President's signing of the energy bill we announced our UniStar partnership with Constellation Energy to create the framework to build the country's newest EPRs.

We are ourselves investing on our own balance sheet and expense statement here in the United States $200 million over 4 years to obtain NRC design certification and we are providing Constellation with the necessary engineering and licensing support to obtain a combined construction and operating license.

Our significant investment in the deployment of U.S. EPR reactor design is based on the belief that nuclear power is an essential element of energy independence, energy security, and clean electric power generation.

AREVA, however, foresees market needs for nuclear power beyond electricity generation. Our ANTARES reactor design is envisioned to serve these future markets and is a high-temperature he-

lium-cooled, graphite-moderated reactor, or HTR. Thanks to its indirect cycle, this HTR is able to produce process heat at temperatures well above those of the current fleet of light water reactors. The process heat may be able to offset heat currently produced by fossil fuels, as you know, in a broad range of industrial applications.

For example, in the coming decades we see a growing need for alternate liquid fuels to augment traditional petroleum sources, alternate sources such as Alberta oil sands, Western oil shale, and conversion of coal-to-liquids may become significant contributors to our transportation fuel mix. In place of fossil fuels presently used to provide the process heat for these applications, nuclear reactors may be able to provide the necessary energy. This would avoid significant amounts of carbon dioxide emission and further consumption of fossil fuel. Ultimately, ANTARES may be able to procure the process heat necessary to deploy the technology developed at Idaho National Laboratory to produce hydrogen.

Nuclear programs such as NGNP require significant Bonneville in research and development, first of a kind engineering and manufacturing infrastructure. These costs of developing new technology can be prohibitive for individual commercial entities working alone. That is why international cooperation to develop new technology is needed.

For the HTR, a demonstration reactor is necessary in order to overcome the technical, infrastructure, and licensing hurdles of this first of a kind power technology in the United States. As a demonstrator for this key technology, the NGNP at Idaho National Laboratory would greatly accelerate the commercial deployment of this technology by reducing risks in these areas. This type of technology development and demonstration complements AREVA's core missions and capabilities. We invest in both near and long-term nuclear technology development and we bring these technologies to market.

As mentioned earlier, AREVA has been developing ANTARES as a practical and flexible future provider of project and electricity. During the past 3 years AREVA globally has invested more than $70 million in R&D and engineering to advance the ANTARES design concept. However, achieving the vision of an HTR demonstrator such as NGNP will require resources that are beyond what can be provided by any one company. The Energy Policy Act of 2005 contains provisions supporting cost-sharing and industry participation. We believe that the best way for achieving real progress towards NGNP realization is for the Department of Energy to have frank discussions with industrial partners who have a vested interest in HTR technology development.

AREVA would be interested in leading or participating in an industrial consortium to achieve NGNP goals if such a strategy were selected. AREVA will invest in technology design and development that is forecast to have future marketability. NGNP could match this criteria.

Industry needs to be involved at the early stages of licensing and design strategy for the NGNP. This is when the highest leverage exists to ensure that a cost-effective and marketable technology is

defined. We should therefore have industrial involvement now and not wait until 2011.

As has been said before, a key element of a successful NGNP program is a demonstration plant that has a measured risk profile. The selected technology goals for this plant should be the result of a realistic assessment of its future usefulness in an industrial setting, with features that support ongoing research and development.

Regarding the specific needs for the NGNP, we believe DOE should define the technology concept that they will support for the NGNP. This selection process needs to address market-based requirements. Then industry needs to be a partner in providing a reference design that meets customer requirements. This reference design should be the means to focus all R&D. Industrial development is also needed in developing licensing strategies and assessing design tradeoffs throughout the project. The NGNP should be defined to focus the effort where the benefit is the highest. This will minimize risk for the NGNP in the first commercial versions of this new technology.

In conclusion, we believe that the high temperature reactor technology can be a part of the mix of energy technologies that we should be working on now to achieve energy independence. HTR technology offers the potential to replace fossil fuel heat delivery in a broad range of applications, offsetting oil and gas imports. We look forward to working with DOE to make the NGNP program a successful partnership and to support America's goal of energy independence.

Mr. Chairman, I appreciate having this opportunity to join you today and I would be pleased to answer any questions.

[The prepared statement of Mr. Christopher follows:]

PREPARED STATEMENT OF THOMAS A. CHRISTOPHER, CHIEF EXECUTIVE OFFICER, AREVA, INC.

Mr. Chairman and members of the Committee, I am Tom Christopher, Chief Executive Officer of AREVA, Inc.

Thank you for this opportunity to testify before you today on the U.S. Department of Energy's Next Generation Nuclear Plant program.

I am very pleased to join Assistant Secretary of Energy Dennis Spurgeon on this panel. Assistant Secretary Spurgeon comes from a distinguished industry background, and he has taken on many challenges implementing our nation's nuclear energy policy. I look forward to working with him to achieve the objectives of the Energy Policy Act of 2005.

AREVA, Inc. is an American company headquartered in Maryland with 5,000 employees in 40 locations across 20 U.S. states. We are part of a global family of AREVA companies with 58,000 employees worldwide offering proven energy solutions for emissions-free power generation and electrical transmission and distribution. We are proud to lead the nation and the world in nuclear power, and we are the only company to cover all the industrial activities in our field. Last year, our U.S. operations generated revenues of $1.8 billion—9 percent of which were from U.S. exports to foreign countries.

We provide nuclear power plant services, components and fuel to America's electricity utilities. We offer our expertise to help meet the nation's environmental management needs and have been a longtime partner with DOE. We jointly operate the successful Blended Low Enriched Uranium (BLEU) program in Erwin, Tennessee, for example, where we convert problem waste materials from Savannah River Site into safe and inexpensive fuel for Tennessee Valley Authority reactors. In Idaho, we recently invested $300,000 in new equipment to upgrade Idaho National Laboratory's fuel testing capabilities and supported the INL study of next generation technologies for the production of heat for coal gasification processes.

With the hard work this Committee put into authoring and shepherding into law the Energy Policy Act of 2005, AREVA is poised to build the country's newest fleet

of commercial nuclear reactors using our advanced U.S. EPR (Evolutionary Power Reactor) design. Just weeks following the President's signing of the energy bill, AREVA announced its new UniStar partnership with Constellation Energy to create the framework to build the country's newest U.S. EPRs. We are investing $200 million here in the U.S. to obtain NRC design certification, and we are providing Constellation with the necessary Combined Construction and Operating License (COL) application support to begin work on their next nuclear plant. Clearly, America's nuclear renaissance will be driven by this next fleet of light water reactors.

NGNP'S COMMERCIAL POSSIBILITIES

Our significant investment in the deployment of the U.S. EPR reactor design is based upon the belief that nuclear power is an essential element of America's energy independence, energy security and clean electrical power generation. Nuclear energy supports global sustainable development and the reduction of harmful greenhouse gas emissions. These objectives are important elements of the Energy Policy Act passed by Congress last year.

AREVA foresees market needs for nuclear power beyond electricity generation. Our ANTARES reactor design is envisioned to serve these future markets and is a High Temperature helium cooled graphite moderated Reactor, or HTR. Thanks to its indirect cycle, this HTR is able to produce process heat at temperatures well above those of the current fleet of light water reactors. This process heat may be able to offset heat currently produced by fossil fuels in a broad range of industrial applications.

For example, in the coming decades, we see a growing need for alternate liquid fuels. To augment traditional petroleum sources, alternate sources such as Alberta oil sands, Western oil shales and conversion of coal to liquids may become significant contributors to our transportation fuel mix. These all consume large quantities of process heat and hydrogen. Conversion of cellulosic biomass to ethanol also requires significant process heat. In place of fossil fuels presently used to provide the process heat for these applications, nuclear reactors may be able to provide the necessary energy. This would avoid significant amounts of carbon dioxide emissions and further consumption of fossil fuel.

Ultimately, ANTARES may be able to procure the process heat necessary to deploy the technology developed at Idaho National Laboratory to produce hydrogen. Achieving these missions in process heat production would strongly support Congress' and the Administration's goal to further America's energy security and sustainability.

NGNP AND INDUSTRY INVOLVEMENT

Nuclear programs such as NGNP require significant investment in research and development, first-of-a-kind engineering and manufacturing infrastructure. These costs of developing new technology can be prohibitive for individual commercial entities working alone. That is why international cooperation to develop new technology is needed.

But a government-industry partnership is also vital to addressing the goals of a major advance in nuclear technology. For the HTR, a demonstration reactor is necessary in order to overcome the technical, infrastructure and licensing hurdles of this first-of-a-kind power technology in the U.S. As a demonstrator for this key technology, the NGNP at Idaho National Laboratory will greatly accelerate the commercial deployment of this technology by reducing risks in these areas.

AREVA has participated whenever possible with the NGNP program throughout the last four years. We've contributed to the Generation IV Roadmap and provided direct input to the NGNP Independent Technology Review Group in 2003 and 2004. Our efforts have been aimed at helping guide the NGNP to become a commercially deployable nuclear technology for the future.

This type of technology development and demonstration complements AREVA's core missions and capabilities. We invest in both near- and long-term nuclear technology development and bring these technologies to market. We are also involved in the support of other Generation IV concepts.

As mentioned earlier, AREVA has been developing ANTARES as a practical and flexible future provider of process heat and electricity. During the past three years, AREVA and its affiliates have invested more than $70 million in research, development and engineering to advance the ANTARES design concept. However, achieving the vision of an HTR demonstrator such as NGNP will require resources that are beyond what can be provided by any one company.

The Energy Policy Act of 2005 contains provisions supporting cost-sharing and industry participation. AREVA believes that the best way for achieving real progress

towards NGNP realization is for the Department of Energy to have frank discussions with industrial partners who have a vested interest in HTR technology development. AREVA would be interested in leading an industrial consortium to achieve NGNP goals if such a strategy were selected. AREVA will invest in technology design and development that is forecast to have future marketability. NGNP could match this criterion.

Industry needs to be involved at the early stage of licensing and design strategy for the NGNP. This is when the highest leverage exists to ensure that a cost-effective and marketable technology is defined. We should, therefore, have industrial involvement now and not wait until 2011.

There are markets for this technology now, especially in hydrogen and process heat production. Given the long time needed to bring any nuclear technology to market, we must start now and make steady visible progress in order to create market confidence. NGNP could benefit from a government-industry partnership today. AREVA is ready to lead the formation and execution of such a partnership.

NGNP AND DOE LEADERSHIP

A key element of a successful NGNP program is a demonstration plant that has a measured risk profile. The selected technology goals for this plant should be the result of a realistic assessment of its future usefulness in an industrial setting, with features that support ongoing research and development.

Whereas there may be a temptation to incorporate some "stretch goals," we must remain mindful that such goals carry potentially significant technical challenges and cost burdens that could result in early project termination. The recent Nuclear Energy Research Advisory Committee report on NGNP identified some of these kinds of measured risks that should be considered for the NGNP demonstration plant.

Regarding specific needs for the NGNP, we believe DOE should define the technology concept that they will support for the NGNP. This selection process needs to address market-based requirements. Then industry needs to be a partner in providing a reference design that meets customer requirements. This reference design should be the means to focus all research and development.

Industrial involvement is also needed in developing licensing strategy and assessing design tradeoffs throughout the project. The NGNP should be defined to focus the effort where the benefit is the highest. This will minimize risk for the NGNP and the first commercial versions of this new technology.

In conclusion, we believe that high temperature reactor technology can be a part of the mix of energy technologies we should be working on now to achieve energy independence. HTR technology offers the potential to replace fossil fuel heat delivery in a broad range of applications, offsetting oil and gas imports. We look forward to working with DOE to make the NGNP program a successful partnership—and to support America's goal of energy independence.

Mr. Chairman, I appreciate having this opportunity to join you today. I would be pleased to answer any questions you may have at this time.

Senator CRAIG. Tom, thank you very much.

Now let us turn to Dr. Matzie, and I understand, doctor, you are under a bit of a time crunch. So please offer us your testimony, and if you need to leave before we get to questions we will leave the record open and submit to you some questions in writing to fill certainly the committee's needs or any additional information you want to provide us.

STATEMENT OF DR. REGIS A. MATZIE, SENIOR VICE PRESIDENT AND CHIEF TECHNOLOGY OFFICER, WESTINGHOUSE ELECTRIC COMPANY

Dr. MATZIE. Thank you, Mr. Chairman.

Mr. Chairman, members of the committee, it is an honor to present the views of Westinghouse Electric Company on the state of the U.S. nuclear development in general and the Next Generation Nuclear Plant project specifically. I have been working in the commercial nuclear industry for over 30 years and this is the most exciting time in my career.

Currently nuclear plants are performing at unparalleled levels of excellent economics and safety. A large group of power companies have announced plans to apply for combined construction and operating licenses, which is a key step in the construction of new nuclear plants. Many other countries are also planning to expand their nuclear fleets and others are looking at the United States for direction, for the signal that the time has come to rely more on clean, environmentally friendly nuclear power and less on fossil fuels.

Westinghouse has a long history of technology leadership in commercial nuclear energy. We built the first commercial nuclear plant at Shippingport, Pennsylvania, in 1957. We are proud that we have been making the investments in new reactor technology over the past decades that have prepared us for the current nuclear renaissance.

Our AP-1000 advanced passive plant received design certification from the U.S. Nuclear Regulatory Commission this past December. This has given many power companies the confidence that they can move forward with their planning of new plant construction based on our already approved AP-1000 design. It is imperative that the U.S. Department of Energy continue to show the leadership it initiated with its Nuclear Power 2010 program and help launch the renaissance as quickly as possible, while the momentum is strong. This should be the highest priority of the Department because without the renewal of new plant build based on advanced light water reactors such as AP-1000 there will be no nuclear renaissance.

Congress showed tremendous foresight in the Energy Policy Act of 2005 when it authorized the Next Generation Nuclear Plant program, whereby a high temperature gas-cooled reactor was to be built at the Idaho National Laboratory with the dual mission of demonstrating cogeneration of hydrogen and electricity. The reason I characterize this provision of the act as such is that it opens up the use of nuclear energy beyond the current mission of electricity production to other sectors of the energy market.

High temperature reactors can be used to provide environmentally friendly process heat for a broad range of applications, including syngas production, coal-to-liquids, petroleum conversion, and hydrogen production. By developing and demonstrating these process heat applications, we can move forward toward a hydrogen economy in the near term. We do not have to wait for the development of hydrogen distribution and storage systems. We do not have to develop an economical hydrogen-fueled car. Instead, we can use existing industrial infrastructure of the chemical and transportation sectors. This will help stabilize fossil fuel prices. This will help our Nation become less dependent on foreign imported fossil fuels at a time when energy security is prominent in our minds and it would also make a significant additional contribution to greenhouse gas reduction.

I strongly encourage Congress to press forward with the development of gas-cooled reactors, to provide for and press the Department of Energy to fully launch the Next Generation Nuclear Plant program. This should be done as a public-private partnership program with the strong involvement of both the commercial nuclear

industry and the fossil fuels industry. This will help ensure that the program is commercially relevant and that it is accomplishes in the most economical and timely way possible.

The program should also build on key developments in other countries, like the pebble bed modular reactor being demonstrated in the Republic of South Africa, the lead program in the world for commercial-sized high temperature gas reactors and a reactor program in which Westinghouse is an investor. This electric plant demonstration program is progressing well, with both strong South African government and investor commitment to completion.

A part of this program includes large-scale testing facilities that will be of use by a U.S.-based program for high temperature gas reactors at a significant savings to the U.S. taxpayer. This program should also be used to leverage design development, material selection, and component specification to accelerate the program here in the United States so that the mission of the Next Generation Nuclear Plant program can be demonstrated within a 10-year period, which will be key to getting strong industry participation.

As evident today with the Nuclear Power 2010 program, the long pole in commercializing new nuclear reactor technologies is the regulatory process. Again, the pebble bed modular reactor program can be of help to the Next Generation Nuclear Plant program because this design is already being reviewed by the U.S. Nuclear Regulatory Commission. Generic high temperature gas-cooled reactor licensing issues are being addressed by the Commission as a precursor to formal design certification application. These issues are germane to both electricity and process heat applications.

By helping to accelerate the review of these generic issues and driving for a timely completion of the review, a robust Next Generation Nuclear Plant licensing program can be completed to support operation of NGNP by 2016.

In summary, I strongly encourage Congress to "stay the course" that it has directed in the Energy Policy Act of 2005, to drive for early deployment of advanced light water reactors by fully funding the Next Generation Nuclear Plant program, to fully launch the Next Generation Nuclear Plant program, to demonstrate nuclear cogeneration, with the objective of completion of the demonstration reactor within 10 years through the establishment of a public-private partnership, including strong international cooperation.

I thank you for your time and attention.

[The prepared statement of Dr. Matzie follows:]

PREPARED STATEMENT OF DR. REGIS A. MATZIE, SENIOR VICE PRESIDENT AND CHIEF TECHNOLOGY OFFICER, WESTINGHOUSE ELECTRIC COMPANY

Mr. Chairman and members of the Committee, it is an honor to present the views of Westinghouse Electric Company on the state of U.S. nuclear energy development. I have been working in the commercial nuclear energy industry for over 30 years and this is the most exciting time of my career. Current nuclear plants are performing at unparalleled levels with excellent economics and safety. A large group of power companies have announced plans to apply for combined construction and operating licenses, which is a key step in the construction of new nuclear plants. Many other countries are also planning to expand their nuclear fleets, and others are looking to the United States for direction, for the signal that the time has come to rely more on clean, environmental friendly nuclear power, and less on fossil fuels.

Westinghouse has a long history of technology leadership in commercial nuclear energy. We built the first U.S. commercial nuclear plant at Shippingport, PA, in 1957. We are proud that we have been making the investments in new reactor tech-

nology over the past decades that have prepared us for the current nuclear Renaissance. Our AP1000 advanced passive plant received Design Certification from the U.S. Nuclear Regulatory Commission this past December. This has given many power companies the confidence that they can move forward with their planning on new plant construction based on our already approved AP1000 design. It is imperative that the U.S. Department of Energy continue to show the leadership it initiated with its Nuclear Power 2010 program and help launch this Renaissance as quickly as possible while the momentum is strong. This should be the highest priority of the Department, because without the renewal of new plant build based on advanced light water reactors such as AP1000, there will not be a nuclear Renaissance.

Congress showed tremendous foresight in the Energy Policy Act of 2005 when it authorized the Next Generation Nuclear Plant program, whereby a high temperature gas-cooled reactor was to be built at the Idaho National Laboratory with the duel mission of demonstrating co-generation of hydrogen and electricity. The reason that I characterize this provision of the Act as such is that it opens up the use of nuclear energy beyond its current mission of electricity production to other sectors of the energy market. High temperature reactors can be used to provide environmentally friendly process heat for a broad range of applications, including syngas production, coal-to-liquid petroleum conversion, and hydrogen production. By developing and demonstrating these process heat applications, we can move toward a hydrogen economy in the near term. We do not have to wait for the development of hydrogen distribution and storage systems. We do not have to develop an economical hydrogen-fuelled car. Instead, we can use the existing industrial infrastructure of the chemical and transportation sectors. This will help stabilize fossil fuel prices. This would help our nation become less dependent on foreign imported fossil fuels at a time when energy security is prominent in our minds and would make a significant additional contribution to greenhouse gas reduction.

I strongly encourage Congress to press forward with the development of gas-cooled reactors—to provide for and press the Department of Energy to fully launch the Next Generation Nuclear Plant program. This should be done as a public-private partnership program with the strong involvement of both the commercial nuclear industry and the fossil fuels industry. This will help ensure that the program is commercially relevant and that it is accomplished in the most economical and timely way possible. The program should also build on key developments in other countries, like the Pebble Bed Modular Reactor, being demonstrated in the Republic of South Africa. This electric plant demonstration program is progressing well with both strong government and investor commitment to completion. A part of this program includes large-scale testing facilities that will be of use by a U.S.-based program for high temperature gas reactors, at a significant savings to the U.S. taxpayer. This program should also be used to leverage design development, materials selection, and component specification to accelerate the program here in the U.S., so that the mission of the Next Generation Nuclear Plant program can be demonstrated within a 10 year period.

As evident today with the Nuclear Power 2010 program, the "long pole" in commercializing new nuclear reactor technologies is the regulatory process. Again, the Pebble Bed Modular Reactor program can be of help to the Next Generation Nuclear Plant program because this design is already being reviewed by the U.S. Nuclear Regulatory Commission. Generic high temperature gas-cooled reactor licensing issues are being addressed by the Commission as a precursor to formal Design Certification application. These issues are germane to both electricity and process heat applications. By helping to accelerate the review of these generic issues and driving for a timely completion of the review, a robust Next Generation Nuclear Plant licensing program can be completed to support plant operations by 2016.

In summary, I strongly encourage Congress to "stay the course" that it has directed in the Energy Policy Act of 2005. To drive for early deployment of advanced light water reactors by fully funding the Nuclear Power 2010 program. To fully launch the Next Generation Nuclear Plant program to demonstrate nuclear co-generation with the objective of completion of the demonstration reactor within 10 years through the establishment of a public private partnership, including strong international cooperation.

I thank you for your time and attention.

Senator CRAIG. Doctor, thank you very much for that testimony.

Now let us turn to Dan Keuter, vice president, nuclear business development, Entergy Nuclear, Jackson, Mississippi.

STATEMENT OF DAN R. KEUTER, VICE PRESIDENT, NUCLEAR BUSINESS DEVELOPMENT, ENTERGY NUCLEAR

Mr. KEUTER. Good afternoon. It is an honor to address this committee. My name is Dan Keuter. I am vice president of business development for Entergy Nuclear, the second largest operator of nuclear energy plants in the United States. We are very pleased to see you are looking at the Next Generation Nuclear Plant. The nuclear energy industry supports the integration of Next Generation Nuclear Plants into a nuclear development strategy. The Next Generation Nuclear Plant holds great promise for our Nation, our electricity, our environment, and truly maintaining the American quality of life. This high temperature gas reactor can be an important part of reducing air pollution and greenhouse gases, preserving our finite resources of oil and natural gas, reducing the volume of our used nuclear fuel, and reducing our dependence on foreign energy sources.

The Next Generation Nuclear Plant would be a super-safe, virtually meltdown-proof, and a reactor that could be built mostly underground and therefore more resistant to terrorist attacks. One of the greatest advantages of these high temperature gas-cooled reactors is that we would be much more efficient than today's nuclear or coal-fired plants, converting the reactor's heat to electricity in an efficiency rate of 48 percent. This is a 50 percent improvement over today's powerplants, nuclear or coal. That means this new reactor could get 50 percent more power from the same amount of heat and fuel. This means lower power costs for our customers.

The fact that nuclear energy does not emit greenhouse gases means that we can help reduce the threat of global climate change. We also avoid air pollution adversely affects the air we breathe, such as sulfur dioxide and nitrogen oxide emissions.

Let me explain how I believe we can get there. The U.S. energy industry's highest priority now is to design, license, and construct advanced passive light water reactors that are a clear refinement of the designs currently being operated at the 103 nuclear sites today. They will be lower in cost and even safer to operate.

The nuclear industry agrees with the administration that the United States needs to show strong leadership in the development and deployment of nuclear energy technologies in order to meet our nonproliferation goals, improve our balance of trade, and achieve our energy and environmental goals as a Nation. Without energy security our national security is threatened.

To this end, we need Congress to fully fund the Nuclear Power 2010 program and Yucca Mountain projects. Without the construction and operation of a national fleet of Generation III advanced, passive light water reactors, there will not be a Generation IV high temperature gas-cooled reactor, despite all of its promises.

Nuclear energy technology can play a significant role in helping our Nations switch to a hydrogen economy. In fact, the high temperature gas reactor is needed today to help meet today's growing needs for hydrogen alone. There is a strong market for non-polluting hydrogen now.

A fundamental problem is we do not have a low cost source of hydrogen that does not pollute our air. We produce most of our hydrogen today by breaking down natural gas, putting increased

pressure on its volatile prices and even shorter supply. But worse, for every ton of hydrogen we produce today in the steam reformation process, at least ten tons of carbon dioxide are produced and released to the atmosphere, worsening the risk of climate change.

Hydrogen is a basic raw material in today's economy today. Hydrogen is a feedstock for anhydrous ammonia, the fertilizer almost all farmers in the United States depend on to increase their crop yields every year, whether they are growing corn, cotton, rice, soybeans, or any other crop, amounting to 38 percent of the hydrogen produced today. Ethanol production from corn would also increase demand for fertilizer and its hydrogen feedstock even more.

Very large amounts of hydrogen are also used today to raise the energy level of imported sour crude to make gasoline, truck diesel fuel, and aircraft jet fuel. Gasoline production requires 30 percent of all the hydrogen we are making today and is growing at 10 percent per year, doubling every 7 years. Due to environmental concerns and America's growing import of foreign heavy crude oil, hydrogen demand by refineries alone is expected to double by 2010 and quadruple by 2017.

Fertilizer and oil refining represent 75 percent of today's use of hydrogen and both will grow as environmental concerns increase. Hydrogen is also the raw material in the production of a variety of chemicals and plastics.

We understand that the Department of Energy and the automotive industry are close to developing a fuel cell to power our large transportation sector of cars and trucks of the future. But a hydrogen economy only makes sense if the hydrogen is produced from non-emitting sources. That is not the case today.

The Energy Policy Act of 2005, one of the most far-sighted energy measures ever passed by Congress, under the strong leadership of this committee and its far-sighted chairman, chartered a better way. The act includes $1.25 billion for the design and construction of a commercial prototype of high temperature gas reactors. The act provided the high temperature gas-cooled reactor should be built at the Idaho National Laboratory no later than 2021.

Only the Government can undertake such long-term capital-intensive research and development efforts. There is simply far too much risk for the private sector to do it by itself.

The governments of other countries of the world are already building or operating such prototype high temperature reactors. Japan has been operating a demonstration 30-megawatt high temperature gas reactor since 1998. China was so encouraged by its 10-megawatt high temperature laboratory reactor which began operation in 2000 that it announced in 2004 that it will build a 200-megawatt demonstration reactor.

The U.S. nuclear industry agrees with the need to close the nuclear fuel cycle by recycling used nuclear fuel. The Government needs to implement the necessary research and development programs that would provide the facts needed in order to make the decisions on how best to recycle. In our present once-through nuclear fuel cycle, only about 4 percent of the uranium is actually used. 96 percent of the uranium in our used fuel today is actually unburned and can be reclaimed. America should be doing that.

Other energy countries—the U.K., France, and Japan are already recycling. High temperature gas-cooled reactor technology, like fast reactors, can play an important role in developing recycling as a safe and reliable technology.

We believe America needs for hydrogen from non-emitting sources can be integrated within our research and development needs for a recycling program that would close the nuclear fuel cycle in a safe, reliable, and low-cost manner acceptable to the American public.

In summary, our priorities is: No. 1, the licensing and construction of advanced light water reactors as soon as possible; and in parallel the completion of Yucca Mountain project; No. 3, designing and building the Next Generation Nuclear Plant; and No. 4, closing the nuclear fuel cycle, in this order.

We must harness the promising potential of nuclear energy in this country, not leave it to other countries of the world. We must also move towards a hydrogen economy. That requires that we develop a way to produce large volumes of hydrogen at a stable, low cost. A generation of nuclear energy plants can provide the source of hydrogen. Our country's economy and quality of life depend on it. Our children and our grandchildren depend on it.

Thank you for listening to me today and I will respond to questions, but I would also, Mr. Chairman, would like to ask for consent that EPRI and Idaho National Lab, in cooperation with the Nuclear Energy Institute, paper on "Nuclear Energy: Development Agenda for a Consensus of the U.S. Government and Industry," be submitted as part of my record, as part of my written testimony.*

[The prepared statement of Mr. Keuter follows:]

PREPARED STATEMENT OF DAN R. KEUTER, VICE PRESIDENT, NUCLEAR BUSINESS DEVELOPMENT, ENTERGY NUCLEAR

Good afternoon.

My name is Dan Keuter and I am Vice President of Business Development for Entergy Nuclear, the second largest operator of nuclear energy plants in the United States.

We are very pleased to see you are looking at the Next Generation Nuclear Plant. The nuclear energy industry supports the integration of the Next Generation Nuclear Plant into a nuclear development strategy. The next generation of nuclear energy plants holds great promise for our nation, our economy, our environment and, truly, maintaining our American quality of life.

This high temperature gas cooled reactor can be an important part of:

- Reducing air pollution and greenhouse gases
- Preserving our finite resources of oil and natural gas
- Reducing the volume of our used nuclear fuel, and
- Reducing our dependence on foreign energy sources.

The Next Generation Nuclear Plant would be super-safe, virtually meltdown-proof, and a reactor that could be built mostly underground, and therefore be more resistant to terrorist attack.

One of the greatest advantages of these high temperature gas-cooled reactors is that they would be much more efficient than today's nuclear or coal-fired power plants, converting the reactor's heat to electricity at an efficiency rate of 48 percent, a 50% improvement over today's power plants, nuclear or coal. That means this new reactor could get 50% more power from the same amount of heat and fuel. This means lower power costs for our customers.

The fact that nuclear energy does not emit the greenhouse gases means they can help us reduce the threat of global climate change. They also avoid air pollutants

*The paper has been retained in committee files.

that adversely affect the air we breathe, such as sulfur dioxide and nitrogen oxide emissions.

Let me explain how we believe we can get there.

The U.S. nuclear energy industry's highest priority now is to design, license and construct the advanced, passive light water reactors that are a clear refinement of the designs currently being operated at 103 nuclear sites today. They will be lower in cost, and even safer to operate.

The nuclear industry agrees with the Administration that the United States needs to show strong leadership in the development and deployment of nuclear energy technology in order to meet our non-proliferation goals, improve our balance of trade, and achieve our energy and environmental goals as a nation. Without energy security our national security is threatened.

To this end, we need the Congress to fully fund the Nuclear Power 2010 program and the Yucca Mountain project. Without the construction and operation of a national fleet of Generation III advanced, passive light water reactors, there won't be a Generation IV high temperature gas-cooled reactor, despite all its promise.

Nuclear energy technology can play a significant role in helping our nation switch to a hydrogen economy. In fact the high temperature gas-cooled reactor is needed today to help meet today's growing needs for hydrogen alone. There is a strong market for non-polluting hydrogen now.

A fundamental problem is we do not have a low cost source of hydrogen that doesn't pollute the air. We produce most of our hydrogen today from breaking down natural gas, putting increased pressure on its volatile prices and ever shorter supply. But worse, for every ton of hydrogen we produce in today's steam reformation process, at least 10 tons of carbon dioxide are produced and released to the atmosphere, worsening the risk of climate change.

Hydrogen is a basic raw material in America's economy today. Hydrogen is the feedstock for anhydrous ammonia, the fertilizer almost all farmers in the U.S. depend on to increase their crop yields every year—whether they are growing corn, cotton, rice, soybeans or any other crop, amounting to 38 percent of the hydrogen produced today. Ethanol production from corn would also increase demand for fertilizer and its hydrogen feedstock even more.

Very large amounts of hydrogen are also used today to raise the energy level of imported sour crude oil to make gasoline, truck diesel fuel and aircraft jet fuel. Gasoline production requires 37 percent of all hydrogen we make today and is growing 10 percent a year, doubling every seven years. Due to environmental concerns and America's growing imports of foreign heavy crude oil, hydrogen demand by refineries alone is expected to double by 2010 and quadruple by 2017.

Fertilizer and oil refining represent 75 percent of today's use of hydrogen and both will grow as environmental concerns increase. Hydrogen is also a raw material in the production of a variety of chemicals and plastics.

We understand the Department of Energy and the automobile industry are close to developing the fuel cell to power our large transportation sector of cars and trucks in the future. But a hydrogen economy only makes sense if the hydrogen is produced from non-emitting sources. That is not the case today.

The Energy Policy Act of 2005, one of the most far-sighted energy measures ever passed by this Congress, under the strong leadership of this Committee and its far-sighted Chairman, charted a better way. The Act included $1.25 billion for the design and construction of a commercial prototype of a high temperature gas-cooled reactor. The Act provided the high temperature gas-cooled reactor should be built at the Idaho National Laboratory no later than 2021.

Only the government can undertake such long-term, capital intensive research and development efforts. There is simply too muck financial risk for the private sector.

The governments of other countries of the world are already building or operating such prototype high temperature reactors. Japan has been operating a demonstration 30-megawatt HTGR plant since 1998. China was so encouraged by its 10-megawatt high temperature laboratory reactor, which began operating in 2000, that it announced in 2004 that it will build a 200-megawatt demonstration reactor.

The U.S. nuclear industry agrees with the need to close the nuclear fuel cycle by recycling used nuclear fuel. The government needs to implement the necessary research and development programs that would provide the facts you need in order to make the decisions on how best to recycle. In our present once-through nuclear fuel cycle, only about four percent of the uranium is actually burned. About 96 percent of the uranium in our used fuel of today is actually unburned and can be reclaimed.

America should be doing that. Other nuclear energy countries—the UK, France, and Japan already are recycling. High temperature gas cooled reactor technology,

like fast reactors, can play an important role in developing recycling as a safe, reliable technology.

We believe America's need for hydrogen from non-emitting sources can be integrated with our research and development needs of a recycling program that would close the nuclear fuel cycle in a safe, reliable and low cost manner that would be acceptable to the American people.

In summary, our priorities are (1) the licensing and construction of advanced light water reactors as soon as possible, (2) completion of the Yucca Mountain project, (3) designing and building a Next Generation Nuclear Plant and (4) closing the nuclear fuel cycle, in that order.

We must harness the promising potential of nuclear energy in this country, not leave it to other countries of the world.

We must also move toward a hydrogen economy—and that requires that we develop a way to produce large volumes of hydrogen at a stable, low cost. A new generation of nuclear energy plants can provide that source of hydrogen.

Our country's economy and quality of life depend on it. Our children and our grandchildren depend on it.

Thank you for listening today. I will be pleased to respond to your questions.

Senator CRAIG. Without objection, Dan, that will become a part of your testimony.

Mr. KEUTER. Thank you.

Senator CRAIG. Thank you very much.

Now let us turn to Dr. Lawrence Burns from General Motors Corporation. Welcome.

STATEMENT OF LAWRENCE BURNS, PH.D., VICE PRESIDENT, RESEARCH AND DEVELOPMENT AND STRATEGIC PLANNING, GENERAL MOTORS CORPORATION

Dr. BURNS. Mr. Chairman, thank you for the opportunity to testify today.

Senator CRAIG. Again, for both you and for Jeff, we would ask, your full statements will be a part of the record. For the sake of our time and for the opportunity to question, feel free to run your time out, but summarize if you can. Thank you.

Dr. BURNS. General Motors has placed a very high priority on fuel cells and hydrogen as the long-term energy carrier and power source for our automobiles. We see this combination as the best way to simultaneously increase energy independence, remove the automobile as a source of emissions, and allow auto makers to create better automobiles that will sell in very high volume. This really is the key for advanced technology vehicles, is high volume sales. It is the only way that we can meet the growing demand for automobiles worldwide while at the same time realize significant energy and environmental benefits.

By the year 2020 there will be over a billion automobiles on our planet. That is up from 800 million today. With the increased demand for energy and automobiles, it is essential that we create a way for transportation to truly be sustainable, and this is one of the major goals of General Motors' hydrogen fuel cell program.

We really are focused in three areas: first, developing a propulsion system that can compete head to head with today's internal combustion engine systems; second, demonstrating the progress that we are making publicly; and third, collaborating with energy companies and governments to ensure safe, convenient, and affordable hydrogen is available for our customers. We are targeting to design and validate a fuel cell system by the year 2010—that is just 3.5 years from now—that has the performance, durability, and

cost, assuming scale volumes, of today's internal combustion engine systems. This aggressive timetable is a clear indication that automotive fuel cell technology is industry-driven and has matured to the point where such timing is indeed possible.

We have made significant progress with our technology. In the last 7 years we have improved the power density of our design by a factor of 14. This means that for the same amount of power our system is one-fourteenth as large as it would have been 7 years ago. Therefore it can fit nicely inside the engine compartment of a car and also deliver great driving performance for our customers.

We have also significantly improved the durability, reliability, and cold start capability of our technology, which is critical for meeting our customers' expectations, and we have developed safe hydrogen storage systems that approach the range of today's vehicles, and we are going beyond that to the next generation storage, which also has great promise.

Our progress has convinced us that fuel cell vehicles have the potential to be fundamentally better automobiles than today's automobiles, and that is the key to high sales volume. With just one-tenth as many moving parts as you have in an internal combustion engine system, our design has the potential to meet our cost and durability targets.

Today we are demonstrating our vehicles around the world. I will give you just one quick example. Here in Washington, DC., we have six vehicles that have been operating as a fleet for 4 years. We have had over 4,300 people experience a ride or drive in the technology. We will field 32 of our next generation vehicles as part of the Department of Energy's learning program starting in 2007.

One challenge that we have going forward for the auto industry is that to transform to fuel cells we need the hydrogen fueling infrastructure. A major advantage of hydrogen is that it can come from so many different pathways, including nuclear and renewable sources. We are not in the energy business, so I do not want to come across as an energy expert, but we do track very carefully what is going on with these different hydrogen pathways in terms of their economics and their safety.

We think the best way to think about hydrogen is somewhat how you think about electricity. Most of us do not know which source of electricity powers our house. We know that it comes from a variety of sources. For example, in Vermont electricity is generated primarily by nuclear power. I think in your State a lot of it is from hydropower. A major source in Texas is natural gas. Many other States use coal.

Similarly, we do not think there is one answer for hydrogen for transportation purposes. In fact, that is what we like about it. The diversity of pathways gets us off our 98 percent dependence on petroleum. Each region will evaluate the resources that they have available and as the technology progresses, as the economics improve, and as society sets higher expectations regarding the environment and energy, we will see a variety of these pathways emerge, though we do see nuclear as one of these important pathways.

Today, hydrogen can be produced from inexpensive clean electricity generated by nuclear. Longer term, as we have heard from

the other testifiers today, it could be created directly from nuclear. In the United States alone, nuclear power is a $60 billion industry. In comparison, the U.S. transportation industry is $300 billion, five times as large. So this really opens up a significant opportunity for growth in the industry business, as well as the means to reduce our Nation's dependence on imported oil. The key questions are how fast can this transformation take place and can the nuclear industry compete at a hydrogen price equivalent to $2 to $3 for gasoline gallon.

At GM we are working as hard as we can to create a fuel cell vehicle market as soon as possible. Our fuel cell program seeks to develop clean, affordable for performance vehicles that excite and delight our customers. We believe customers will buy these vehicles in large numbers and that society will reap the energy, environmental, and economic benefits. Similarly, we believe that building clean, renewable energy pathways will enable America to reduce its dependence on imported oil, promote the creation of new industry, stimulate jobs and economic growth, and ensure our country's ability to compete on a global basis.

Thank you very much.

[The prepared statement of Dr. Burns follows:]

PREPARED STATEMENT OF LAWRENCE D. BURNS, PH.D., VICE PRESIDENT, RESEARCH & DEVELOPMENT AND STRATEGIC PLANNING, GENERAL MOTORS CORPORATION

Mr. Chairman and Committee Members, thank you for the opportunity to testify today on behalf of General Motors. I am Larry Burns, GM's Vice President of Research & Development and Strategic Planning, and I am leading GM's effort to develop hydrogen-powered fuel cell vehicles.

GM has placed very high priority on fuel cells and hydrogen as the long-term power source and energy carrier for automobiles. We see this combination as the best way to simultaneously increase energy independence, remove the automobile from the environmental debate, and allow automakers to create better vehicles that customers will want to buy in high volumes.

High volume is critical. It is the only way to meet the growing global demand for automobiles while realizing the large-scale energy and environmental benefits we are seeking. By 2020, there will be more than one billion vehicles on the planet, up from over 800 million today. Clearly, with the increased demand for energy and automobiles, a greater effort to make automotive transportation truly sustainable is required.

GM's fuel cell program is focused on three areas:

- Developing a fuel cell propulsion system that can compete head-to-head with internal combustion engine systems.
- Demonstrating our progress publicly to let key stakeholders experience firsthand the promise of this technology.
- Collaborating with energy companies and governments to ensure that safe, convenient, and affordable hydrogen is available to our customers, enabling rapid transformation to fuel cell vehicles.

We are targeting to design and validate an automotive-competitive fuel cell propulsion system by 2010. By automotive competitive, we mean a system that has the performance, durability, and cost (assuming scale volumes) of today's internal combustion engine systems.

This aggressive timetable is a clear indication that fuel cell technology for automotive application is industry driven (rather than government driven) and that this technology has matured to a point where such timing is indeed possible.

We have made significant progress on the technology:

- In the last seven years, we have improved fuel cell power density by a factor of fourteen, while enhancing the efficiency and reducing the size of our fuel cell stack.
- We have significantly improved fuel cell durability, reliability, and cold start capability.

- We have developed safe hydrogen storage systems that approach the range of today's vehicles, and we have begun to explore very promising concepts for the next generation of storage technology.
- We have made significant progress on cost reduction through technology improvement and system simplification.

Our progress has convinced us that fuel cell vehicles have the potential to be fundamentally better automobiles on nearly all attributes important to our customers, a key to enabling high-volume sales. And, with just 1/10th as many moving propulsion parts as conventional systems, our vision design has the potential to meet our cost and durability targets.

Today, we are demonstrating our vehicles around the world:

- We have had a six-vehicle fleet here in Washington, D.C. for four years, and 4,300 people have participated in a ride or drive. We also have demonstrations under way in California, Japan, Germany, China, and Korea.
- We collaborated with the U.S. Army on the development of the world's first fuel cell-powered military truck, which has been evaluated and maintained by military personnel at both Ft. Belvoir and Camp Pendleton.
- We will field 32 of our next-generation fuel cell vehicles as part of the Department of Energy's Learning Demo, beginning in 2007.
- And we created the AUTOnomy, Hy-wire, and Sequel concepts, which show how new automotive DNA can reinvent the automobile. Sequel is the first fuel cell vehicle capable of driving 300 miles between fill ups. Later this year, we will be holding test drives to demonstrate the capabilities of this truly impressive vehicle.

With respect to collaboration, we are working with key partners on virtually every aspect of fuel cell and infrastructure technology. Among our partners are Shell Hydrogen, Sandia National Lab, Dow Chemical, Hydrogenics, and QUANTUM Technologies, as well as the Department of Energy and the FreedomCar and Fuel Partnership involving Ford, DaimlerChrysler, and five energy companies.

One challenge to fast industry transformation is the fueling infrastructure. A major advantage of hydrogen is that it can be obtained from many pathways, including nuclear and renewable resources. As such, it promises to relieve our 98-percent dependence on petroleum as an energy source for our cars and trucks.

GM is not in the energy business, so we are not experts on the energy industry. But, as we work to commercialize fuel cell vehicles, we have a keen interest in hydrogen pathways, and the technologies and economics involved in the various methods.

The best way to think about hydrogen is like we think of electricity. Most of us don't know which energy source is being used to power our homes; we do know that there are a variety of sources supplying power to the grid. For example, most of Vermont's electricity is generated from nuclear power; in Idaho, most is generated from hydropower; a major source in Texas is natural gas, and in many states much of the electricity is produced using coal.

Similarly, there is no single, best answer with respect to hydrogen; there are various options from which to choose. Each region will evaluate the resources that it has available. And, as technology progresses, and the economics change, and societal pressures emerge relative to environmental concerns and energy use, different options will become preferable in different locations.

GM believes an important hydrogen pathway is generation of inexpensive electricity produced by means of nuclear power, or creation of hydrogen directly from nuclear energy.

Currently, 441 nuclear power plants operating in 30 countries—including 103 in the United States—produce about 16 percent of the world's electricity. What if we could use this generating capacity at off-peak hours and harness it for transportation power?

In the U.S. alone, nuclear power production today is a 60-billion-dollar industry, and transportation energy is a 300-billion-dollar market. If nuclear energy were to be employed to produce hydrogen for fuel cell vehicles, that opens up an exciting new option for the energy industry.

The key questions are: How fast will the fuel cell vehicle market ramp up? And can the nuclear industry compete at a hydrogen price equivalent to two-to-three dollars per gallon of gasoline?

To summarize GM's position: We see hydrogen as the long-term automotive fuel and the fuel cell as the long-term power source. Our fuel cell program seeks to create clean, affordable, full-performance fuel cell vehicles that will excite and delight

our customers. We believe customers will buy these vehicles in large numbers and that society will reap the economic, energy, and environmental benefits.

Similarly, we believe that building clean, renewable energy pathways will enable America to reduce its dependence on imported oil, increase our energy security, promote the creation of new industries, stimulate jobs creation and sustainable economic growth, and ensure our country's ability to compete on a global basis.

GM applauds the enactment of the Next Generation Nuclear Plan Project as part of last year's Energy Bill. We view nuclear power as having an important role in developing the Hydrogen Economy. And we are ready and eager to work collaboratively with government, energy companies, and suppliers on energy pathways that will drive the Hydrogen Economy to reality.

Senator CRAIG. Dr. Burns, thank you very much for that testimony.

Now let us turn to Jeff Serfass, president, National Hydrogen Association. Jeff, welcome to the committee.

STATEMENT OF JEFFREY SERFASS, PRESIDENT, NATIONAL HYDROGEN ASSOCIATION

Mr. SERFASS. Thank you, Senator. It is a pleasure to be here this morning and I appreciate the chance for our organization to speak on behalf of the implementation of the Next Generation Nuclear Plant. For over 17 years our association and our members have been dedicated to the research, development, and demonstration of hydrogen and fuel cell technologies leading to a firm basis for establishing and growing a commercial hydrogen energy economy. Our extensive work in safety codes and standards, education and outreach, and policy advocacy have gotten us to the edge, indeed I would suggest the beginning, of the transition to hydrogen and a hydrogen economy. Our 103 members represent a great diversity, the great diversity in the hydrogen community: the large energy and automobile firms, utilities, fuel cell and electrolyser manufacturers, small businesses, transportation agencies, national laboratories, including Idaho National Lab, universities, and the many other researchers, development and manufacturers of hydrogen energy productions.

In partnership with the U.S. Government and each other, we are I believe the wave front of technical and economic action on hydrogen in the United States and abroad. I have attached a list of members to my written testimony.*

I want to make a few simple points and I will try not to repeat the elaboration on these points that have been presented already by other witnesses here this afternoon. First, hydrogen is critical for our energy future. It is our Nation's premier energy destination. The President's hydrogen fuel initiative, expanded and permanently authorized by the Energy Policy Act of 2005, provides the framework for a significant transformation of our energy and transportation systems. The United States and countries around the world are embarked on this transition to hydrogen as a fuel because it provides benefits in the areas you have already heard about—energy security, environmental health, and the benefit of economic growth to new businesses and expanded jobs to produce, frankly, transportation fuels domestically instead of importing them.

*The list has been retained in committee files.

Second, the transition to a hydrogen economy has begun already and it is accelerating. There are products on the market today in three significant sectors of our economy: stationary power generation, namely small-scale fuel cells fueled by hydrogen; portable electronics that are being deployed to power professional video cameras, as well as personal military power systems for the field; and transportation even, including forklifts and personal mobility vehicles.

These products, today's development of niche markets, and the DOE-cited progress in meeting key system goals suggest that we are already on the technology and market growth curve toward the hydrogen economy.

The introduction of hydrogen vehicles, as Dr. Burns has already described, is just around the corner and it is moving faster than we could have predicted just a few years ago and faster, frankly, than even the aggressive goals of the Department of Energy to have technology validation or decisions for a commercialization base in 2015. The industry is ready to move automobiles sooner than that and the infrastructure is developing. Our new web site, which provides a database of operating and planned hydrogen fueling stations in the United States and Canada, shows today a total of 37 operating hydrogen fueling stations and another 22 planned. The infrastructure, frankly, is out a bit ahead of the market and it will be ready for early fleets in urban areas and increasingly to connect hydrogen highways planned in a number of States.

So hydrogen will require and the hydrogen economy will require large amounts of hydrogen and, while it is 95 percent produced by fossil fuels today, we all know that it is going to be supplied by a variety of resources which we expect and hope will include nuclear. Nuclear can provide a significant portion of the hydrogen required, with waste management and safety issues addressed. It has been addressed already by the panel. It is our position as an association that those two issues must be addressed, because the beauty of a hydrogen future is that it is clean and it is secure. Our hydrogen production methods must meet these objectives also, and nuclear indeed is clean and it is safe.

The Next Generation Nuclear Plant solves the waste management and safety issues. So the NGNP is well suited for hydrogen production. It can produce hydrogen in three different ways: conventional low temperature electrolysis, high temperature electrolysis, and thermochemically or directly.

EPAct 2005, section 645, lays out time lines which are consistent with the growing need for hydrogen in 2020 through 2050, several decades of development. The prototype construction and operation by 2021 is needed, if not sooner, to allow investments later in the decade and beyond for full scale hydrogen production.

The future hydrogen economy needs the nuclear option and NGNP is the best way to get there. I thank you for the opportunity to appear today and look forward to discussion and continuing work with this committee as well as the Department of Energy.

[The prepared statement of Mr. Serfass follows:]

PREPARED STATEMENT OF JEFFREY SERFASS, PRESIDENT, NATIONAL HYDROGEN ASSOCIATION

Chairman Domenici, Senator Craig and other Honorable Members of the Committee: On behalf of the members of the National Hydrogen Association (NHA), I would like to speak to you today regarding the implementation of the Next Generation Nuclear Plant (NGNP) Project within the Department of Energy, as this effort may affect our country's transition to a hydrogen economy. For over 17 years, the National Hydrogen Association has been dedicated to research, development and demonstration of hydrogen and fuel cell technologies, leading to a firm basis for establishing and growing a commercial hydrogen economy. Our extensive work in safety, codes and standards, education and outreach, and policy advocacy have gotten us to the edge, indeed the beginning, of the transition to hydrogen.

Our 103 members represent the considerable diversity of the community interested in the future hydrogen economy: large energy and automobile firms, utilities, fuel cell and electrolyzer manufacturers, small businesses, transportation agencies, national laboratories, universities and the many other researchers, developers and manufacturers of hydrogen energy products. In partnership with the U.S. government and each other, we are the wave front of technical and economic action on hydrogen in the U.S. and abroad—these are the people and organizations that are making great progress along a broad technical front, and will have a key role in implementing these technologies (please see the attached list of members and our Board of Directors).*

SUMMARY

My testimony will make the following points that reflect the NHA's policy positions:

- Hydrogen is critical for our energy future to achieve energy security, environmental health and economic growth objectives.
- The transition to hydrogen has already begun, with early products on the market, and it is accelerating.
- The introduction of hydrogen vehicles into early markets is just around the corner.
- A hydrogen economy capable of fueling our transportation needs will require a large amount of hydrogen with new production capacity.
- Nuclear power can provide a significant portion of the new hydrogen required, with no greenhouse gases or other pollution, providing that waste management and safety issues are addressed.
- The Generation IV Modular Helium Reactor (MHR) planned for NGNP solves the waste management and safety issues.
- The NGNP high efficiency electric generation is well suited for hydrogen production with today's low temperature electrolysis, and NGNP high temperatures allow it to produce hydrogen with new high temperature electrolysis and/or direct thermochemical water splitting.
- The future hydrogen economy needs the nuclear option and this program is the best way to get there in the required time frame.

HYDROGEN IS OUR NATION'S PREMIER ENERGY DESTINATION

The President's Hydrogen Fuel Initiative, expanded and permanently authorized by the Energy Policy Act of 2005, provide the framework for a significant transformation of our energy and transportation systems. The U.S. and countries around the world are embarked on this transition to hydrogen as a fuel because it provides benefits to energy security, the environment and economic growth:

1. Hydrogen can help energy security because it can be produced by a variety of resources, contributing to the development of alternatives to imported oil for transportation, and fueling distributed fuel cell power generation;
2. Hydrogen can benefit the environment because it can be produced and used in ways that have minimal impact on health-related air quality and on greenhouse gas emissions; and
3. Hydrogen can benefit economic growth through more efficient energy systems, new businesses and in-country production of transportation fuels resulting in new jobs.

We will need an army of dedicated and talented people to solve all the technical and market-building challenges along the way. We will need a robust set of options

*The list has been retained in committee files.

for producing, storing and using the hydrogen, just as we currently have multiple paths to the production and use of electric energy. The stakes are high and we have a lot of work to do to get to the future we believe is achievable.

THE TRANSITION HAS BEGUN AND IS ACCELERATING

Products to produce and use hydrogen are in use today, and the pace of growth in hydrogen's use will accelerate over the next 10 to 20 years as the technologies and the infrastructure evolve. There are emerging products in three key areas:

- Stationary power generation for power at remote sites and for grid-isolated applications
- Portable electronics using micro-fuel cells in computers, cameras, surveillance equipment, military personnel power and cell phones
- Transportation, including fork lifts, personal mobility vehicles and soon, buses, cars and possibly trains.

These early products, today's development of niche markets, and the DOE-sited progress in meeting key system goals suggest that we are already on the technology and market growth curve toward the hydrogen economy.

THE INTRODUCTION OF HYDROGEN VEHICLES IS JUST AROUND THE CORNER

DOE's hydrogen program in EERE is focused on technology readiness by 2015 for hydrogen-fueled transportation. Congress has funded and DOE has implemented an impressive program to address the technology challenges, in addition to the Fossil Energy and Nuclear Energy programs funded separately.

As early as 2015 is, National Hydrogen Association members are moving even more aggressively. The manufacture and introduction of competitive technologies, market creation and development, and customer positioning by industry are indicating that commitments to early production vehicles is happening now. We will have early commercial vehicles on the road in the next few years from several manufacturers. The pace is faster than one could have expected even a few years ago. Industry is driven to the creation of world market vehicles that address environmental issues and petroleum constraints.

The supporting infrastructure is developing, too. The NHA's new website which provides a database of operating and planned hydrogen fueling stations in the U.S. and Canada shows a total of 37 operating hydrogen fueling stations already and another 22 planned. The infrastructure development is out ahead of the market and will be ready for early fleets in urban areas, and increasingly to connect hydrogen highways planned in a number of states and border nations.

A HYDROGEN ECONOMY WILL REQUIRE LARGE AMOUNTS OF HYDROGEN

No single hydrogen production strategy will be sufficient for the U.S. Although 95% of hydrogen today is produced by the steam reforming of fossil fuels, the hydrogen economy of the future will require hydrogen produced by a variety of resources, including renewable energy, nuclear and coal. Large amounts of hydrogen will be required and, just as in electricity production, different resources will be used in different regions, in different markets, and for different applications. It is through resource diversity that hydrogen will be one of two clean and secure energy carriers of the future. Electricity is the other energy carrier.

A hydrogen economy will require significant new hydrogen production, even with the increased efficiency of the automobile fleet through fuel cells and lighter weight vehicles. While it is expected that coal, with carbon capture and management, and renewable energy will be significant contributors, nuclear is expected to be required, in the U.S., and even more so in countries that lack the coal resources that the U.S. has.

The U.S. Energy Information Administration said U.S. annual gasoline usage in 2000 was 129 billion gallons, which is comparable to 129 billion kg of hydrogen if hydrogen were the replacement fuel. To provide an accurate comparison, it is important to note that hydrogen-fuel cell vehicles are more than twice as efficient as today's internal combustion engine vehicles. So let's say the annual hydrogen need is 65 billion kg for a fully hydrogen light weight vehicle fleet. The NHA reports that a manufacturer can produce hydrogen and compress it for vehicle storage with 60 kWh per kg of hydrogen, so the electric energy required with today's electrolysis technology is nearly 4,000 billion kWh, requiring about 2 million MW of electric generation capacity. With the higher hydrogen-producing efficiency of the NGNP plant, this volume of hydrogen would require only 1 million MW of new capacity. If 20 to 50% of the new hydrogen mix is nuclear, we would need approximately 60 to 150

new 3,000 MW plants in this country alone, and this new U.S. technology will be exportable to countries with far fewer domestic energy resources than the U.S. has.

Nuclear energy can produce high quality hydrogen in large quantities at a relatively low cost without any air emissions. Most importantly, large volumes of hydrogen can be produced by nuclear with investments by government and industry to develop the technology, and investments by industry to build the plants.

NUCLEAR POWER CAN PROVIDE A SIGNIFICANT PORTION OF THE HYDROGEN REQUIRED, WITH WASTE MANAGEMENT AND SAFETY ISSUES ADDRESSED

The National Hydrogen Association's position is that nuclear is an important component of the hydrogen production resource mix because, as with coal, hydrogen can be produced in great volumes to support a worldwide growing hydrogen energy market. However, nuclear waste management issues must be solved, with acceptable strategies for disposal of current and projected wastes to minimize the problem. Further, safety issues must be addressed, not because the safety record is poor today (the record is exceptional), but because the public will expect that future nuclear plants need to be designed to even higher safety standards, and be passively safe.

It is important to keep in mind that there are risks and issues with all energy production and use and there will be risks with hydrogen production and use, just as there is with gasoline and electricity. The beauty of the hydrogen future is that it is clean and secure. Our hydrogen production methods must meet those objectives, too. Nuclear is clean, and it must be safe.

THE NEXT GENERATION NUCLEAR PLANT SOLVES THE WASTE MANAGEMENT AND SAFETY ISSUES

The most promising nuclear hydrogen production technologies will likely use the high temperature gas reactor (HTGR) that is the fundamental technology behind the NGNP project. Its high temperature hydrogen production processes are more efficient (overall efficiency of ~50% or twice that of today's nuclear Light Water Reactors with low temperature electrolysis) and will be able to provide more economical, large-scale hydrogen production with greatly reduced waste and significantly increased safety.

THE NGNP IS WELL SUITED FOR HYDROGEN PRODUCTION IN THE TIME FRAME NEEDED

The NGNP project will lead to high temperature processes that can produce hydrogen in three different ways:

1. Conventional Electrolysis—Currently, the best way to produce hydrogen from nuclear energy is with conventional electrolysis. This can be done by today's Light Water Reactors and tomorrow's higher temperature reactors by electrically splitting water into its components, hydrogen and oxygen. The high efficiency of the Next Generation Nuclear Plant will produce hydrogen from conventional electrolysis more efficiently than today.
2. High Temperature Electrolysis—The high NGNP temperatures can be used in high temperature electrolyzers under development, capable of producing hydrogen at even greater efficiency than conventional electrolysis. High temperature electrolysis uses heat from the reactor to replace some of the premium electricity required in conventional electrolysis.
3. Thermochemical—High temperature steam can be used to produce hydrogen directly, thermochemically, bypassing electrolysis with even greater efficiency. The necessary chemical reactions take place at high temperatures (450-1000 °C), temperatures that are available in NGNP processes.

EPAct 2005 Section 645 lays out timelines which are consistent with the growing need for hydrogen in 2020 to 2050. The prototype construction operation by 2021 is needed to allow investments later in the decade and beyond for full scale hydrogen production.

THE FUTURE HYDROGEN ECONOMY NEEDS THE NUCLEAR OPTION AND NGNP IS THE BEST WAY TO GET THERE

We thank you for the opportunity to provide this testimony. We look forward to continuing a fruitful working relationship with the Committee, its staff, and all our stakeholders in building a successful Hydrogen Economy.

Senator CRAIG. Jeff, thank you very much.

A couple of questions of the panelists before we close out today.

Mr. Christopher, AREVA—in your testimony you mention cellulosic ethanol as well as refineries, oil sands, synthetic fuels, as a product that could benefit from the process of heat from an NGNP. Question: Could you please explain how this might work? Would the NGNP heat replace refinery heat that is currently coming from burning fossil fuels or natural gas? When we talk process energy or process heat, is that not what we are referring to?

Mr. CHRISTOPHER. Yes, in general the various cogeneration uses, if you will, of heat generally use temperatures that are higher than today's light water reactors, where you are talking temperatures of 600 degrees Fahrenheit and steam pressures of 1,000 to 1,100 psi. Most industrial facilities in terms of the types of temperatures they need or are looking for are probably double that, 1,200 degrees Fahrenheit, 1,300 degrees Fahrenheit, and they are using the burning of natural gas or other fuels to get them to the kinds of temperatures for those reactions, because those reactions are typically much more efficient at those higher temperatures than ours.

Senator CRAIG. Mr. Keuter, your company is participating in the voluntary emissions program. GAO recently reported that companies are not setting targets aggressively enough. Can you please discuss how Entergy is doing—I should say, how it is doing, with your voluntary emissions and how NGNP might fit into this?

Mr. KEUTER. We are actually—if you look at the top 100 utilities in the United States and look at the amount of carbon that we produce on gigawatt hours, we are one of the lowest in the Nation, not only in CO_2 emissions, but also in NO_X and SO_X. We have voluntarily gone to a very aggressive CO_2 reduction program nearly 5 years ago in cooperation with Environmental Defense and we are meeting those goals and we have spent millions and millions of dollars to meet those goals.

In fact, we are going to re-sign up for another 5 years to reduce it even farther. We have agreed to do that without relying on nuclear power. Nuclear power is 42 percent of our generation, but we also look at the next generation of advanced light water reactors to continue our reduction in CO_2 and eventually get into hydrogen production for transportation.

A majority of the actual hydrogen produced in this Nation, including for the Space Shuttle, is made within our service area. So we see this as a major product of the future for us, but also a major way for us to continue reduction of CO_2.

Senator CRAIG. Mr. Burns, can you discuss with the committee the time line for when GM expects that demand for hydrogen will begin to increase substantially in relation to transportation demands or as you project outward your product entering the U.S.'s fleet?

Dr. BURNS. Yes. As I mentioned in my testimony, we believe we will have the design for the propulsion system that uses fuel cells and hydrogen validated by 2010, that we think has really good high volume long-term potential. That does not mean we will be building high volumes in 2010. Our goal was to first prove to ourselves and the world that, yes, fuel cell vehicles have high volume potential.

Then we see between 2010 and 2015 a series of generations of vehicles being introduced to the market so that we can continu-

ously learn and build our supply base and build the infrastructure in hand with that. So between 2010 and 2015 we would see the initial commercialization. Hopefully, by that time we would begin to approach tipping points, so that we would see a ramp-up of much higher volume sales beyond 2015. We have not attempted to forecast those numbers at this point in time. I think the real key is to get to that tipping point.

Senator CRAIG. In the technology that you are working with, do you see it applicable not only to surface transportation units, primarily the family automobile, but larger units, like trucks and heavy truck transportation?

Dr. BURNS. Yes, that is one of the beauties of a fuel cell system, is it is very scalable from small applications to large. You just simply put more cells into the system. So we certainly see personal automobiles as well as larger trucks and buses and even locomotives down the road. We also see the potential for stationary. We are not in the stationary power business, but as we pursue our cost target of $50 a kilowatt for our system, which makes it competitive with a gasoline engine system, we are going to be passing cost targets that have been set for stationary applications. So we will see if someone is interested in licensing that technology.

Senator CRAIG. I am always amazed when I have heard—I have heard one other person use the term, calculating kilowatts per automobile. We are just not there mentally yet as a country. But obviously when we are dealing with fuel cells I guess that is what we are dealing with.

Dr. BURNS. Kilowatts is another way of talking about horsepower, but we are trying to cost out our technology in terms of how much power it can generate. The typical gasoline engine system, with its transmission and gasoline tank and exhaust system, will run anywhere from $3,500 to $5,000 for the entire system. We have to eliminate that pile of parts and put a fuel cell stack, an electric motor, hydrogen storage and controls in place and it cannot cost more than $3,500 to $5,000 or else our customers are not going to want to buy it. So that is why we have set such an aggressive target for ourselves.

Senator CRAIG. Well, thank you very much.

Mr. Serfass of the Hydrogen Association, can you please discuss what other alternatives there are to nuclear for hydrogen in the future and how big of a role do you expect nuclear to play in this equation?

Mr. SERFASS. Well, the other two driving sets of options are coal with carbon capture and sequestration and renewable energy. They too will play important parts. I think of course the market will determine greatly the regionality, the availability of the resources will determine, and primarily of course economics. People expect today that solar, for example, is a bit expensive, but wind power is actually competitive with other forms of generating electricity.

But we are going to need lots of energy and I think people are looking to nuclear and coal capturing their, frankly, normal share. If you look at the nuclear capturing 20 percent of the electrical market today, I think that would probably be a minimum for their role in hydrogen production and I think it could go much higher than that.

Senator CRAIG. It is interesting that you would mention coal and nuclear. Let me ask generally all of you, because coal in its effort to move into the future as a lesser emitting fuel source certainly, and the abundance of it inside the continental United States and the recognition of the need for its application, brought together a vision called FutureGen, and pushing technology forward as it relates to that.

I and others have talked about the new technology of nuclear being known as FreedomGen, or the nuclear hydrogen process heat kind of future that we are looking for, a non-emitting source obviously and one with substantial abundance. Any one of you in wrap-up wish to make a general comment in relation to that concept? I know that industry has come together to start producing or coming together for a group of those interested in this general collective interest. Any one of you wish to comment on that in closing?

Tom?

Mr. CHRISTOPHER. Senator, I will make one comment. We have to keep a balance with regard to the relative impacts of these technologies. While coal is plentiful in the United States and strategically important to us, any source of coal that you have seen in the United States in the last 3 years has doubled in price and has no near-term indications for relaxation.

So while IGOCC or other types of coal plants certainly are useful, the American public has to recognize they are talking about electricity from those plants that will exceed $50 a megawatt hour, as compared to perhaps $30 today for those types of plants. It has a part of America's energy portfolio, but it will not be the low-cost part.

Mr. KEUTER. If you look at industry 100 years from now, there is probably going to be three sources, main sources of energy. There is going to be clean coal, nuclear, and renewables. One of the byproducts of Next Generation Nuclear Plants when you produce hydrogen is oxygen. One of the major things that you need for clean coal is oxygen. 20 percent of the cost of a clean coal operation is oxygen. I think you have a perfect partnership for the future of clean coal and nuclear from Next Generation Nuclear Plants because the byproduct is oxygen and the need for clean coal is oxygen.

Senator CRAIG. Thank you.

Mr. Burns?

Dr. BURNS. From the auto industry perspective, we would like to see all energy pathways in play because we think the growth of the economy is a good thing and economic growth is going to require energy. But we cannot picture an auto industry where we create unique propulsion systems for every energy pathway, so you would have a car for gasoline, a car for coal, a car for natural gas. Instead, with hydrogen we get that common currency of an energy carrier and all of the energy pathways can be converted into hydrogen before they come to our customer. We see that having very exciting potential. It makes our business model simpler, our supply chain simpler, and the potential for a significant acceleration of the growth of our industry.

We cannot do that alone. We have to do that in partnership with energy companies, governments, and our customers. We think all

four need to be seeking a win as we go forward here and that that is possible.

Senator CRAIG. Thank you.

Jeff, we will give you the last word.

Mr. SERFASS. Sure. I think FutureGen and its combination of components—high temperature fuel cells, the use of coal, coal gasification, and carbon capture and sequestration—are all very important components of a coal future in general and fit well the vision of a hydrogen economy. Coal in this country is undoubtedly going to play a significant influence or have a significant influence on hydrogen, as it will in China and other countries. We need to develop those technologies.

Today we are here to talk about nuclear. I think nuclear is inherently clean. The next generation of nuclear power is safe, safer even than the excellent safety record of nuclear today. So we are expecting that nuclear is going to play a major role.

Senator CRAIG. Well, gentlemen, thank you very much for your time before the committee today in establishing this record as we move forward with the implementation of the Energy Policy Act of last year. We think it is an important step forward. Some of you have viewed it, as I think it should be viewed, as probably one of the most comprehensive efforts on the part of this Congress in cooperation with this country that we have seen in a long while as it relates to energy development and alternatives and new technologies.

Without objection, the committee's record will stay open for the purpose of any additional questions to be submitted to our panelists. With that, the committee record will stay open through the close of business tomorrow.

Gentlemen, thank you very much again, and the committee will stand adjourned.

[Whereupon, at 4:17 p.m., the hearing was recessed, to be reconvened on June 19, 2006.]

RENEWABLE FUEL STANDARD AND THE FUTURE POTENTIAL OF BIOFUELS

MONDAY, JUNE 19, 2006

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

The committee met, pursuant to notice, at 2:32 p.m., in room SD–366, Dirksen Senate Office Building, Hon. Jim Talent presiding.

OPENING STATEMENT OF HON. JIM TALENT, U.S. SENATOR FROM MISSOURI

Senator TALENT. I'll open the hearing. Senator Bingaman is on his way, I'm informed, but will be a few minutes late, so I'm going to go ahead and open the hearing. And then, when he comes, we'll take a break for any opening statement he might want to make.

Thanks to the witnesses for appearing before the Energy Committee today. As many of you know, we're holding a series of implementation hearings on different provisions contained within the Energy Policy Act of 2005, which Congress passed last year.

Several other Senators on the committee, and I, sponsored an amendment to establish a Renewable Fuel Standard. Since the energy bill has passed, we've seen unprecedented growth in the domestic ethanol and biodiesel industries and the attendant economic, energy, and environmental benefits resulting from that growth.

Because of the energy bill, the U.S. ethanol industry is, today, the fastest growing energy resource in the world. I have said, many times before, that ethanol and biodiesel are the fuels of the future that we can use today. The Renewable Fuel Standard required refiners to utilize the increasing volume of renewable fuels.

The RFS began in January. It requires refiners to use at least 4 billion gallons of ethanol and/or biodiesel this year. That gradually increases to at least 7.5-billion gallons of renewable fuels by the year 2012. The Senators who sponsored that amendment here in the committee knew that, in short order, the standard would become a floor, not a ceiling. And that is happening.

The Renewable Fuel Standard provided certainty to the ethanol industry and the financial community that demand for ethanol and biodiesel was a reality, and, therefore, allowed the renewable fuels industry to grow with confidence. There are currently 35 ethanol plants under construction. Twenty-one of those have broken ground just since last August, when President Bush signed the energy bill into law. With existing biorefineries that are expanding, the indus-

try expects more than 2.2 billion gallons of new production capability to be in operation within the next 12 to 18 months. The same is true for the biodiesel industry. That industry also benefits from the Renewable Fuel Standard. The biodiesel blender's tax credit in the energy bill has, in addition, been extraordinarily effective in incentivizing the blending of biodiesel into the Nation's diesel fuel supply. It has been the primary stimulant in 2005 and through the first few months of 2006, with a dramatic increase in new plants and jobs in biodiesel, bringing economic opportunity to both rural and urban areas.

After 2 years of significant growth, the industry is on track to exceed 150 million gallons in 2006. We went from 22 biodiesel plants in 2004 to more than 60 plants currently, and there are over 40 more plants currently under construction, with another 30 projects in preconstruction, including two in Missouri.

Today, renewable fuels represent the single most important value-added market performers. The rapidly increased demand for grain use in ethanol and biodiesel processing has improved farm income, created jobs in the agriculture sector, and revitalized numerous rural communities where biorefineries are located.

In short, the renewable fuels industry has made tremendous progress from where it was just 5 years ago, and it has helped to advanced the Nation in the direction of energy independence, it has sustained and increased economic growth in the rural areas, and it has helped improve our environment, just in that short period of time.

I'm sure we'll hear, from our witnesses, about the tremendous progress that we all expect the industry to make in the next 5 years and thereafter.

I want to say a word about new feedstocks. To date, the ethanol industry has grown almost exclusively from grain processing, and I want to thank the corn and grain industry for their leadership in building this important new part of the economy. In the future, ethanol will be produced from a variety of feedstocks, including cellulose. Cellulose is the main component of plant cell walls. It's the most common organic compound on earth. I look forward to hearing from our second panel of witnesses, who will discuss, among other things, the future of cellulosic feedstocks for biofuels.

As you know, it's more difficult to break down cellulose and convert it into usable sugars for ethanol, yet making ethanol from cellulose dramatically expands the types and amount of available material for ethanol production. This includes many materials now regarded as waste, requiring disposal, as well as cornstalks, rice straw, and woodchips, or energy crops of fast-growing trees and grasses. Cellulosic ethanol production will augment, not replace, grain-based ethanol, but, ultimately, it will exponentially expand potential ethanol supplies.

I am committed, as I think the committee is, to the renewable fuels industry. I see ethanol and biodiesel as a key component of a national strategy to greatly reduce our dependence on imported oil. For years, agriculture in the United States has fed the country. Increasingly, it's in a position to fuel the country, as well.

The Energy Policy Act of 2005 put us on a new path towards greater energy diversity and national security through the Renew-

able Fuel Standard, and I look forward to hearing from our witnesses today on the state of the biofuels industry as we work through the implementation the Renewable Fuel Standard.

All right, with that, and, again, while we wait for Senator Bingaman to come, we'll go ahead with our first panel.

And our first panel is Mr. Bill Wehrum, who's the acting assistant administrator of the Office of Air and Radiation at the U.S. Environmental Protection Agency.

Mr. Wehrum, thank you for being here with us, and please give us your statement.

[The prepared statement of Senator Bingaman follows:]

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

Mr. Chairman, thank you for calling this important hearing today. I am very interested in hearing what our witnesses have to say about the implementation of the Renewable Fuels Standard (RFS) that we enacted last year as part of the Energy Bill.

I am pleased to have a representative from the EPA; as the lead agency on this initiative, they have been working very hard to draft a rule that accomplishes what we envisioned for the RFS.

I am also pleased to see that we have a representative from our nation's premier institute for research on renewable fuels, the National Renewable Energy Laboratory (NREL). The pursuits of scientists, researchers, and laboratory technicians at NREL are crucial to helping our nation develop a slate of new renewable energy technologies to meet our future energy needs and lessen our dependence on imported fossil fuels.

I welcome our other witnesses and look forward to hearing the testimony.

Thank you Mr. Chairman.

STATEMENT OF WILLIAM WEHRUM, ACTING ASSISTANT ADMINISTRATOR, OFFICE OF AIR AND RADIATION, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. WEHRUM. Thank you, Mr. Chairman.

I appreciate the opportunity to come before you today to testify on the status of EPA's efforts to develop the comprehensive rulemaking implementing the Energy Policy Act's Renewable Fuel Standard.

The Energy Policy Act of 2005, or EPAct, as we call it, required EPA to take a significant number of specific actions that directly affect our Nation's fuel supply and quality. Some of these actions have already been proposed or taken effect; however, a lot of work remains.

The most important and significant requirement established in EPAct is a national Renewable Fuel Standard, or RFS. Since increasing the amount of domestically produced renewable fuels is a key element of the President's energy initiatives, and supports his goal of reducing the country's dependence on imported oil, the Agency has placed the highest priority in preparing this major rulemaking.

EPA also understands the need to implement an RFS rulemaking that maximizes existing fuel production and minimizes impacts on the fuel distribution system.

Under EPAct, the RFS program requires that increasing volumes of renewable fuel be blended into gasoline in the continental United States beginning in 2006. With the help of our stakeholders, including renewable fuel producers and oil refiners, EPA has been able to accelerate the implementation of these EPAct pro-

visions by making use of a default requirement provided in the act that only applies to 2006.

Last December, we promulgated a direct final rule to implement the default standard that allowed the program to begin in January without all the credit trading and compliance provisions that the full program requires.

Under the 2006 RFS default rule, refiners, importers, and gasoline-blenders are collectively responsible for ensuring that the amount of renewable fuel used nationwide is at least 2.78 percent of the total gasoline used in the continental United States. This equates to approximately 4 billion gallons of renewable fuel, of which both ethanol and biodiesel count. If the default standard is not met in 2006, the rule specifies that the deficit volume of renewable fuel would carry over to the RFS requirement for 2007. Based on data demonstrating ethanol use in 2005, and projections for 2006, it is expected that far more than 4 billion gallons of renewable fuels will be used in 2006 in the United States.

We're currently in the process of developing the full program that will apply in 2007 and beyond. EPA will propose a rule this year that would implement the comprehensive RFS program. The agency expects to publish the proposal in September for public review and comment. We plan to complete the rulemaking early in 2007.

Although the act prescribed many aspects of the program, including the required renewable fuel volumes, it did not specify the structure of the credit trading program. Unlike past programs, in which credit trading was used simply as a cost-savings measure or a way to increase compliance flexibility, for the RFS program it will be a critical aspect of demonstrating compliance. Credit trading also differs under the RFS program, because those parties that produce renewable fuels are not the same parties that must demonstrate compliance.

The proposed RFS rulemaking will also define the liable parties for the RFS program, establish how liable parties demonstrate compliance with their obligation, and establish the necessary compliance and enforcement provisions. Many of the issues involved have been considerably more complex than originally envisioned. For now, I'll provide an overview of the extensive process EPA has undertaken to develop this important rulemaking.

EPAct establishes the years for which the RFS is in effect and the required annual volumes of renewable fuel. While the 2006 level is 4 billion gallons, the volume increases, on a yearly basis, up to 7.5 billion gallons in 2012. EPAct requires that, annually, EPA is to establish the percentage requirement which will apply to individual refiners, blenders, and importers that will ensure use of the total volume of renewable fuels specified for that year in EPAct.

In order to implement a rulemaking of this magnitude, it was imperative for the Agency to properly enter into close dialogue with the affected parties, to understand how the RFS program would impact the stakeholders in realworld applications. EPA directly engaged all the major stakeholders, including the refinery industry, renewable fuel providers, and the fuel marketers and distributors, to gather information and suggestions, which were incorporated

into drafting the various compliance and credit-trading-program provisions.

EPA is committed to helping ensure the continued successful implementation of the renewable fuels program. We have accelerated the process for the RFS rule and are on track to issue a final rule in early 2007.

Thank you, Mr. Chairman and members of the committee, for you interest in the Agency's progress in developing this important rule. This concludes my prepared statement. I'd be happy to answer any questions you may have.

[The prepared statement of Mr. Wehrum follows:]

PREPARED STATEMENT OF WILLIAM WEHRUM, ACTING ASSISTANT ADMINISTRATOR, OFFICE OF AIR AND RADIATION, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. Chairman, and members of the Committee, I appreciate the opportunity to come before you today to testify on the status of the Environmental Protection Agency's efforts to develop the comprehensive rulemaking implementing the Energy Policy Act's Renewable Fuels Standard.

THE ENERGY POLICY ACT OF 2005

The Energy Policy Act of 2005, or EPAct, required EPA to take a significant number of specific actions that directly affect our nation's fuel supply and quality. Some of these actions have already been proposed or have taken effect, including the removal of the oxygen standard for the federal reformulated gasoline program, proposal of new gasoline benzene content standards to control mobile source air toxics, and the recent proposed listing of boutique fuels. However, a lot of work remains. As the Agency continues to work on all these actions, the most important and significant requirement established in EPAct is a national renewable fuels standard, or RFS. Since increasing the amount of domestically-produced renewable fuels is a key element of the President's energy initiatives and supports his goal of reducing the country's dependence on imported oil, the Agency has placed the highest priority in preparing this major rulemaking. This effort will require significant resources for the necessary technical and analytical work. EPA also understands the need to implement an RFS rulemaking that maximizes existing fuel production and minimizes impacts on the fuel distribution system.

Interest in renewable fuels has grown significantly in recent years due to concerns about high fuel prices, our nation's dependence on foreign oil, and emissions of greenhouse gases such as carbon dioxide. These are some of the reasons that the RFS program garnered such strong support during its development, and why Congress continues to investigate ways to expand the use of renewable fuels. In this context, we see the RFS program as a critical first step, and as such, it is important that it be carefully designed for the long term.

THE RENEWABLE FUELS STANDARD

Under EPAct, the RFS program requires that increasing volumes of renewable fuel be blended into gasoline in the continental United States beginning in 2006. With the help of our stakeholders, including renewable fuel producers and oil refiners, EPA has been able to accelerate the implementation of these EPAct provisions by making use of a default requirement provided in the Act that only applies to 2006. Last December we promulgated a direct final rule to implement the default standard that allowed the program to begin in January without all the credit trading and compliance provisions that the full program requires. The default rule provides us one additional year, until January of 2007, to implement the full program. Under the 2006 RFS default rule, refiners, importers, and gasoline blenders are collectively responsible for ensuring that the amount of renewable fuel volume used nationwide is at least 2.78 percent of the total gasoline used in the continental United States, as specified in EPAct. This equates to approximately 4.0 billion gallons of renewable fuel, of which both ethanol and biodiesel count. If the default standard is not met in 2006, the rule specifies that the deficit volume of renewable fuel would.carry over to the RFS requirement for 2007. Based on data demonstrating ethanol use in 2005, and projections for 2006, it is expected that far greater than 4.0 billion gallons of renewable fuels will be used in 2006 in the U.S.

We are currently in the process of developing the full program that will apply in 2007 and beyond. EPA will propose a rule this year that would implement the com-

prehensive RFS program. The Agency expects to publish the proposal in September for public review and comment. We plan to complete the rulemaking early in 2007.

Although the Act prescribed many aspects of the program, including the required renewable fuel volumes, it did not specify the structure of the credit trading program. Unlike past programs in which credit trading was used simply as a cost savings measure or a way to increase compliance flexibility, for the RFS program it will be a critical aspect of demonstrating compliance. Credit trading also differs under the RFS program because those parties that produce renewable fuels are not the same parties that must demonstrate compliance. We have been working closely with our stakeholders to design the credit trading program, and there have been many difficult issues to resolve. These issues include defining a renewable fuel credit, what parties can generate credits, how credits are generated, when and by whom credits can be traded, the life of a credit, and the methodologies for determining the appropriate value of credits for ethanol produced from cellulosic feedstocks, as well as qualifying non-ethanol renewables, such as biodiesel. However, we continue to make progress on addressing these issues through the concerted efforts of our technical and legal staff.

The proposed RFS rulemaking will also define the liable parties for the RFS program, establish how liable parties demonstrate compliance with their obligation, and establish the necessary compliance and enforcement provisions. Many of the issues involved have been considerably more complex than originally envisioned. For now, I will provide an overview of the extensive process EPA has undertaken to develop this important rulemaking.

EPAct establishes the years for which the RFS is in effect and the required annual volumes of renewable fuel. While the 2006 level is 4 billion gallons, the volume increases to 4.7 billion gallons in 2007, 5.4 billion gallons in 2008 and continues to scale up to 7.5 billion gallons in 2012. EPAct requires' that annually EPA is to establish the percentage requirement, which will apply individually to refiners, blenders, and importers, that will ensure use of the total volume of renewable fuels specified for that year in EPAct.

In order to implement a rulemaking of this magnitude, it was imperative for the Agency to promptly enter into close dialog with the affected parties to understand how the RFS program would impact the stakeholders in real world applications. EPA directly engaged all the major stakeholders, including the refining industry, renewable fuel providers, and the fuel marketers and distributors to gather information and suggestions which were incorporated into drafting the various compliance and credit trading program provisions. Following extensive dialog with these stakeholders, the Agency believes we are very close to completing proposed comprehensive regulations.

Another critical component of the rulemaking is provisions to ensure compliance, such as recordkeeping and reporting. Because this rule impacts parties not traditionally affected by motor vehicle fuel regulations, namely those in the business of producing renewable fuels, there is an additional layer of complexity not found in our other clean fuel programs. The Agency continues to work with affected parties to develop an RFS program that, where possible, utilizes existing EPA systems for collecting data and submitting records while avoiding duplicative burden.

CLOSING

EPA is committed to helping ensure the continued successful implementation of the national renewable fuels program. We have accelerated the process for the RFS rule and are on track to issue a final rule in early 2007.

I want to thank you, Mr. Chairman and the members of the Committee for your interest in the Agency's progress in developing this important rule. This concludes my prepared statement. I would be pleased to answer any questions that you may have.

Senator TALENT. Sure. And I have a few, but I think what I'll do is defer to Senator Salazar, who is here now. And if you want to make an opening statement, Ken, and then ask your questions, that'd be fine.

STATEMENT OF HON. KEN SALAZAR, U.S. SENATOR FROM COLORADO

Senator SALAZAR. Thank you very much, Senator Talent.

Let me just say that I appreciate the Energy Committee holding this hearing on renewable fuels and the implementation of the national Energy Policy Act, which we passed last year. As you know, that was a broad bipartisan effort on the part of this committee. I think we voted our bill out of this committee with only one no-vote, and it garnered over 80 votes on the floor of the Senate.

By including in that legislation the Renewable Fuel Standard, we set a very solid and attainable goal on our path towards energy independence. In the few months that they have been in place, the RFS and the renewable fuels incentives we included in EPAct have helped spur a sizable expansion of renewable fuels production across our country.

Since the bill's passage last July, we have 34 new ethanol plants that have been built or are under construction, eight existing plants are being expanded, and ethanol production is thriving in 21 States around the country. In Colorado, where we had zero ethanol plants a year and a half ago, we now have three ethanol plants online. We have several others under construction. And, in addition to that, we also have added a biodiesel plant in Colorado.

But this is only a start. If we are to succeed in growing our way to energy independence, we must make dramatic, even revolutionary, new commitments to renewable energy production. As I understand it, we will easily meet the 7.5-billion gallon target, which we set in this Congress last year, by the year 2012. We should, I believe, set the bar higher so that renewable fuels can make a greater dent in our petroleum imports.

We should continue to press forward by supporting new research at the National Renewable Energy Lab, in Golden, Colorado. We should extend the renewable energy production tax credit, now set to expire by 2007. That will allow greater certainty for investors and businessmen and -women. We should make greater investments in our E85 refueling infrastructure. We have legislation, S. 2614, with Senators Thune and Obama, which hopefully will give consumers greater choices at the pump. And we should pass S. 2025, the Vehicle and Fuel Choices for American Security Act. That legislation would help increase renewable fuel production and access for consumers, and also help us retool America's vehicle fleet so our cars and trucks can run on renewable fuels.

I look forward to hearing the testimony of the witnesses here today, and I thank you all for being here. I'm particularly interested in your thoughts on the progress of biodiesel and cellulosic ethanol research and production, along with the progress we have made in expanding the E85 infrastructure.

And I have a slightly longer statement than that, Senator Talent, and I'll just submit that for the record.

Senator TALENT. Sure. Without objection.

[The prepared statement of Senator Salazar follows:]

PREPARED STATEMENT OF HON. KEN SALAZAR, U.S. SENATOR FROM COLORADO

Thank you Mr. Chairman. I appreciate you holding this hearing to examine the implementation of the Renewable Fuel Standard in the Energy Policy Act of 2005. As you know, I worked with Senator Talent and others to include this provision in the bill, and I was pleased that it had such widespread, bipartisan support in this committee.

By passing the Renewable Fuel Standard last year, we set a solid, attainable goal on our path to energy independence. In the few months that they have been in place, the RFS and the renewable fuels incentives we included in the Energy Policy Act have helped spur a sizable expansion of renewable fuels production across the country. Since the bill's passage last July, 34 new ethanol plants have been built or are under construction, 8 existing plants are being expanded, and ethanol production is thriving in 21 states around the country. In Colorado we now have three ethanol plants online, with another under construction, in addition to a biodiesel plant.

But this is only the start. If we are to succeed in growing our way to energy independence, we must make dramatic, even revolutionary, new commitments to renewable energy production. As I understand it, we will easily meet the 7.5 billion gallon target of the RFS by 2012. We should set the bar higher, so that renewable fuels can make a greater dent in our petroleum imports.

We should continue to press forward by supporting new research at NREL, the National Renewable Energy Lab, in Golden, Colorado. We should extend the renewable energy production tax credit, set to expire in 2007, to allow greater certainty for investors and entrepreneurs.

We should make greater investments in our E85 refueling infrastructure. I am a cosponsor of S. 2614, the Alternative Energy Refueling System Act of 2006, introduced by Senators Thune and Obama, which would give consumers greater choices at the pump.

And we should pass S. 2025, the Vehicle and Fuel Choices for Americans Security Act, which not only helps increase renewable fuel production and access for consumers, but retools America's vehicle fleet so our cars and trucks can run on renewable fuels. Many of the provisions in S. 2025 are included in a bill, S. 2747, on which we will have a hearing later this week, and I want to thank the Chairman for scheduling that hearing.

I look forward to hearing the testimony of the witnesses today and I thank you all for being here. I am particularly interested in your thoughts on the progress of biodiesel and cellulosic ethanol research and production, along with the progress we have made in expanding E85 infrastructure.

Thank you.

Senator TALENT. Just a few general questions. We've heard, also, from the industries, that the communication between the EPA and the industries has been good, which is a good thing. We're grateful to you for that. Now, you're going to publish this rule in September, and go through the normal process, then, of finalizing it. What kind of plans do you have for educating and interacting with the ethanol, the biodiesel, and the petroleum industry, also, about how the rule is actually going to work, and then making sure that it gets implemented? I mean, are you guys planning for that? We've had close consultations so far, and that's been good. Now, what are your plans for continuing that?

Mr. WEHRUM. Yes, Mr. Chairman, we certainly are planning ahead, and successful implementation of this program is highly, highly important to us in the administration.

You emphasized in your question a couple of times, but I will emphasize, as well, that good preparation is very important to getting a good result. And we already have tried very hard to identify all of the relevant stakeholders from various parts of the fuel production system, the fuel distribution system. In this case, our reach goes far beyond where we typically have gone in our prior fuels regulations, because of the need to encompass those who produce ethanol and other biofuels. So, it's quite a large and complex and comprehensive undertaking, and we have tried very, very hard to reach out and establish contacts with all the relevant stakeholders, and solicit their input in the basic design of this program, all in an effort to make sure, as sure as we can, that it will be a successful program.

As you also pointed out, a very important part of what happens next is the typical rulemaking process. After we propose, there will be a public comment period, where anyone with an interest can submit written comments to us, and we will certainly consider them before we take final action. We will also have a public hearing, where folks with an interest can actually speak to us and deliver their thoughts and their concerns and their considerations verbally. All of that will lead to promulgation of a final rule. And, while we don't have a specific plan mapped out right now, because much has to be done between now and then, I assure you, Mr. Chairman, that we will try very hard to reach out to the affected industry, from all sides of this complex rulemaking, to help assure, as much as possible, its successful implementation.

Senator TALENT. OK. The reason I ask is—I'm sure you would agree that the standards in the Renewable Fuel Standard have helped create a climate where there's a certainty that that market is going to be there, and that this has helped generate all this investment. I mean, would you agree with that?

Mr. WEHRUM. I agree with that, Mr. Chairman.

Senator TALENT. So, if the publishing of your rule, and the follow-up, creates a great deal of uncertainty, then it could affect the development of the market. Would you agree with that?

Mr. WEHRUM. I agree with that, Mr. Chairman.

Senator TALENT. That's why it's important that you continue the progress you've made at this point, having good, strong standards that everybody can understand and implement. And you're not going to be able to do that without consultation.

How do you think—you seem confident that we're going to meet the 2006 statutory requirement for the Renewable Fuel Standard. And I certainly would agree. I mean, with the tremendous investment we've had, and then the desirability of ethanol and biodiesel, given the high price of oil, I mean, it seems to be working very well. How would you say that the 2007 budget request supports the fuel-related provisions of the energy bill?

Mr. WEHRUM. Mr. Chairman, the President's 2007 budget request for EPA included substantial funds for the development and implementation of the Renewable Fuel Standard and related activities. The budget included a request for $11.4 million to directly support development and implementation of the rule, and an additional $2.8 million which would go to related activities, such as improving the models that we use to analyze these complex regulations.

Senator TALENT. Talk a minute about boutique fuels. Section 1541 of the energy bill addressed that issue. It prohibited new boutique fuels from coming online. There's been a lot of concern in the Congress that the number of boutique fuels has contributed to some of the stress on energy prices. How would you say that agency's acknowledging those concerns? What do you think about it? What are you doing about it, if anything?

Mr. WEHRUM. Mr. Chairman, we're proceeding on several fronts in a parallel fashion. First, and very importantly, we are, in fact, aggressively implementing the requirements of the Energy Policy Act, as they relate to boutiques. And the most important aspect of that is a provision that requires us to list all of the current bou-

tiques and, thereby, limit the number of boutiques that can be approved in the future.

We published a draft list on June 2. We have asked for comment from the affected public and other interested parties. And we hope to wrap up that action in the very near future.

At the same time, addressing boutiques is a very high priority for this administration and for the President. The President has directed Administrator Johnson and ourselves to form a task force with State Governors to investigate the issue of boutiques, and come up with recommendations to further limit the number of boutiques that are in use in the country right now. And we have aggressively been pursuing that directive of the President. We've held several meetings, over the past few weeks, with interested States. We are working on developing a draft report for the President, and we hope to issue that report as early as next week. So, the issue of boutiques is a very important one, from many perspectives, and it's one that we're spending considerable time and resources in investigating and taking action, as appropriate.

Senator TALENT. All right, thank you.

Senator Salazar.

Senator SALAZAR. Thank you very much, Senator Talent.

In your statement and in your testimony today, you state that—in your testimony, as well as in your written statement, you are—I think you project great optimism about where we are and how successful we're being, in terms of getting to the RFS that was set forth in the 2005 national Energy Policy Act. Based on what you see happening around the country, would it be a wise thing for this Congress to up the bar from the 7.5 billion gallons that we have proposed for 2012, to some higher amount? And, if so, what would be that higher amount that you think would work as a new RFS?

Mr. WEHRUM. Senator, we are, in fact, optimistic—optimistic about our ability to put together a program that reasonably implements the requirements in the EPAct. And we're optimistic that the country is going to produce enough ethanol and other biofuels to meet the mark that has been set by the Energy Policy Act.

The question of whether the bar should be raised is a question that we, as an agency, have not investigated comprehensively at this time. Our efforts are predominantly focused on making the current requirements a success, and we're working very hard to make that happen.

Senator SALAZAR. Thank you very much.

Senator TALENT. I would agree with Senator Salazar about that. Gee, I was going to ask you to comment on my particular proposal in this area. But I won't. I mean, my feeling is, while we wait for the credit-trading regulations, which are going to be necessary to making this whole thing work well over time anyway, we can afford to let 100 flowers bloom, if you will, with a bunch of different ideas out there about what the next step is that we ought to take. But I think we're all very pleased at the growth in the industry as a result of the initial step, and eager to move further.

Let me ask you about the question of the distribution network; and, in particular, getting enough stations pumping E85 and pumping ethanol, in general. Now, I'm following up. Senator Salazar talked about a bill that Mr. Thune and Mr. Obama have

sponsored, and I've cosponsored, and I imagine you have, also. Using some of the interest in the fund from the Leaking Underground Storage Tank Fund to support further tax credits for gas stations that implement more E85—or that put in more E85 pumps, do you have an opinion on that? And do you know what the balance is on the funds, in the Leaking Underground Storage Tank Fund, the LUST Fund, as it's called? I'll avoid that acronym as much as possible, but that's what it's called.

Mr. WEHRUM. Mr. Chairman, my understanding is, the Fund has a value, roughly, of $2 billion right now.

Senator TALENT. OK.

Mr. WEHRUM. And as for promoting the use of ethanol, we, of course, believe that it's important, given the mandate that's created in the Energy Policy Act and the environmental benefits that derive from using ethanol and other biofuels. And we, within the Agency, of course, are looking for—in a variety of ways, to promote, for instance, the use of E85. We're taking a hard look at that issue right now. We know that least three of the car companies are spending significant money on advertising campaigns to promote the use of E85. We think that's a worthwhile effort, and we're trying to find a way that we can productively interact with them on that front.

As for the legislation, we have not taken a position on that legislation at this time.

Senator TALENT. And I understand. We're still in an early stage, and you are implementing the law from last year. But this seems to me to be, more and more, a crucial area, because, you're right, the auto manufacturers are advertising. People are aware, in a general sense, about the availability of ethanol and biodiesel. When they see stations on the corner pumping E85, I think that's going to be the final piece in the puzzle that really generates a lot of consumer use of that.

I also want to comment that I have been pleased with how EPA has administered this, to this point. It's still early, but we really, sort of, changed ethanol and biodiesel from being primarily a tool to achieve clean air, although it is that, and that's the reason you all are administering it, to a broader energy policy. And I had questions in my mind about whether the agency would be able to adapt to that broader goal. And I think you guys have done well so far. I wanted to say that. But I hope you'll keep in mind the importance of considering the broader energy goals, as well as the environmental goals involved in the Renewable Fuel Standard.

Mr. WEHRUM. Thank you, Mr. Chairman. And we certainly will. As I noted earlier in my testimony, it is a priority for the President and for this administration to improve our energy security and reduce our dependence on foreign oil. And successful implementation of this program is a big step in the right direction.

Senator TALENT. All right. Well, the committee thanks you for your testimony, and we can go to the second panel.

Mr. WEHRUM. Thank you, Mr. Chairman.

Senator TALENT. Well, we want to welcome the second panel, distinguished representatives of industry, the financial sector, as well as science involved in renewable fuels. And we'll just go from my left to right. And I'll introduce each one of you. And then, after I

introduce you, you may give your statement. The committee will be looking forward to your comments.

Our first guest on the second panel is Dr. Michael Pacheco, who is the director of the National Bioenergy Center, the National Renewable Energy Laboratory, in Golden, Colorado.

Go ahead, Dr. Pacheco.

STATEMENT OF DR. MICHAEL PACHECO, DIRECTOR, NATIONAL BIOENERGY CENTER, NATIONAL RENEWABLE ENERGY LABORATORY, GOLDEN, CO

Dr. PACHECO. Mr. Chairman, thank you for this opportunity to discuss how biofuels can provide our Nation with an abundant renewable source of energy, and, in particular, help our Nation reduce its dependence on imported oil.

I am the director of the National Bioenergy Center at the National Renewable Energy Laboratory in Golden, Colorado. NREL is the Department of Energy's primary laboratory for renewable energy and energy efficiency. And NREL is managed by the Midwest Research Institute located in Kansas City, Missouri. I am honored to be here today to speak with you.

The committee is to be commended for your hearings on the potential of biofuels. Given the seriousness of our energy challenges, there is a lengthy list of renewable and conventional energy options that must be pursued.

If we narrow the focus to those things that can reduce our addiction to oil, then the options become more limited. Developing an industry to produce biofuels, like ethanol and biodiesel, must be a priority, because biomass is the only renewable option that we have for liquid transportation fuels.

The biomass resource in our country is huge. We envision that every State in the Nation can benefit economically from an expanding biofuels industry.

A recent study by USDA and DOE found that the United States could, annually, produce 1.3 billion tons of biomass for fuels every year. As illustrated in my written testimony, this amount of biomass holds as much energy as 3.5 billion barrels of oil. This equals the energy in 60 percent of all the oil consumed in the United States each year, and it also equals the most oil the United States has ever produced in 1 year.

The United States currently produces more than 4 billion gallons per year of ethanol, almost exclusively from corn grain, as you said in your opening statement. The industry is growing at about 30 percent annually, and corn ethanol can ultimately supply about 5 or 10 percent of the liquid fuels that we need.

To move the ethanol industry where we need it to be, we have to go beyond corn grain as the primary resource. One of the most abundant potential resources that we have is corn stover, the nonfood parts of the corn plant, including the stalks, the leaves, and the husks. Other resources include forest things, to reduce fire hazards, residues from the forestry and agricultural operations in our country, and eventually even energy crops, like fast-growing trees and hardy grasses, like switchgrass.

Given this full range of resources and today's best available technology, NREL estimates that we can replace up to 70 percent of the gasoline that we use in the United States. As I speak——

Senator TALENT. That was 70, you said.

Dr. PACHECO. Seventy.

Senator TALENT. OK.

Dr. PACHECO. As I speak, DOE is developing a vision for how to produce 60 billion gallons of ethanol, about 30 percent of today's gasoline demand, by the year 2030.

To use all of these resources, and to maximize the impact that ethanol can have, we need to perfect the technologies for growing, harvesting, transporting, and converting these cellulosic materials into liquid fuels. We need to reduce the cost of these technologies and improve the overall conversion efficiency. With an aggressive national research effort, the size of our biomass resource base, and the efficiency of our conversion technologies, can both be increased, and biofuels can become a major fraction of our liquid fuel supply in the next several decades.

With the President's biofuels initiative, we are on course to see this vision become a reality. Our goal is to make cellulosic ethanol as cheap as corn ethanol within the next 6 years and to help the industry deploy the technology and fully develop the resource base over the next several decades.

As illustrated in my testimony, we've made good progress towards reducing the cost of cellulosic ethanol over the past 4 years, and the increased funding in the President's initiative will allow us to accelerate our R&D plans. We are targeting a goal of $1.07 per gallon by the year 2012 for cellulosic ethanol, while shooting at the longer-term cost target of 60 cents per gallon for cellulosic ethanol.

There has been some public debate about the energy efficiency of ethanol, and DOE has taken a stand in this debate. The ethanol industry today is much more efficient than it was 20 years ago. Today, the energy benefits of fuel ethanol are clear and considerable. The chart in my written testimony summarizes DOE's analysis of the energy balance, and compares it with gasoline. Corn ethanol delivers 60 percent of the total energy that we use to make it, and most of the energy that we use is renewable energy from the corn itself. The energy delivered to the customer in the form of fuel ethanol is actually 1.4 times greater than the fossil energy input, and about ten times greater than the petroleum input. Cellulosic ethanol will yield about 45 percent of the energy that we use to make it, and nearly all of the energy is in the form of the biomass itself. The key takeaway message is that ethanol can replace about ten times the amount of petroleum that's used to produce the ethanol. This is true for both corn and cellulosic ethanol.

In conclusion, biomass is our only renewable option for liquid transportation fuels. U.S. resources can supply a large portion of the liquid fuels we need, and the energy balance is very good for such a young technology. Biofuels can come from resources in every region of the country, and can stimulate rural economies. Ongoing research will reveal new ways to expand the resource base and improve the conversion technology, while also creating new fuels that can even go beyond ethanol and biodiesel.

As the director of the Nation's research center for bioenergy, I can assure you that a sustained high level of investment in biofuels research will provide sustainable benefits for all future generations. Biofuels are an environmentally and economically beneficial way to bridge the gap between rising demand and peaking oil production, while also reducing U.S. dependence on foreign oil.

Thank you very much, Mr. Chairman.

[The prepared statement of Mr. Pacheco follows:]

PREPARED STATEMENT OF DR. MICHAEL PACHECO, DIRECTOR, NATIONAL BIOENERGY CENTER, NATIONAL RENEWABLE ENERGY LABORATORY, GOLDEN, CO

Mr. Chairman, thank you for this opportunity to discuss how biofuels can provide our nation with an abundant, renewable source of energy, and in particular, help reduce our dependence on imported oil. I am the director of the National Bioenergy Center at the National Renewable Energy Laboratory in Golden, Colorado. NREL is the U.S. Department of Energy's primary laboratory for research and development of renewable energy and energy efficiency technologies. I am honored to be here, and to speak with you today.

The committee is to be commended for your hearing on the Renewable Fuel Standard and the future potential of biofuels such as biodiesel, cellulosic ethanol, and E-85. Researchers at NREL are dedicated to helping our nation develop a full portfolio of renewable energy technologies that can meet our energy needs. Given the seriousness of the energy challenges we face as a nation, there is a lengthy list of renewable and conventional energy options that must be pursued. If we narrow our focus, however, and consider specifically just those things we can do to create a viable alternative to oil—then our choices become more limited. Developing an industry to maximize the production of biofuels like ethanol, biodiesel, and other biofuels must be a priority—because biomass is the only renewable option we have for liquid transportation fuels.

Among the many benefits of biofuels are some significant advantages regarding air emissions. Both ethanol and biodiesel are oxygenates and hence can reduce the hydrocarbons, carbon monoxide and soot emitted from the tail pipes of gasoline and diesel vehicles. Biodiesel and ethanol can significantly reduce toxic compound emissions. Ethanol additionally can cut by 25% the emissions of smog forming hydrocarbons from fuel evaporation.

THE EMERGING BIOFUELS INDUSTRY

Biomass is plant material—most commonly trees, grasses or agricultural wastes—that can be turned into energy. There are a lot of ways biomass can provide energy, and for decades there has been a valuable biopower industry in this country that produces electricity from biomass. Your hearing this afternoon on the future potential of biofuels is timely and appropriate. We only recently have come to fully comprehend just how valuable a contribution biofuels can make, and how we can mobilize the technology and the entrepreneurial wherewithal to make it happen.

I strongly believe that the goals set forth in the Renewable Fuel Standard are not only achievable, but that they represent a minimum of what is needed. Accelerated development of a cellulosic ethanol industry is a goal that I believe is required and can realistically be accomplished—if we put adequate resources behind the effort. And, accelerating the adoption of E-85 is critical to displacing a large fraction of petroleum with ethanol. When President Bush came to our laboratory earlier this year, he talked about a national goal of replacing more than 75% of our oil imports from the Middle East by 2025. And he affirmed that the best way to do that is through increasing our research on advanced energy technologies.

NREL's Director, Dr. Dan Arvizu, and I were privileged to take the President through one of our key research buildings, the Alternative Fuels User Facility. We toured our process development equipment in this facility and I explained what goes on there—the research needed to accelerate the growth of a vital bioenergy industry in the United States.

Our goal is to make renewable biomass-derived fuels and chemicals the solution for ending, as President Bush himself memorably put it, our nation's "addiction" to oil. And with the President's Advanced Energy Initiative, we are on course to bring the nation's first commercial cellulosic ethanol production facilities into existence by 2012.

BIOMASS: A PLENTIFUL RESOURCE

While much remains to be done, we as a nation start with some significant strength. The biomass resource in the country is huge, and the potential for it to grow is significant.

The Department of Agriculture and the Department of Energy recently looked at the question of whether the nation's biomass resource could foster a biofuels industry large enough to meet a significant portion of our nation's future fuel needs. The report, now commonly referred to as "The Billion Ton Study," for the first time confirmed that the U.S. could yield more than a billion tons of biomass annually for energy needs. And, importantly, we could do this without negatively affecting the nation's ongoing needs for food or fiber. This is significant because the 1.3 billion tons of biomass that was forecasted contains as much energy as 3.5 billion barrels of oil.

Let me provide some perspective on that. These 3.5 billion barrels are about 60% of the 6 billion-plus barrels of oil the U.S. consumes each year. Domestically, the United States, including Alaska, currently produces about 2 billion barrels of oil per year. That's only 67% of the potential we see from biomass. U.S. oil production peaked in the early 1970s at the same level of production, about 3.5 billion barrels per year. The U.S. has never produced more than 3.5 billion barrels a year of oil.

I should emphasize that such a transition to biofuels will not happen overnight. It will take a significant and sustained national effort to get us there. Still, "The Billion Ton Study" clearly demonstrates the biomass resource is real, and large enough to ultimately replace a large fraction of the petroleum-derived fuels we depend on today. DOE is in the midst of developing a vision for replacing 30% of current motor gasoline with ethanol by 2030 and this should help guide us in realizing the potential of biofuels.

Moreover, the resource is regionally diverse. We envision that every state in the nation could produce biomass and could benefit economically from an expanding biofuels industry.

We also are encouraged by the fact that there already exists a strong and growing ethanol fuels industry in this country. The U.S. currently produces more than 4 billion gallons a year of ethanol, almost exclusively from corn grain, and the industry is growing 30% annually.

To understand where we are today and where we need to go, we need to see ethanol, technology issues and biomass resource issues as interrelated. To move the ethanol industry to where we need it to be, we have to move beyond corn grain as the primary biomass resource. One of the most abundant potential resources we have is corn stover, the non-food parts of the corn plant, including the stalks, leaves and husks. Other resources are forest thinnings, hardy grasses like switch grass, and fast growing trees.

To use these and other resources we need to perfect new technologies that convert the cellulosic materials of the plants into fuel.

BREAKING DOWN THE ECONOMIC BARRIERS

So, why aren't we producing ethanol from cellulosic biomass today? Simply put, the cost is too high. If we were to build a facility today for converting cellulosic biomass to ethanol, it would produce ethanol at about twice the price of one of today's existing corn grain ethanol facilities. But we are making steady progress. The focus of the DOE Biomass Program and the National Bioenergy Center is to make cellulosic ethanol as cheap as corn ethanol within the next 6 years. Longer term, DOE and NREL are targeting a cost of cellulosic ethanol as low as 60 cents per gallon, but this will require revolutionary approaches for producing, collecting, and converting biomass.

The targets we have set to accomplish this are ambitious, but we believe they can be met with adequate research support. Our goal is to reduce the cost of producing cellulosic ethanol from $2.25 a gallon in 2005, to $1.07 in 2012. To get there we are working to greatly increase production efficiencies, and boost the average yield from 65 gallons per ton as it is today, to 90 gallons per ton in 2012.

One of the reasons I'm optimistic that we will meet these targets is our encouraging progress to date. Over the past 5 years, we've been able to drastically cut the cost of ethanol from cellulosic biomass, corn stover in particular, by reducing the cost of enzymes in partnership with two major enzyme manufacturers, and improving the biomass conversion process.

In the late 1990s, the high cost of cellulase enzymes forced the use of an entirely different biomass conversion process called acid hydrolysis, even though the acid hydrolysis process has inherent limitations in what it can yield. That has changed because of a partnership between DOE and two of the world's largest biotechnology

companies—Genencor and Novozymes. The consequences of that research collaboration have been impressive. The cost of enzymes for producing cellulosic ethanol has been reduced more than tenfold. As a result, all major process development work on cellulosic ethanol production is now focused on the more efficient enzymatic hydrolysis process—proof that the nascent industry is already benefiting from these scientific breakthroughs. We continue to work toward further reductions in the cost of these enzymes.

INTEGRATION OF BIOREFINERIES INTO EXISTING INDUSTRIES

Another exciting area of work is in the development of what are coming to be called "biorefineries". Our scientists at NREL, together with those at other DOE national laboratories, universities and corporations, are leading the development of fully integrated refineries that use biomass, instead of petroleum, to produce fuels, chemicals, synthetic materials—virtually all of the products we use from a conventional oil refinery today. Biorefineries utilize a complex array of processing facilities to break down, convert and recombine a wide range of biomass components into fuels and chemicals, in a manner similar to how petroleum refineries convert petroleum crude oil. We envision that future biorefineries will utilize a wealth of resources we either underutilize or don't use at all today. That includes agricultural residues, forestry residues, dedicated energy crops, municipal solid waste, algae and by-products of the food and grain industry.

A range of biorefinery R&D work is underway in partnership with industry. DOE's biomass program is partnering with a number of the major ethanol technology providers and ethanol producers, including Abengoa, ADM, Broin and Cargill, to increase the yield of ethanol from existing corn ethanol facilities and expand the slate of feedstocks. In many ways, a cellulosic biorefinery can be viewed as an expansion of a corn ethanol facility. That's why we believe tomorrow's cellulosic ethanol industry will not replace today's corn grain ethanol industry, it will evolve from it.

At the same time, DOE is partnering with chemical industry leaders, such as DuPont, to develop new opportunities for producing both fuels and chemicals from biomass. DOE is partnering with the forest products industry to explore and develop biorefinery concepts that can integrate into existing forestry operations. And, most recently, NREL is partnering with oil industry technology developers to explore novel options for integrating biomass streams into existing petroleum refineries. These and other partnerships are speeding the progress of new technologies to the marketplace, and may uncover new options for producing fuels from biomass.

Thermal technologies such as gasification, pyrolysis and hydrothermal systems are all worthy of further research and development to determine how these technologies and the respective biofuel products impact the cost, efficiency and integration into existing fuels infrastructure.

ETHANOL REDUCES USE OF PETROLEUM

You may have heard some discussion about the energy efficiency of ethanol. The first ethanol plants built in the late 1970s were costly and energy intensive, and that sparked a debate about whether it made good "energy sense" to replace gasoline with ethanol. Today's ethanol industry is considerably more cost effective and energy efficient. Researchers at DOE, USDA and elsewhere have shown that the net energy benefits of fuel ethanol are clear and considerable.

The figure below summarizes results from the "Well to Wheels" study conducted by Argonne National Lab, General Motors and several other partners including two major oil companies. As shown in the figure, the energy contained in ethanol made from corn is about 1.4 times the fossil energy used to produce the ethanol, and 10 times the petroleum used. For cellulosic ethanol, the ratio of energy in the ethanol to the fossil energy used also increases to about 10 Btu in the ethanol for every 1 Btu of fossil fuel used. From the perspective of science, at least, this debate has been decided in favor of continued development of ethanol. Ethanol is proving to be a very effective option for reducing our dependence on petroleum—regardless of whether it is made from corn or cellulosic materials.

There is little doubt that ethanol will be, and should be, the first biofuel that we can use to reduce our dependence on petroleum. However, NREL and the National Bioenergy Center recognize that other biofuel options need to be developed as well.

Biodiesel and other derivatives of fats, oils and greases can make a significant contribution. Researchers at DOE and USDA have shown that the energy contained in biodiesel is 3.2 times the fossil energy used to produce the biodiesel. A wide variety of seed oils, animal fats and waste oils from all parts of the country can be converted to biodiesel. Aquatic species such as algae can also play a major role in the

long term because they do not require fertile soils, can grow in brackish water, and yet algae can produce very high yields of oil. Considerable research and development will be required to realize the potential of algae as a source of oil feedstock.

There is a small but rapidly growing biodiesel industry in the United States. The growth of this industry is currently limited by a number of barriers to market penetration, including the need to develop new fuel quality standards, uncertainty regarding impact on NO_X emissions, and by lack of understanding of how this new fuel affects engine performance and durability. This is especially true for new diesel engines equipped with advanced emission control technologies that will be introduced beginning next year. NREL's Center for Transportation Technologies and Systems is working to address these issues in partnership with biodiesel producers and engine manufacturers. We, along with industry, believe additional engine testing is needed to better understand the performance of B20 (20% biodiesel) and lower blends in the advanced emission control diesel engines that will enter the market in the 2007-2010 time frame in response to EPA regulations. This engine test work would advance biodiesel technologies by ensuring compatibility with these new (and much different) engines.

OTHER NREL VEHICLES AND FUELS RESEARCH

I would be remiss if I did not note the other important research being conducted at NREL which also is contributing to the next generation of vehicles and fuels. NREL's Center for Transportation Technologies and Systems is working to address the biodiesel utilization issues noted above. Similar R&D is needed to more accurately quantify the air quality benefits of ethanol and develop engines that are optimized to operate on ethanol as well as on gasoline. A number of vehicle efficiency improvements are also being investigated including technologies to dramatically reduce fuel use for air conditioning. Other promising answers to our future transportation needs are gasoline-electric and diesel-electric hybrid systems and so-called "plug-in hybrids". Plug-in hybrid vehicles use both a gasoline engine and the electric outlet of your home to eventually achieve fuel economy of more than 100 miles per gallon.

CONTINUED RESEARCH HASTENS FUELS DEVELOPMENT

In conclusion, let me review some key points. Biomass is the only renewable option for producing liquid transportation fuels. The U.S. biomass resource can supply a large portion of demand for gasoline and we can greatly expand the resource base when world petroleum production begins its decline. The biofuels industry can use resources from every region of the country and could become a needed stimulus for ailing rural economies. Ongoing research, like research into biorefineries, will create many new products beyond the biopower, ethanol and biodiesel we are producing today.

The President's Advanced Energy Initiative holds the promise of accelerating our work so that we can help get this industry up and running, to benefit the American people, even sooner. The initiative envisions a more aggressive research effort in all key areas: further reductions in enzyme costs, advances in process technology to reduce capital and operating expenses and advances in feedstock R&D that will reduce the cost of production, collection and transportation of biomass to the biorefinery.

As director of the nation's research center for bioenergy, I can assure you that a sustained, high level of investment for research in bioenergy will provide major benefits for future generations. We need to keep apace with this work because biofuels are an environmentally and economically beneficial way to bridge the gap between rising energy demand and peaking oil production, while reducing U.S. dependence on imported oil. Thank you.

Senator TALENT. Thank you, Doctor.

Our next witness is Chris Standlee, who's the vice president of Abengoa Bioenergy, from Chesterfield, Missouri. And it's always good to have a Missourian here, Mr. Standlee.

Mr. STANDLEE. Thanks.

Senator TALENT. By coincidence, we have a couple of Missourians on the panel. I don't know how that happened.

[Laughter.]

Senator TALENT. Go right ahead.

STATEMENT OF CHRIS STANDLEE, EXECUTIVE VICE PRESIDENT & GENERAL COUNSEL, ABENGOA BIOENERGY CORP., CHESTERFIELD, MO

Mr. STANDLEE. Thank you very much, Mr. Chairman. And we appreciate the opportunity to testify today.

As you said, my name is Chris Standlee. I'm the executive vice president of Abengoa Bioenergy. We are an international ethanol producer, with our headquarters in St. Louis. I also happen to be the vice chairman of the board of directors of the Renewable Fuels Association, the national trade association for the ethanol industry. And I am happy to be here today to make some remarks on behalf of both of those organizations. We're particularly happy to be here to discuss the fastest-growing energy resource in the world, and that is the U.S. ethanol industry.

Our company—again, an international company—is an ethanol company, with a focus on research and development of new technologies. Our primary business has been the production of ethanol in the United States since the early 1980's, and in Europe since the 1990's. We're currently the fifth-largest producer in the United States, with three operating plants and a fourth under construction. We're located in Kansas, New Mexico, and Nebraska, and our new facility under construction right now is located in Nebraska. More importantly, we have two more plants in the final stages of development, where we expect to start construction of very large ethanol plants, within the next several months, that will almost triple our current capacity over the next couple of years worth of construction.

The growth in this industry, and the growth of our company, is largely due to the passage of the Renewable Fuel Standard contained in the EPAct and the recent energy bill.

We are also the largest producer in Europe, with three operating facilities there, and a fourth and final development in France. We're a world leader in research and development, having established a separate individual research-and-development company in 2002, and funded that company with over $100 million, to be spent solely on research and development for new ethanol technologies over the next few years.

We are focusing both on traditional starch-based—improvements in starch-based technologies and also in cellulosic technologies, with a heavy focus in cellulosic. We are currently in the process of building the world's first commercial demonstration cellulosic ethanol plant at—a separate, standalone plant in Salamanca, Spain. This is expected to be operational in the spring of 2007, next year. Our goal there is to make cellulosic ethanol more practical, more feasible, and to provide insight into efficiencies and technologies for biomass ethanol production that can be incorporated into a full-scale cellulosic plant, which we plan to build here in the United States within the next few years.

We've developed partnerships with universities, Federal research facilities, and other leading R&D companies. And our goal here is, again, to produce biomass ethanol at a cost competitive with gasoline.

There's no need to go into the tremendous economic benefits. Certainly, your opening statement, Senator Talent and Senator

Salazar, is—have, kind of, highlighted those things. The one thing that I would like to point out, one of my favorite statistics, for 2005 the ethanol produced, which, of course, was ethanol based upon starch, reduced our oil imports by 170 million barrels of oil valued at $8.7 million. Today, ethanol is blended in more than 40 percent of the Nation's fuel supply, and it's sold coast to coast, and border to border.

We are way ahead, as you point out, of the minimum requirements of the RFS, with 4.7 billion gallons of capacity today. We still expect an additional 2 billion gallons of new production within the next 12 to 18 months.

The RFS implementation is going well. It's done exactly what this committee and Congress intended. It's provided stimulation to grow and expand the industry, and to attract Federal and private funds for growth. It's persuaded the financial community that biofuels companies are growth-market opportunities and encourage new investment.

The EPA has worked diligently to promulgate the rules. We, at our company, and the RFA, have supported the EPA's interim rule allowing the RFS to move forward. And it's now anticipated that more than 6 billion gallons of ethanol will be used in 2006, 25 percent over the minimum required level.

RFA has met regularly with the EPA to help craft the final rules. And, due to their efforts to include all stakeholders, we are confident that the rules will be finalized in time for the 2007 program, and that the rules will be supported by all.

I'd like to take—just very briefly comment on our position on—in E85, which we believe is a true alternative fuel and has tremendous promise, even though it's a relatively small part of the gasoline supply today, there are 6 million flexible-fuel vehicles on the road today. But steadily increasing numbers from automobile manufacturers, such as GM, Ford, and others, along with joint ventures, such as our recently announced partnership with General Motors, Kroger Stores, in the State of Texas, to bring E85 to Houston and Dallas, we believe, will bring that market to a much larger position in the energy industry. Certainly, incentives provided by the RFS and additional legislation pending is going to help that.

I'd like to also comment briefly on our cellulosic biomass provision. You know, today's ethanol industry is fermentation from grain. We believe that cellulose is the most promising new development. As indicated, our—we have an objective to build the first—we're building one plant now, in Spain, which will produce 2 million gallons of ethanol from biomass—our objective is to build a second facility, in the United States, which will produce approximately 15 million gallons of ethanol from biomass, and then a final full-commercial-scale cellulose facility by 2011. We also have a pilot plant, which is under construction in connection with our York, Nebraska, facility right now, that is also a biomass pilot plant.

Certainly, we think biofuels play a vital role to reduce the carbon emissions in the transportation sector. We believe that there will be tremendous expansion in the cellulosic industry following—initially developing around the starch industry in the Midwest, but, since cellulose is so readily available virtually everywhere in the

Nation, there will be huge expansion, I think, to the coasts and to the north and the south.

We certainly are willing to continue our commitment and our continued investment to focus on the accomplishment of these goals, and we thank you for the opportunity today.

[The prepared statement of Mr. Standlee follows:]

PREPARED STATEMENT OF CHRIS STANDLEE, EXECUTIVE VICE PRESIDENT & GENERAL COUNSEL, ABENGOA BIOENERGY CORPORATION, CHESTERFIELD, MO

Good morning, Mr. Chairman and Members of the Committee. My name is Chris Standlee, and I am the Executive Vice President and General Counsel for Abengoa Bioenergy Corporation, which in the United States, is headquartered in Chesterfield, Missouri. I also serve as Vice Chairman on the Board of Directors for the Renewable Fuels Association, the national trade association representing the U.S. ethanol industry. I am here today to represent both Abengoa Bioenergy and the Renewable Fuels Association, and I am pleased to be here this morning to discuss the fastest growing energy resource in the world—the U.S. ethanol industry.

ABENGOA BIOENERGY

First, I must point out that Abengoa is a technology driven, highly diversified company committed to sustainable development. Abengoa Bioenergy primary business is the production of ethanol; we own and operate ethanol production plants in the United States and Europe. In the U.S. we own and operate three plants, with a fourth under construction: one in New Mexico, two in Nebraska, and one in Kansas. We are also a world leader in the research and development of new ethanol technologies (both traditional starch based and cellulosic). This research commitment includes building the world's first commercial demonstration cellulosic ethanol plant in Salamanca, Spain, which is now under construction and is expected to begin operation in mid 2007.

Our commitment to research is significant. First, we have formed a separate research company called Abengoa Bioenergy R&D, Inc. Second, we have committed over $100 million to research that will be spent over the next four years to help form cellulosic ethanol plants more practical and feasible. Finally, that company has formed partnerships with universities and federal research facilities such as Washington University in St. Louis, Auburn University, Kansas State University, the National Renewable Energy Laboratory, and companies such as Novozymes, Syngenta, NatureWorks, LLC and UOP.

Currently, we are the largest ethanol producer in Europe, where we operate three ethanol plants, and have a fourth in the final stages of development. We are now constructing the commercial demonstration cellulosic ethanol plant in Salamanca, Spain where we expect to be producing ethanol from cellulose by June 2007. This plant should provide significant insight into efficiencies and technologies for biomass ethanol production that we can incorporate into a new cellulosic plant here in the U.S.

Abengoa is committed to making the cellulosic industry work in the U.S. As mentioned, our company is a world-wide leader in research and development and has committed to investing significant resources to produce biomass ethanol at a cost competitive price with gasoline, as well as DOE's goal of producing 60 billion gallons of ethanol from cellulose by 2030. We expect to submit an application to compete for one of the three cellulosic demonstration plants the President proposed in the State of the Union address.

Abengoa became interested in ethanol in the mid-1990 and shortly thereafter built its first ethanol plant in Spain. To become a world leader in the renewable fuels industry, Abengoa targeted and completed the acquisition of High Plains Corporation in February 2002. High Plains Corporation was a U.S. public company and a pioneer in the ethanol industry, building its first plant in the early 1980's. After the acquisition, High Plains Corporation changed its name to Abengoa Bioenergy Corporation in early 2003.

Senator Talent thank you for the opportunity to testify and Chairman Domenici and Senator Bingaman, it is good to see you again. I have had the honor of hosting both of you at our plant in Portales, New Mexico, and as you are aware, Abengoa Bioenergy is the only ethanol producer in New Mexico. Like so many other companies in our industry, we have recently doubled the size of that plant. We are also developing at least two additional U.S. ethanol facilities which will almost triple our current capacity within the next few years. That growth is due largely to the pas-

sage of the Renewable Fuel Standard (RFS) in the Energy Bill. Our industry in general has accepted the responsibility you have given us and we are committed to diversifying our domestic energy transportation fuels supply to include substantial quantities of home grown renewable fuels.

My testimony today includes a review of EPA's implementation of the Renewable Fuels Standard and the cellulosic industry. But first, I need to update you on the renewable fuels industry, since it is changing so rapidly.

TODAY'S ETHANOL INDUSTRY

Today's ethanol industry consists of 101 biorefineries located in 19 different states with the capacity to process more than 1.7 billion bushels of grain into nearly 4.7 billion gallons of high octane, clean burning motor fuel and 9 million metric tons of livestock and poultry feed. It is a dynamic and growing industry that is revitalizing rural America, reducing emissions in our nation's cities, and lowering our dependence on imported petroleum.

Ethanol has become an ubiquitous component of the 140 billion gallon U.S. gasoline marketplace. Today, ethanol is blended into more than 40% of the nation's fuel supply, and is virtually sold from coast to coast and border to border.

In 2005, the U.S. ethanol industry consumed more than 1.4 billion bushels of corn in the production of 4 billion gallons of ethanol. This represents approximately 12% of last year's 11 billion bushel crop. The industry also used 55 million bushels of sorghum, or about 14% of that crop. Finally, ethanol is produced from a variety of agricultural waste products, including cheese whey, beer and beverage waste.

The 4 billion gallons of ethanol produced and sold in the U.S. last year significantly contributed to the nation's economic, environmental and energy security. According to an analysis completed for the RFA, the 4 billion gallons of ethanol produced in 2005 resulted in the following impacts:

- Added $32 Billion to gross output;
- Created 153,725 jobs in all sectors of the economy;
- Increased economic activity and new jobs from ethanol increased household income by $5.7 Billion, money that flows directly into consumers' pockets;
- Contributed $1.9 Billion to tax revenue for the Federal government and $1.6 Billion for State and Local governments; and,
- Reduced oil imports by 170 million barrels of oil, valued at $8.7 Billion.

But we are not finished yet. There are currently 32 plants under construction. Twenty-one of those have broken ground just since last August when Congress passed and President Bush signed last year's Energy Policy Act into law. With existing biorefineries that are expanding, the industry expects more than 2 billion gallons of new production capacity to be in operation within the next 12 to 18 months.

The potential for the ethanol industry to continue to build infrastructure and become a substantial volume of our domestic motor fuels supply is enormous and if we truly are working towards energy independence, then we must continue moving forward. In 2006 alone, we will add more than 1.1 billion gallons of new ethanol to the marketplace, which means that without any new technological breakthroughs the industry already has the potential to grow to more than 11 billion gallons by 2012.

RENEWABLE FUELS STANDARD IMPLEMENTATION

Our company and in particular our CEO Javier Salgado, is extremely excited about the opportunities for ethanol and the commitment to the industry shown by Congress in creating the RFS. It was only a few short months ago, when this Committee worked with Senator Talent from Missouri and others on a bipartisan basis to accept an amendment that created an 8 billion gallon (RFS). The President added to my CEO's enthusiasm when he proposed three demonstration plants in his State of the Union earlier this year.

The RFS has done exactly what Congress intended. It has provided our industry with the stimulation to grow and expand, and to attract federal and private funds for the all important research and development. It convinced the petroleum industry that ethanol would be a significant part of future motor fuel markets and moved them toward incorporating renewable fuels into their future plans. It persuaded the financial community that biofuels companies are growth market opportunities, encouraging significant new investment from Wall Street and other institutional investors. While farmers have been and will continue to be the foundation of this industry, teachers, truck drivers, police officers and now all Americans have the opportunity to invest in our nation's energy future.

The Environmental Protection Agency has been working diligently to promulgate the rules implementing the RFS. The RFA and Abengoa, along with every other stakeholder, supported the Agency's interim rule, which allowed the RFS to move forward in the absence of final rules for credit banking and trading on the assumption that more than the required 4 billion gallons of renewable fuels would most certainly be used in 2006. Indeed, the industry anticipates that more than 5 billion gallons of ethanol will be sold this year, and with a projected 200 million gallons of biodiesel sales, the biofuels industry will be more than 25% over the required RFS level in 2006.

The RFA has been meeting regularly with EPA and other stakeholders to craft final credit banking and trading program. We are confident the Agency will be in a position to promulgate a rule in time for the 2007 program, and we give you our commitment that we will work with the Agency to complete this rule in a timely manner since it is vital to the future development of this infant industry. We are also confident, given the Agency's yeoman's work to include all stakeholders in this discussion, that the rule will be supported by all.

E85

E85 (an 85% ethanol to gasoline blend) is a true alternative fuel that shows a great deal of promise. While still a relatively small part of the nations fuel supply, it has the capacity to replace more gasoline than the standard 10% blend, and further lessen the country's dependence on imported oil. Abengoa Bioenergy believes there is a strong future for E85, and recently announced a partnership with General Motors, Kroger Stores, and the State of Texas to bring E85 fuel to the Dallas and Houston markets. General Motors, Ford and other automobile manufacturers are steadily increasing the number of vehicles that can burn E85 (Flexible Fuel Vehicles, or FFV's) and incentives provided by the Energy Bill and the Jobs Bill, as well as legislation being considered in several states, are promoting the expansion of the fueling infrastructure which will make E85 a more prevalent and viable fuel option.

CELLULOSIC BIOMASS

To date, the ethanol industry has developed almost exclusively from fermentation of grain starch, and this production of ethanol from grain fermentation will continue to grow. However, in the near future ethanol will need to be produced from other feedstocks, such as cellulose, to provide greater variety and volumes of feedstock and to sustain continued industry growth. Abengoa believes in the future of cellulosic ethanol and is committed to that future.

Cellulose is the main component of plant cell walls and is the most common organic compound on earth. However, it is much more difficult to break down cellulose than starch and convert it into usable sugars for ethanol. Yet, making ethanol from cellulose dramatically expands the types of material, the geographic region those materials are produced, and the amount of available material for ethanol production. At some point in the future, the materials now regarded as wastes that require disposal, as well as corn stalks, rice straw sorghum stalks and wood chips or "energy crops" of fast-growing trees and grasses will be feed stocks. Cellulosic ethanol production will augment, not replace, grain-based ethanol, and ultimately will exponentially expand potential ethanol supplies.

Abengoa plans to be a leader in the commercialization of ethanol production from cellulosic materials. Our commitment to cellulosic technology was first made at the end of the 1990s, with our first investment in an emerging cellulosic ethanol company. Soon after the acquisition of High Plains Corp in 2002, we incorporated Abengoa Bioenergy R&D, Inc. to further the development and commercialization of the cellulosic biomass technology. Our objective is to have the first commercial operating facility by 2011. This facility will use agricultural residues and switchgrass to manufacture cellulosic biomass ethanol. Like Abengoa Bioenergy, many other ethanol companies in the U.S. are working to commercialize cellulosic ethanol production: first, because we already have cellulose materials coming into the plant and second, because we are working to meet the goals of the 250 million gallons of ethanol from cellulosic feedstocks by 2013, as established by the Energy Bill.

The cornerstones of Abengoa Bioenergy's efforts are the two biomass ethanol facilities which are presently under construction, one in Spain and the other here in the U.S. Our goal is to enable the commercialization of the technology by 2011. The engineering and research pilot plant facility in York, Nebraska will demonstrate our new biomass fractionation and fermentation technology. This facility will be operating by the end of the year. The biomass demonstration facility being constructed in Salamanca Spain will demonstrate the enzymatic hydrolysis technology at the commercial scale. This facility will use wheat straw as the primary feedstock and

will have the capacity to produce approximately 2 million gallons of ethanol annually. The knowledge gained and lessons learned from these two facilities will be the basis for the design of our first commercial scale biomass ethanol facility which will be located in the U.S. grain belt. The site for this facility is being finalized and will be announced later this summer.

RESEARCH NEEDS

The only thing more astonishing than the growth of the ethanol industry is the technological revolution happening at every biorefinery and every ethanol construction site across the country. Technology is moving ahead at a very rapid pace for the companies that are conducting the research. Abengoa believes in the future of cellulosic ethanol. It is vital to the future of the renewable industry and because of that important role, Abengoa Bioenergy has committed over $100 million to be spent over the next four years to research that will be important to making cellulosic ethanol more practical and feasible.

In 2003, Abengoa was awarded a $35 million competitively awarded cost share project by the DOE to improve efficiencies of traditional ethanol production from grains, and to evaluate and develop new biomass ethanol technologies. Because of the DOE grant, we were able to form partnerships and look into new ventures with companies like Nature Works to develop a new pentose fermenting yeast, essential for the biomass technology. In addition, we have partnerships with several other companies that will assist in the development of ethanol synthesis technology.

Historically, DOE's competitively awarded grants, funded through the Biomass and Biorefinery Systems research and development program have been essential to the industry developing new technologies that will move the industry forward. Some of the previously mentioned partnerships were competitively selected projects to be funded by the DOE, but are on hold due to lack of funds.

Recently, the DOE has informed our industry that it intends to cancel many of these competitively awarded research programs, while simultaneously proposing new solicitations to fund similar research. We believe that both the DOE and the industry are frustrated with this situation because it sends the wrong message to the winners of those competitive awards.

This DOE program is an excellent way to provide federal cost-share funds to the most promising and innovative technologies to move the renewable fuels industry forward. The program has allowed Abengoa Bioenergy to build a pilot plant near our York, Nebraska facility that promotes research to increase the efficiencies of both the traditional starch fermentation process and the cellulosic ethanol production. We believe that competitively awarded programs are one of the most efficient ways to encourage development of new and unproven technologies that cannot be financed in traditional ways, and to facilitate growth in a new industry. We have asked Congress to continue to allow for additional funds for competitive solicitations. This money will provide very valuable research if the DOE is able to fund new awards and continues funding the previously awarded grants.

NEXT STEP

It is our belief that biofuels will play a vital role to reduce carbon emissions in the transportation sector in the near to mid term (the longer term may have additional options such as hydrogen).

The cellulose ethanol industry will develop in the Midwest around the existing starch ethanol industry, but biomass exists in vast quantities everywhere, and we expect significant geographical expansion after it is initially established. As documented by the USDA. There is sufficient biomass resources to make over 50 billion gallons per year of ethanol, in addition to traditional fermentation gallons.

After construction of a full commercial scale cellulosic ethanol facility, our deployment plan calls for the addition of cellulosic biomass processing capacity to our existing production facilities in both the U.S. and Europe. The plan also calls for the geographical expansion of ethanol by constructing greenfield cellulosic biomass facilities in the eastern and western parts of the U.S. where biomass is abundant.

Abengoa Bioenergy also intends to license its technology to qualified partners to further expand biomass technology.

With the incentives, biomass ethanol could quickly grow to 20 or 30 billion gallons of production in the mid-term, replacing a significant amount of our imported oil needs, and approaching DOE's goal of 60 million gallons. While biomass ethanol is competitive with oil even as low $50 per barrel, the industry needs incentives to insure growth and to protect against the possibility that oil prices could temporarily dip below $50 per barrel. Without these incentives, private new technologies and unproven plant designs are difficult to finance.

One of the main obstacles facing a new industry is securing capital from the financial markets to invest in the physical infrastructure needed to determine what technology works in the plant. Financial markets look for signals from the federal government to show that it is serious about developing a new industry. The RFS was a significant step in the right direction, but more needs to be done to meet the goals set forth in the Energy bill and the goals set by the Administration. Another important signal is funding the biorefineries commercial demonstration, the biomass production credits and the loan guarantee program in a manner so that they can complement each other and provide the necessary support and resources for the industry to grow. Of course, we would ask that you fully fund those programs; however, we also understand the realities of the current budget situation. The President's Energy Initiative has recommended a $150 million investment over three years to fund the construction of three commercial demonstration biomass biorefineries in partnership with industry and we support that recommendation.

CONCLUSION

In the State of the Union Address, President Bush acknowledged the nation "is addicted to oil" and pledged to greatly reduce our oil imports by increasing the production and use of domestic renewable fuels such as ethanol and biodiesel.

Due to the vision and hard work of this Committee, the Energy Policy Act of 2005 clearly put this nation on a new path toward greater energy diversity and national security through the RFS. We appreciate your commitment to the hardworking men and woman across America who are today's newest energy producers and we understand our responsibility as we work to diversify our energy supply.

With that in mind, additional and more focused research and the continued commitment of this Committee will make the President's vision of a more energy secure America a reality.

Thank you.

Senator TALENT. Thank you, Chris. You raised a lot of interesting issues, which we'll follow up on in just a few minutes.

We'll let Mr. Jobe give his testimony, and then Senator Salazar has to leave a little early, so we'll just—after you finish, Joe, we'll go to Senator Salazar for his questions, and then go back to the last two witnesses.

So, our next witness is Joe Jobe, who is the CEO of the National Biodiesel Board, and he's from Jefferson City, Missouri.

Joe.

STATEMENT OF JOE JOBE, CHIEF EXECUTIVE OFFICER, NATIONAL BIODIESEL BOARD, JEFFERSON CITY, MO

Mr. JOBE. Thank you, Mr. Chairman. It is a pleasure to be here this morning. I appreciate this committee holding this hearing. It is a very important and timely issue.

I've submitted my full testimony, my detailed testimony, for the record. I'll just make a few remarks to summarize that testimony.

Mr. Wehrum, of the EPA, earlier, discussed the implementation of the RFS, and I don't need to really add to that, other than—for biodiesel—other than to say that the EPA has been very conscientious and solutions-oriented in working with our industry on the implementation of that program, and we continue to look forward to working with them, going forward.

The biodiesel and the ethanol industries, as you pointed out, Mr. Chairman, earlier, are growing at an extraordinary rate. Since the passage of the energy bill, and the programs in the energy bill, our industries have been experiencing almost explosive growth.

There are three main policy measures, as it pertains to the biodiesel industry, that have primarily contributed to that growth. But all of those are about to expire, and need to be considered, very soon, for extension.

The first one is the biodiesel blender's tax credit. This was included in the volumetric ethanol excise tax credit that was passed in the Jobs Act of 2004. It was extended in the energy bill of 2005, but it's—for biodiesel, it's set to expire in December 2008. Senators Grassley and Baucus have introduced S. 2401, which is the Alternative Energy Extenders Act. And we're very hopeful that that measure will proceed and be passed.

The second policy measure is the bioenergy program. The bioenergy program is a program that—is a production incentive program that has done much to——

Senator TALENT. Go right ahead. We ignore those, and you should, also.

[Laughter.]

Mr. JOBE. The bioenergy program is a production incentive program that has done much to stimulate investment in biodiesel and the development of new refinery capacity for the biodiesel industry. The OMB and its PART evaluation program reported that the bioenergy program has been very effective in helping to develop, specifically, the biodiesel program. The bioenergy program is scheduled to expire, effectively, at the end of this month. We're hopeful that that program can be extended, because it has been very effective.

And the third policy measure that has contributed to the very expansive growth for the biodiesel industry is the Biodiesel Education Program. This program has been very effective in helping address fuel quality issues in the industry, working with the engine manufacturers and fuel-injection equipment manufacturers, working with petroleum industry partners to integrate biodiesel into the existing liquid petroleum infrastructure. That program is very key. It is going through the appropriations process and is set to hopefully be extended in the new farm bill.

Those are the three primary policy measures that have contributed to our explosive growth.

One thing I would like to mention is that also included in the energy bill of 2005 was an engine testing program that this committee authored and promoted, and Congress passed, as part of the energy bill. It is important that that program receive appropriations, because moving forward with advanced diesel engine technology, the advanced diesel engines are being tested right now with ultra-low-sulfur diesel fuel. And it's very important that they are also tested, while that testing is going on, in order to get certified with biodiesel blends.

Finally, I'll just wrap up by mentioning that a recent report was just released which stated that if these primary policy measures that I just summarized are extended, and we can continue to grow biodiesel at the rate that it's growing now, that biodiesel will add more than $24 billion to the U.S. economy, add more than $24 billion to GDP, by 2015. Just the addition to the U.S. Treasury would be $8.3 billion. Offset of the cost of the extension of the program, $3.5 billion, the blender's tax credit is a net revenue gainer, according to that. More than 39,000 new permanent jobs would be created by 2015. And so, it is pretty exciting what is going on right now, and the fact that the policy measures that are in place are actually working.

So, with that, I'll conclude, and thank you, again, Mr. Chairman.
[The prepared statement of Mr. Jobe follows:]

PREPARED STATEMENT OF JOE JOBE, CHIEF EXECUTIVE OFFICER, NATIONAL BIODIESEL BOARD, JEFFERSON CITY, MO

Good morning Mr. Chairman, Ranking Member Bingaman, and committee members. It is a pleasure to be here today. We appreciate the committee holding this hearing and providing the opportunity to examine this important issue.

My name is Joe Jobe, Chief Executive Officer, of the National Biodiesel Board (NBB). The NBB is the national not-for-profit trade association representing the commercial biodiesel industry as the coordinating body for research and development in the U.S.

The announced purpose of this hearing is to consider the implementation of the Renewable Fuel Standard (RFS) and future potential of biofuels. Biofuels, particularly biodiesel and ethanol, are currently experiencing tremendous growth. I would like to focus my comments this morning on the factors that have contributed to that growth for biodiesel, why this growth is important to America, and what must be done to keep it on its current path of success.

Biodiesel is a diesel fuel replacement that is made from agricultural fats and oils and meets a specific commercial fuel definition and specification. Soybeans are the primary oilseed crop grown in the United States, and soybean oil makes up about half of the raw material available to make biodiesel. The other half consists of all other vegetable oils and animal fats. Biodiesel is made by reacting the fat or vegetable oil with an alcohol to remove the glycerin in order to meet specifications set forth by the American Society of Testing and Materials (ASTM). Biodiesel is one of the best-tested alternative fuels in the country and the only alternative fuel to meet all of the testing requirements of the 1990 amendments to the Clean Air Act. Biodiesel exhibits certain premium diesel characteristics. It contains oxygen so it burns cleaner, it reduces smoke and smell, and increases cetane and lubricity, two important operational characteristics.

Beginning this month, Ultra Low Sulfur Diesel Fuel (ULSD) will begin phase-in for on-road diesel fuel. Most ULSD will require a lubricity additive in order to meet lubricity specifications. Just 2% biodiesel can provide sufficient lubrication properties to any diesel fuel. In fact, Stanadyne Automotive, the largest fuel injection manufacturer in the United States has stated that adding 2% biodiesel to all ULSD is a superior solution to the lubricity problem with ULSD. It is anticipated that a significant amount of biodiesel will be used in ULSD as a renewable lubricity additive.

Biodiesel production and sales have grown from an estimated 25 million gallons in 2004, to an expected 150 million gallons in 2006. Likewise, investment in biodiesel production has grown from 22 biodiesel plants in 2004 to more than 65 biodiesel plants currently. There are over 50 more plants currently under construction.

The high price of fuel is one of the factors contributing to increased biodiesel use. However, there are three main federal policy measures that have been extraordinarily effective in stimulating biodiesel's increased production and use. Because of these three policy measures, biodiesel is beginning to make a small but significant impact on our nation's energy supply. These three measures are all working extraordinarily well, but are soon scheduled to expire, and must be continued in order to keep the growth in biodiesel going strong. Although biodiesel is showing signs of success, the industry is still in its infancy, and is where ethanol was in 1982.

First, the biodiesel blender's tax credit was part of the restructured Volumetric Ethanol Excise Tax credit or "VEETC" legislation, enacted as part of the JOBS Act of 2004. The new blender's tax credit for biodiesel went into effect in January of 2005. It functions similarly to the ethanol tax credit, and it has been extraordinarily effective in incentivizing the blending of biodiesel into the nation's diesel fuel supply. It has been the primary stimulant in 2005 for the dramatic increase in new plants and jobs in biodiesel, bringing economic opportunity to both rural and urban areas.

Senators Grassley and Baucus have introduced the Alternative Energy Extender Act, S. 2401. This act includes the extension of the biodiesel blender's tax credit through 2010. It is likely that the need for this program will go beyond 2010, and it is critical that this tax credit, which has been so effective for biodiesel, not be allowed to expire.

The second policy measure that has been very effective in energizing biodiesel's growth is the Bioenergy Program. The program was initiated by the USDA in 2000 to stimulate the use of crop surpluses for energy needs. It was extended as part of the 2002 Farm Bill. However, the program is set to expire in July of this year. This

program provides a production incentive which has been highly effective in the growth of the biodiesel industry. A 2005 OMB Program Assessment Rating Tool or "PART" evaluation reported that the program did an excellent job of stimulating biodiesel growth, and indicated that the program could continue to be effective for the emerging biodiesel industry. The report stated, "Increases in the production of biodiesel indicate a rise in the supply of domestically produced renewable fuels. It's also an indicator of the viability of the biodiesel industry and its expanded consumption of agricultural commodities."

According to Centrec Consulting Group, if an extended 2007 Bioenergy Program for biodiesel increased soy-based biodiesel production by a very modest 40 million gallons it would be expected to increase soybean prices up to $0.07 per bushel. Based on a 3.0 billion bushel crop and given the fact that low prices are projected to result in farm program payments, this increase in biodiesel demand could reduce soybean farm program outlays by up to $210 million. This would more than offset the cost of extending the Bioenergy Program for biodiesel for FY-2007. Extension of this program for biodiesel has many positives. It will be good for farmers, good for biodiesel, and can be a net positive for the U.S. Treasury. I ask that you please consider doing what you can to extend this important program which is scheduled to expire in July of this year.

The third program that has greatly contributed to biodiesel's success is the USDA's Biodiesel Fuel Education Program. This program was a part of the energy title of the 2002 Farm Bill. The program provides educational funding to support increased fuel quality measures, increased acceptance of biodiesel by engine and equipment manufacturers, petroleum partners, users, and the general public. The USDA has done a superb job in implementing this program and it has been a key ingredient to biodiesel's recent growth. A recent survey done to benchmark the program's progress showed that the public's awareness of biodiesel rose from 27 percent in August 2004 to 41 percent in December of 2005. To impact the American public's awareness that significantly on any given issue is remarkable. In addition to greater awareness from the general public, market research shows familiarity among trucking executives increased from 27 in 2004 to 53 in 2005. Also of note:

- Four-in-five consumers continue to support a tax incentive that would make biodiesel cost-competitive with regular diesel fuel.
- 88 percent of environmental group leaders and 84 percent of health organization leaders support biodiesel as a transitional fuel, because biodiesel can make an immediate impact on reducing emissions until zero emissions technology is developed.

While the program has been highly effective, the biodiesel industry is still immature, and faces enormous challenges. Continued education is needed. I ask that you please look for ways to expand and extend this program beyond 2007.

To summarize the three federal policy measures that have been very effective in the development of the biodiesel industry and should be continued:

1. Extension of the biodiesel blender's tax credit;
2. Extension of a Bioenergy Program for biodiesel;
3. Extension and expansion of the biodiesel fuel education program.

In addition to these three primary policy measures, there is one more program that must be mentioned. The Energy Policy Act of 2005 authorized funding for engine testing with biodiesel blends. The program was proposed by this committee and passed by Congress to help fund testing of new advanced diesel technology with biodiesel blends. Recently, a letter of support for this program was sent to the Senate Energy and Water Appropriations subcommittee. The letter was signed by eight major diesel engine and auto makers and the Engine Manufacturer's Association. The letter outlined the fact that recent regulatory changes are requiring that diesel engines be redesigned in order to meet stricter emissions targets. These redesigned engines will need to be tested with biodiesel blends if biodiesel is to play a role in future diesel technology.

Soybean farmers have committed $2.4 million to help address these engine testing needs. Likewise, engine and equipment companies have also committed significant resources. It is imperative that funding for this program is appropriated, so that biodiesel blends can be included in the testing of the new engines while the engines are being tested and certified with ultra low sulfur diesel fuel, and while leveraged funding is available. We ask that you support funding of this program.

According to the findings of LECG, an economic analyst group, continued "expansion of the biodiesel industry will provide significant economic benefits in terms of additional gross output and Gross Domestic Product, household income, new jobs, and tax revenue for government at all levels." The report assumed the extension

and implementation of the four major federal policy initiatives mentioned in this testimony, and projected growth in the biodiesel industry through 2015 and the impacts of that growth. The report concluded that more than $810 million would be invested in biodiesel refineries and that the ongoing operation of those facilities would result in an increase of more than $40 billion of gross output to the U.S. economy. It will result in the creation of more than 25,000 permanent jobs by 2015. The report further concluded that the increased economic activity would result in increased income to American households, and additional tax revenue at all levels of government. Finally, the report concluded that as a result of the displacement of imported crude oil, more than $13 billion will remain in the American economy instead of being sent abroad to finance oil imports.

During the 2006 State of the Union speech, President Bush outlined his Advanced Energy Initiative, which stated the goal of reducing petroleum imports from the Middle East by 75 percent by the year 2025. Biodiesel and ethanol can be the first tools used to begin reaching that goal, because they are liquid renewable fuels that are available right now, ready for blending into our existing fuel supply and used in our existing vehicles. As an illustration of how biodiesel can play a role in that effort, please note that Iraq is the second largest provider of crude oil into the United States from the Persian Gulf region. Of the crude that comes from Iraq, approximately 1.85 billion gallons of diesel fuel is refined for the U.S. market. If long-term, America were to replace just 5 percent of its 37 billion gallons of on-road diesel fuel with biodiesel, it would equal 1.85 billion gallons—the same amount of diesel fuel that we get from Iraq.

In addition to the significant benefits that biodiesel offers to increase our domestic refining capacity and overall energy supply, biodiesel offers enormous benefits to our agricultural sector. Biodiesel does much more than just utilize surplus agricultural commodities; it adds multiple layers of value to agricultural economics. There have been five major comprehensive economic studies evaluating biodiesel in the last four years. All of these studies, using different economic models, had similar conclusions: that increased utilization of fats and oils for biodiesel increases the value that farmers receive for their crops, while making protein meal less expensive as a feed for our domestic livestock producers and more competitive in international protein markets for food and feed. Not only does this allow farmers to more profitably supply global food markets, it may have the effect of increasing agricultural processing in the United States. Additional biodiesel production further increases domestic chemical processing from renewable by-products.

Finally, I would like to point out that during this period of growth and expansion of the biodiesel industry, fuel quality has become a paramount priority of industry stakeholders. Based on the experience of the introduction and expansion of the ethanol industry in the 1980s, the biodiesel industry has tried to anticipate fuel quality issues and address them. In 2000 the NBB established the National Biodiesel Accreditation Commission or NBAC which developed BQ-9000, the industry's voluntary quality assurance program. This program accredits biodiesel producers or certifies biodiesel marketers based on quality assurance in the production and handling of fuel. BQ-9000 was modeled after other industry quality assurance programs such as IS0-9000, and will serve as a mark of quality to enable customers and distributors to better insure quality in their purchasing.

ASTM is the recognized standard-setting body for fuels and additives in the United States. ASTM has adopted a specification for biodiesel, ASTM D 6751. When biodiesel that meets its specification is blended into on-spec diesel fuel, and is handled according to proper fuel management techniques, the result is a high quality fuel. Quality biodiesel blends have been shown to perform well in virtually any unmodified diesel engine. However, use of any fuel that does not meet its quality specifications could cause performance problems or equipment damage, and this includes biodiesel.

The National Biodiesel Board believes strongly that rigorous adherence to D 6751 is important in order to protect consumers from unknowingly purchasing substandard fuel, in order to maintain the integrity of the nation's fuel supply, and in order to protect the reputation of biodiesel as a high quality, high performance fuel. Several federal and state government agencies are responsible for the regulation and enforcement of fuel quality in the United States. Rigorous enforcement of fuel quality and compliance measure are very important, especially during this period of rapid industry expansion.

Mr. Chairman, members, we appreciate the opportunity to come before you today on this most critical issue. On behalf of the biodiesel industry, I want to thank you for all of the support you have given not only to the biodiesel industry, but the development of the biofuels industry overall. We look forward to continue working

with you in this important endeavor. I would be happy to answer any questions you may have.

Senator TALENT. Thank you, Joe. Thanks to all the witnesses who have summarized their testimony. And, of course, your full testimony will be put in the record, without objection.

And now, we'll interrupt, just for a few moments, so Senator Salazar has time to ask his questions.

Senator SALAZAR. Thank you very much, Senator Talent, for accommodating me.

And let me just say to each of the witnesses, Mr. Wehrum, Mr. Carey, Mr. Jobe, Standlee, and Dr. Pacheco, that you're working in a very exciting industry, and the things that you're doing, I believe, are pioneering the energy future of America. And this is an issue which I think transcends partisan politics and ideology.

You know, I had the honor of spending time with Dr. Pacheco and President Bush at NREL, just several months ago, and talking about some of the great opportunities that we have with biofuels here for our country. So, this is an agenda that I know that Senator Talent and I very much believe strongly in, and I think you're going to see lots of opportunities, whether it's in legislation that we craft for this year or legislation that we craft as we put together the energy title of the farm bill. It's going to be significant opportunity for all of you to participate with us as we move this agenda forward.

So, I thank you for your testimony, and I will read all of your testimony. I have just a couple of questions, one to Dr. Pacheco and one to Mr. Jobe.

You have a tremendous vision and goal for NREL. And I have been there on three or four different occasions already in the last year and a half. My question to you is whether or not we, as a country, we, as a Congress, are investing enough, at this point in time, in terms of biomass research. When you talk about getting to the point where we can commercially produce cellulosic ethanol within 6 years, are we putting the investment into the research that's necessary to be able to achieve that goal? And, if not, what more should we be doing, at this point?

Dr. PACHECO. Well, thank you very much, Senator Salazar, for your interest in NREL and the research that we carry out there. The research budgets for cellulosic ethanol, as you know, Senator, is very important. As I said in my testimony, the technology, while it's viable technically today, it's not economically profitable. And we still have a number of very significant technical challenges to face.

The increase in the President's biofuels initiative for next year's budget is substantial, and it will allow us to accelerate our work in a number of different areas. I think the best judge of whether or not it's sufficient or not will be to closely monitor our progress in the coming years, and after years of increase that we have for 2007, is to take note and look at the progress that we've been able to make next year. If the progress is not to the satisfaction of the lawmakers here in Washington, then I think, at that point, it will be necessary to make additional changes. We have very large technical challenges, and it's difficult to predict, from a scientific point of view, how quickly we can make progress. But I can tell you that all of the staff at NREL and the—you know, around the rest of the

United States, universities and other laboratories that are doing research in this area, very much appreciate the actions of this committee and the President's biofuels initiative in recognizing the need for additional funding in the research.

As to whether or not it's sufficient, Senator, I think that a year's worth of progress will be very telling. We have very specific metrics, as you know, and we track our progress against those metrics, and we publish that once a year. And so, I think when we come out with what we call our state-of-technology report in 2007 on cellulosic ethanol, I think that will be the proof as to whether or not we've increased and accelerated the rate of the research sufficient enough, or not.

Senator SALAZAR. Well, I appreciate that very much, Dr. Pacheco. And I know, speaking for myself, and, I'm certain, for my colleagues on this committee, that we would be very interested in that report in 2007. It is an incredible goal to say that we can commercially get to the point where we can produce cellulosic ethanol within 6 years. And so, our ability to monitor the progress of you and all the other partners that are working on this issue, is going to be very important.

Mr. Jobe, my question for you has to do with the source of biodiesel. I think, in this country, most of the biodiesel that we have is currently being produced from soy. There is tremendous opportunity, as I understand it from people in Colorado, for us to do more in the area of canola. Can you briefly describe to the committee what the opportunities are to diversify—not to do away with using soy in producing the biodiesel, but in using other agricultural products, such as canola?

Mr. JOBE. Yes, thank you, Senator Salazar. In the United States, looking at all of the available raw materials for the production of biodiesel, all of the lipid sources, the fats and oils that are available, it's—it comes to about half soybean oil and about half of everything else—and "everything else" would be corn oil, canola, sunflower, safflower, animal fats, recycled oils, et cetera. Those are rough-order-of-magnitude numbers. Soybeans are our primary oil seed crop that we grow in the United States. And so, that is why we talk about it. Of course, in Europe, their primary oil seed crop is rapeseed oil, similar to canola oil.

There are tremendous opportunities. In fact, we are using a significant amount of soy, an increasing amount of soy, but we're also using an increasing amount of all of the other fats and oils that I referenced, including an increasing amount of canola. Soybeans are about 20 percent oil and about 80 percent meal. And soybeans are primarily grown for the protein for food and feed applications, primarily domestic livestock feed applications, domestically, and as protein sources in international markets.

Senator SALAZAR. When I look at Europe—Europe, I think, as you were saying, rapeseed or whatever the seed is similar to canola. What is the potential for us to look at canola as one of the primary sources for biodiesel?

Mr. JOBE. There's a significant potential, because rapeseed has a higher oil content. Soybeans are about 20 percent oil content, rapeseed's about 45 percent oil content. Most of the rapeseed grown in the United States, it's a similar variety as canola—we're more

familiar with the term "canola"—most of that is grown in the upper plains States, and about 90 percent of the canola grown in the United States is grown in North Dakota. However—and that region is well suited for that crop—however, there is some very significant research going on that is the development of arid-variety rapeseed and canola crops that can be grown in your region, for example, and other arid regions, that are very promising; rapeseed varieties that would adapt well in the mid-South, for example, to possibly replace some cotton and tobacco acres. So, there are some very exciting technologies to increase the available supply of oil seeds and crops.

Senator SALAZAR. I appreciate the responses to those questions. And, again, let me just say, this is a very exciting topic for all of us here, because it really goes to the very heart of the national security of our Nation. And I look forward to working with Senator Talent and my colleagues in moving this agenda forward. And I appreciate your testimony today.

And thank you, Senator Talent, for accommodating me and my schedule.

Senator TALENT. I'm glad to. The Senator's worked hard on the Renewable Fuel Standard and on this general issue, and I'm pleased at his interest.

We will now go to Mr. Charles Carey, who's the chairman of the board of the Chicago Board of Trade, obviously in Chicago.

Glad to have you here, Mr. Carey. And, you know, the White Sox are going to be playing the Cardinals in the next Series, but I'm not going to ask you where your sympathies lie on that. I wouldn't want to put you on the spot. You can go ahead and give us your statement, if you'd like.

STATEMENT OF CHARLES P. CAREY, CHAIRMAN OF THE BOARD, CHICAGO BOARD OF TRADE, CHICAGO, IL

Mr. CAREY. Mr. Chairman, on behalf of the Chicago Board of Trade, I want to thank you for the opportunity to appear today.

Founded in 1848, the Chicago Board of Trade has provided transparent and liquid risk-management markets for a variety of industries for over 150 years. Our commitment to the integrity of those markets has allowed the Chicago Board of Trade to grow dramatically from its founding. Today, the Board of Trade is a global, publicly-traded exchange, with a total volume of nearly 675 million contracts traded last year.

The Board of Trade offers futures and options contracts on a wide variety of agriculture, interest rate, stock index, and metals products. One of our most recent offerings is the Chicago Board of Trade ethanol futures contract introduced in March of last year.

The Board of Trade commends Congress and members of this committee for enacting policies to encourage research, production, and use of renewable fuels. As you know, the Energy Policy Act of 2005 included a national Renewable Fuel Standard, which created a baseline-use requirement of 4 billion gallons in 2006, increasing to 7.5 billion gallons by 2012. The Board of Trade supported the establishment of the RFS and believes its implementation will continue to foster development of the U.S. renewable fuels industry.

The rate of growth in the ethanol industry has increased dramatically over the past few years. Only 4 short years ago, U.S. ethanol production capacity was just 2 billion gallons annually. Today, the U.S. ethanol industry can produce approximately 4.8 billion gallons per year, and has almost 2 billion additional gallons of production capacity under construction.

The Chicago Board of Trade began to study the ethanol industry in the spring of 2002. While there was some level of interest in an ethanol futures contract, the exchange determined that the industry was not yet large enough to generate liquidity needed to support a viable contract. However, in our research we learned some interesting facts about the ethanol cash market trade that prompted us to revisit the idea when production and the size of the industry had increased.

Of particular interest, we learned, in 2002, that the industry lacked reliable price discovery and viable risk-management tools. At that time, ethanol price risk, if hedged, was typically hedged using unleaded gasoline futures. That strategy worked in some instances, but was problematic in others, since gasoline futures prices did not always correlate well with ethanol cash prices. Also, many new entrants to the ethanol industry were frustrated by a lack of reliable price data.

Part of the Board of Trade's mission is to provide transparent risk-management tools of the highest integrity, to provide a price discovery mechanism, and to disseminate the prices of transactions that occur on our exchange publicly. Therefore, in 2004, the Chicago Board of Trade re-examined the feasibility of an ethanol futures contract. By that time, annual ethanol production in the United States had increased to over 3 billion gallons, but the United States still did not have a viable risk-management tool or transparent pricing source for domestic ethanol producers and users. Moreover, U.S. market participants were more enthusiastic about obtaining these tools, since the additional production naturally created additional risk.

The Chicago Board of Trade designed a corn-based ethanol futures contract in 2004, and launched it for trading in March 2005. The Board of Trade ethanol futures contract has demonstrated steady growth over the past year. Today, market participants have open-interest positions in the Chicago Board of Trade ethanol futures contract, going out 1 year into the future and representing over 24 million gallons of ethanol. Average daily volume, while variable, continues to grow.

More importantly, perhaps, the industry has begun to use Board of Trade ethanol futures prices as a barometer for domestic cash ethanol transactions. By disseminating the prices discovered through transactions on our exchange, the Board of Trade is providing the industry with transparent pricing, and the results are encouraging. Since all market participants now have a reference for pricing, the way ethanol is traded in the cash market has evolved, as well. The end result of these developments is more efficient trade in both cash and futures, a tighter bid as spread.

Chicago Board of Trade held an ethanol industry meeting in early June to gather feedback from market participants. They offered their support and ideas to grow the Board of Trade ethanol

futures contract. In order for their industry to continue to grow, greater efficiencies in trade will need to be realized. They also understand that a transparent and fair futures market plays an important role in developing these efficiencies.

We, at the Board of Trade, are proud of our part in this dynamic industry, and we look forward to its continued development.

Once, again, the Board of Trade appreciates the opportunity to participate in this dialogue today, and I'll be happy to answer any questions. It's an honor to participate.

[The prepared statement of Mr. Carey follows:]

PREPARED STATEMENT OF CHARLES P. CAREY, CHAIRMAN OF THE BOARD, CHICAGO BOARD OF TRADE, CHICAGO, IL

Mr. Chairman and Members of the Committee, on behalf of the Chicago Board of Trade, I thank you for the opportunity to appear before you today.

Founded in 1848, the Chicago Board of Trade has a more than 150-year history of providing critical risk management markets and price discovery for a variety of industries. Our experience in providing customers with open, transparent, liquid markets and our commitment to the integrity of those markets has allowed the CBOT to grow dramatically from its founding to become a global, publicly-traded exchange with a total volume of nearly 675 million contracts traded last year. The CBOT offers open outcry and electronic trading of futures and options contracts on a wide variety of agricultural, interest rate, stock index and metals products. Among our most recent offerings are CBOT ethanol futures contracts, introduced in March of last year, and we are pleased to be providing our world-class risk management markets and transparent price discovery to this growing and vital industry.

The CBOT commends Congress and members of this Committee for enacting policies to encourage research, production and use of renewable fuels in the U.S. As you know, the Energy Policy Act of 2005 included a national Renewable Fuels Standard (RFS), which created a baseline renewable fuel use requirement of 4 billion gallons in 2006, increasing to 7.5 billion gallons by 2012. The CBOT supported the establishment of the RFS, and believes its implementation will continue to foster development of the U.S. renewable fuels industry, ultimately establishing a more self sustainable energy supply and providing a key source of potential revenues for farmers and rural economies in the U.S.

The rate of growth in the ethanol industry has increased dramatically over the past few years. From its modest beginnings in the late 1970s to around 1980, it took over 12 years for the U.S. ethanol industry to reach an annual production level of 1 billion gallons. A decade later, in 2002, the U.S. reached the 2 billion gallon annual production level. It was at this point, however, that ethanol production truly began to accelerate. It took just 2 more years to reach 3 billion gallons of production and only 1 year after that to reach 4 billion gallons of production in 2005. Today, the U.S. ethanol industry has production capacity of approximately 4.8 billion gallons per year with nearly another 2 billion gallons of production capacity under construction.

The Chicago Board of Trade began to study the ethanol industry in the spring of 2002. At that time, the U.S. had annual ethanol production capacity of just over 2 billion gallons. While many of our existing customers trading corn futures and options contracts supported development of an ethanol contract to enable ethanol producers to protect their processing margin in much the same way that soybean processors use soybean, soybean meal and soybean oil futures to protect their processing margins, the Exchange determined that the ethanol industry was not yet large enough to generate the liquidity needed to support a viable futures contract. However, in our research, we learned some interesting facts about the ethanol cash market trade that prompted us to revisit the ethanol industry in a couple of years, when production and the size of the industry had increased. Of particular interest, in 2002 we learned that the industry lacked reliable price discovery and viable price risk management tools. At that time, ethanol price risk, if hedged, was typically hedged using Unleaded Gasoline futures. That strategy worked in some instances but was problematic in others since gasoline futures prices did not always correlate well with ethanol cash prices. Also, many new entrants to the ethanol industry were frustrated by a lack of reliable price data. Most of these new entrants believed their product was priced fairly, but many were not certain.

Part of the Board of Trade's mission is to provide transparent risk management tools of the highest integrity, and to provide a price discovery mechanism and dis-

seminate publicly the prices at which transactions occur on our exchange. Therefore, in 2004, the CBOT reexamined the feasibility of an ethanol futures contract. By that time, annual ethanol production in the U.S. had increased to above 3 billion gallons. The U.S. still did not have a viable risk management tool or a transparent pricing source for domestic ethanol producers and users. Moreover, U.S. market participants were even more enthusiastic about obtaining these tools than they were in 2002 since the additional production naturally created additional risk. The Chicago Board of Trade designed a corn-based ethanol futures contract in 2004, and launched it for trading in March 2005. The exchange offers the ethanol contract for trading both via open outcry and electronically on our e-cbot platform, and we now have more than a year of successful delivery cycles in the contract under our belt.

The CBOT Ethanol futures contract has demonstrated steady growth over the past year. Today, market participants have open interest positions in CBOT ethanol futures contracts going out one year into the future and representing over 24 million gallons of ethanol. Average daily volume, while variable, continues to grow. More importantly, perhaps, the industry has begun to use CBOT Ethanol futures prices as a barometer for domestic prices. By disseminating the prices discovered through transactions on our exchange, the CBOT is providing the industry with transparent pricing for the first time, and the results are encouraging. Since all market participants now have a reference for pricing, the way ethanol is traded in the cash market has evolved as well. Having a pricing benchmark has enabled the development of more varied and flexible cash contracts that have readily been available in the U.S. grain and energy markets, but have not been available in the ethanol market until recently. The end result of these developments is more efficient trade that results in both higher prices for ethanol producers and lower prices for ethanol blenders (i.e., a tighter bid-ask spread).

The Chicago Board of Trade held an ethanol industry meeting in early June to gather feedback from market participants representing both the buy and sell sides of the ethanol market. Over 40 market participants came to Chicago to offer their support and ideas to grow the CBOT Ethanol futures contract. They know that for their industry to continue to grow, greater efficiencies in trade will need to be realized. They also understand that a transparent and fair futures market plays in important role in developing these efficiencies. We at the CBOT are proud of our part in this dynamic industry, and we look forward to its continued development. Once again, we appreciate the opportunity to participate in this dialogue.

[Note: Forward Looking Statements—In this release, our use of the words "may," "should," "could," "expects," "plans," "anticipates," "believes," "estimates," "predicts," "potential" or "continue" or other comparable terminology is intended to identify forward-looking statements. These statements are not guarantees of future performance and involve risks, uncertainties and assumptions that are difficult to predict. Therefore, actual outcomes and results may differ materially from what is expressed or implied in any forward-looking statements. More detailed information about factors that may affect our performance may be found in filings made by CBOT Holdings, Inc. with the Securities and Exchange Commission, which can be obtained at its website at www.sec.gov. We undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise.

Senator TALENT. Thank you very much, Mr. Carey.

And our last witness is Mr. Daniel More, who's the managing director and head of the Renewable Energy Investment Banking side of Morgan Stanley.

Thank you for being here, Mr. More.

STATEMENT OF DANIEL MORE, MANAGING DIRECTOR AND HEAD OF RENEWABLE ENERGY WITHIN INVESTMENT BANKING, MORGAN STANLEY, NEW YORK, NY

Mr. MORE. Thank you, Mr. Chairman.

I've been invited to testify on how Wall Street views renewable energy, specifically focusing on investments in the biofuel sector.

As recently as 1 year ago, discussion of public market investments in the bioenergy sector and ethanol space was seen by most as being somewhat premature. The ethanol investments were primarily sourced from venture capitalists, private equity funds, and

wealthy individuals. These investors were making relatively small investments in the sector while facing a high level of risk, given the uncertainties facing the industry. Not surprisingly, the cost of this capital was relatively high. These early-stage investors needed to be compensated for the risks they were taking.

Volatility in the ethanol space has been extremely high. Over the last 10 years, the margins have ranged from robust to negative. Such volatility in a commodity product will always make financing difficult. Traditionally, ethanol plants were financed through bank financings, very often with the lead role being played by lending institutions which had a strong background in agriculture-based lending.

Recently, however, the more traditional capital markets for debt financing have been more willing to make investments to the ethanol industry. These financings are often at a lower all-in cost, and generally have fewer restrictions and covenants than traditional construction-based bank loans. Having said that, the rating agencies still rate all the ethanol producers as below investment grade.

Over the last 12 months, the interest in investing equity funds in the ethanol industry has certainly caught the attention of Wall Street and of the institutional investors who drive the investment discussion in the United States and abroad. Investors have suggested to us that a realization that the U.S. dependence on high-priced foreign oil, and the unreliability of such supplies, have led such investors to take a fresh look at the ethanol industry.

Recently, several ethanol companies have successfully tapped the public equity markets. Institutional investor acceptance of new capital-markets issuances is critical to the long-term success and stability of this growing industry.

The chief concerns that institutional investors have had with investing in the ethanol industry include:

One, the blender's tax credit. Continued existence of the 51-cent-per-gallon blender's tax credit provided to gasoline refiners. Uncertainty regarding the continued existence of this tax credit introduces a degree of volatility and risk into investments in the ethanol industry.

Two, foreign imports. The existing tariff on imported ethanol provides U.S. ethanol producers with the support required to ensure that the U.S. ethanol industry has the ability to mature and compete effectively.

Volatility, three. The volatility of ethanol prices will continue to be a concern to investors.

Four, corn and other crop production. Sufficiency of U.S. corn production at reasonable cost is critical to the long-term success of the ethanol industry.

Five, logistics. The ability to have access to rail, to obtain competitive rail rates, and lack of congestion to transport ethanol efficiently is a critical component in investor's minds.

Six, MTBE phase-out. One important use of ethanol is to replace MTBE in the U.S. fuel stream. Certain investors were concerned that the current governmental movement in the United States away from MTBE would somehow be reversed.

Seven, E85. One area investors view as a positive factor in the current ethanol space is continued growth in E85 production.

And, eight, RFS minimum levels. Some investors were concerned that the RFS minimum levels of renewable fuels included in gasoline could be waived by the U.S. EPA.

In summary, institutional investors have recently gotten comfortable with the significant risks inherent in investing the ethanol and biofuel industry. The framework in which the ethanol industry is currently operating seems to be working. Investors crave stability. The biggest risk they face are major changes in the underlying rules under which the current industry is operating.

Thank you, Mr. Chairman.

[The prepared statement of Mr. More follows:]

PREPARED STATEMENT OF DANIEL MORE, MANAGING DIRECTOR AND HEAD OF THE RENEWABLE ENERGY EFFORT WITHIN INVESTMENT BANKING, MORGAN STANLEY, NEW YORK, NY

Morgan Stanley is a global financial services firm and a market leader in securities; asset management and credit services. Morgan Stanley has a market capitalization of approximately $60 Billion, with more then 600 offices located in 30 countries around the globe.

My name is Daniel More. I am a Managing Director and Head of the Renewable Energy Effort within Investment Banking. I have been an investment banker for 28 years and have focused on the Energy Sector for the last 20 years. I have worked on equity and debt financings, restructurings, privatizations and mergers & acquisitions for clients in the Energy Sector on six continents. I received my undergraduate degree from Colby College and an MBA from The Wharton School of Finance.

I have been invited to testify on how Wall Street views the Renewable Energy sector, specifically focusing on investments in the biofuel sector.

RECENT HISTORY

As recently as one year ago, discussion of public market equity investments in the bioenergy sector and ethanol space was seen by most as being somewhat premature. The ethanol investments were primarily sourced from venture capitalists, private equity investors and wealthy individuals. These investors were making relatively small investments in the sector while facing a high level of risk given the uncertainties facing the industry. The investments these private investors made in the Ethanol industry were characterized by little or no liquidity. Because the Ethanol producers were using the investment proceeds to build plants and to start up production there were often no dividends paid. And in addition to the riskiness of this type of early stage investment the Ethanol business remained highly volatile. Volatile margins and fears of oversupply made it difficult for the Ethanol producers to obtain these investments. Not surprisingly the "cost" of this capital was relatively high. These early stage investors needed to be compensated for the risks they were taking.

VOLATILITY

Volatility in the Ethanol space, as has been widely recognized, has been extremely high. (See Exhibit 1). Over the last 10 years the margins (defined as the difference between the cost of producing the Ethanol and the price for which it can be sold) have ranged from robust to negative. Such volatility in a commodity product will always make financing difficult and relatively expensive. Investors will gain greater comfort for investing in producers of a commodity/product when they perceive that the inherent volatility in a commodity product is outweighed by fundamental need for the product and steady growth in the need for such commodity. In the past, that was not necessarily the case for Ethanol. There have been several drivers which have made Investors (both Debt and Equity) more comfortable with taking the risk on Ethanol and other Biofuels.

RECENT EVENTS—DEBT FINANCING

Traditionally Ethanol plants were financed through bank financings, very often with the lead role being played by lending institutions which had a strong background in agriculture based lending. In order to obtain construction financing Eth-

*Exhibits 1-4 have been retained in committee files.

anol developers had to pledge the plants as collateral. Oftentimes there were restrictions on dividends to owners and interest rates were relatively high due to the scarcity of lenders willing to make what was often perceived to be a risky loan.

Recently, however, the more traditional capital markets for debt financing have been more willing to make investments to the Ethanol industry. These financings are often at a lower all in cost and generally have fewer restrictions and covenants than traditional construction based bank loans. Public Market Financings have been completed for Ethanol plants for several producers. The rating agencies (S&P and Moody's) still rate all the Ethanol producers as below investment grade. A list of debt financings for Ethanol producers is attached as (Exhibit 2—At-Issue Bond/ Bank Comparables)

RECENT EVENTS—EQUITY FINANCING

Over the last twelve months, the interest in investing in the Ethanol-industry has certainly caught the attention of Wall Street and of the Institutional Investors who drive the investment discussion in the United States and abroad. Investors have suggested to us that a realization that the U.S. dependence on high price foreign oil and the unreliability of such supplies have led such investors to take a fresh look at the Ethanol industry. In the past twelve months several Ethanol companies have "tapped" the public equity markets. Most recently VeraSun Energy raised $483 mm in an IPO that was very well received. Other Companies currently in the process of raising equity financings in the public markets include Aventine Renewable Energy which is currently "on the road" having filed a prospectus to raise $302 mm and Hawkeye Holdings which has filed a prospectus to raise $500 mm. (See Exhibit 3—Prospectus Cover for VeraSun Energy).

EQUITY INVESTOR CONCERNS

Institutional investor acceptance of new capital markets issuances is critical to the long term success and stability of a company's IPO and share price performance. On the Verasun roadshow many institutional investors were not entirely familiar with the Ethanol industry and the economics of investing in Ethanol. The VeraSun Energy IPO was a success because Management was able to allay the concerns of the Institutional Investors they met and to convince them of the viability of the economic model and to convince them of the potential growth in the industry. (See Exhibit 4—Case study of VeraSun Energy IPO)

The chief concerns that Institutional Investors had with investing in the Ethanol industry include:

1. Blenders Tax Credit: Continued existence of the $.51 per gallon blenders' tax credit provided to gasoline refiners. Uncertainty regarding the continued existence of this tax credit introduces a degree of volatility and risk into investments in the Ethanol industry. An extension of the existing tax credit would serve as an important risk mitigant to investing in the Ethanol sector, and would likely result in the infusion of additional capital into the sector, thereby increasing the supply of ethanol in the United States.

2. Foreign Imports: The threat of imports from foreign ethanol producers. The Ethanol industries in countries such as Brazil have received substantial governmental support over a long time period. The existing tariff on imported ethanol provides U.S. ethanol producers with the support required to ensure that the U.S. Ethanol industry has the ability to mature and compete effectively.

3. Volatility: The volatility of ethanol prices. As I previously discussed, the pricing environment for ethanol has been characterized by extreme volatility. The continued existence of the blenders' tax credit is an important mitigant to this volatility.

4. Corn Production: Sufficiency of U.S. corn production at reasonable costs is critical to the long-term success of the Ethanol industry. Investors will continue to invest in the Ethanol sector so long as they are comfortable that the price of corn (which is the largest cost component in the Ethanol process) remains relatively stable.

5. Logistics: Investors are concerned with the logistics of moving the final product to the markets where it is sold. In most cases, the most economical mode of transportation is rail. The ability to have access to rail, to obtain competitive rail rates and lack of congestion to transport Ethanol efficiently is a critical component in Investors' minds.

6. MTBE Phase-Out: One important use of Ethanol is to replace MTBE in the U.S. fuel stream. Certain Investors were concerned that the current governmental-movement in the U.S. away from MTBE would somehow be reversed. This could have negative effects on the investments in the Ethanol sector.

7. E-85: One area Investors viewed as a positive factor in the current Ethanol space is continued growth in E85 Products. Fuel made up of 85% Ethanol and 15% gasoline currently can be used in approximately six million U.S. autos. Support for the auto manufacturers who produce E-85 "capable" cars and trucks would continue to benefit the industry.

8. RFS minimum levels: Some Investors were concerned that the RFS minimum levels of renewable fuels included in gasoline could be waived by the U.S. EPA. This would cause uncertainty in the industry and would have a negative effect on Ethanol investments.

SUMMARY

Institutional Investors have recently gotten comfortable with the significant risks inherent in investing in the Ethanol and Bio-fuel industry. The framework in which the Ethanol Industry is currently operating seems to be working. Investors crave stability—the biggest risk they face are major changes in the underlying rules under which the current industry is operating.

Senator TALENT. Thank you, Mr. More. That was very helpful.

Let me just ask a couple of general questions—I guess, particularly for Dr. Pacheco, Mr. Standlee, and Mr. Jobe. You all talked about what Congress—some specific ideas of what Congress could do to sustain this growing industry. Do you have any opinion about what the next step ought to be, in terms of the Renewable Fuel Standard itself? Senator Salazar brought this up, and there's a lot of proposals floating around the Congress—I think I'm supporting about all of them—to increase the RFS. Do you see that as a useful step right now, or something that perhaps we ought to wait a little bit to see how things—how research and other kinds of items break, first; maybe, see what the regulations are? And if you do have a sense of—that we ought to take that step, is there any particular proposal that you favor?

Dr. Pacheco, you want to start?

Dr. PACHECO. Mr. Chairman, thank you for the opportunity to comment.

In representing the technical side, I think I'll refrain from making any suggestions on the policies. However, I would like to point out, from a—just from a mathematical point of view, that, at some point, we need to move and have an E85 product as being a central component, because at—using E10, which is what's commonly used in the marketplace, is going to have a limitation as to how much market penetration you can achieve, just from a mathematical point of view. So, from a scientific point of view, from a technical point of view, I think it's very important to recognize when that transition in the marketplace really needs to occur, and what lawmakers can do to catalyze that at the right time.

Senator TALENT. Okay.

Dr. PACHECO. So, I think that's probably the most important point.

If I could use this opportunity, Mr. Chairman, also, I'd like to point out that there is a—I noticed this morning, on a flight, coming out here, there is an error in the written testimony, on the legend for chart number 2, on the written testimony. With your permission, I will go ahead and have that corrected, and have it sent to the committee when I get back to my office.

Senator TALENT. Well, it's exemplary of you to correct that.

Dr. PACHECO. The chart itself is absolutely correct, but the legend somehow got garbled in reproducing for this particular testimony.

Senator TALENT. Well, I was going to ask you about that, but you saved yourself that cross-examination, Dr. Pacheco.

[Laughter.]

Senator TALENT. Mr. Standlee and Mr. Jobe, do you want to comment on my question?

Mr. STANDLEE. Yes, Mr. Chairman. Thanks for the opportunity.

We certainly appreciate your support for efforts to increase the RFS minimums and that sort of thing. Personally, we see the dramatic growth that the industry has had so far, and we would—I think our company's position would be that we would like—we would like to evaluate that a little bit further as it goes forward, and we may be just a little bit premature in trying to pick a new number, so to speak.

Senator TALENT. OK.

Mr. STANDLEE. There are some things that I think would be helpful, certainly one of them being funding—you know, making sure that we do appropriate and fund some of the programs that are actually out there and proposed in the energy bill, everything from the commercial demonstration biorefineries, the biomass production credits, the loan guarantee programs, and those sorts of programs. We certainly would appreciate seeing those funded as much as possible. We also, I think—I think the future of the cellulosic industry, as well as further expansion of the existing starch fermentation industry, would be promoted also by an extension of the secondary tariff, which is currently in place, also.

Mr. JOBE. I would only add that currently the Renewable Fuel Standard—as it's not fully been implemented yet, it's currently not a major driver for the current growth—explosive growth of either the biodiesel or ethanol industries, but what it has done, it has really signaled the strong commitment by the U.S. Government, and by U.S. energy policy, that has really bolstered that position.

If Congress chooses to go forward to extend and expand the RFS, our industry would be supportive of that. And I'm very much encouraged, through the experience of the first RFS, with our industry working together with the ethanol industry and finding the right blend and commitment. And so, we would work with this committee, and be proud to work with the ethanol industry, to make the strongest proposal happen.

Senator TALENT. Well, let me follow up with that—with two questions, and then I'm going to defer to Senator Bingaman, who has arrived now. And I'm certainly very grateful for his leadership on the committee on this, and just generally.

What kind of production efficiencies, besides more efficient feedstocks, should we be looking at to mature this industry? We've all talked about the importance of cellulosic, and I think that is crucial. And the second, with regard to E85—and Dr. Pacheco mentioned it—how important is E85, and visibility for E85? My thinking is that to really put that final piece in the puzzle for the consumer, E85 is very important on the ethanol side of this. In other words—because that's when people are going to see that this renewable age is here, and it's with us now.

So, if you all want to talk about that, any of you who want to pick either one of those up, what other kinds of production effi-

ciencies, besides feedstock, and how important is it to continue encouraging E85?

Dr. PACHECO. Mr. Chairman, I'll mention two production efficiencies, as you call them. And the first would be distribution logistics. The ethanol that's produced is largely produced in the corn belt, and yet the fuel, if it's mandated around the United States, needs to be used from coast to coast, border to border. That creates somewhat of an inefficiency, in terms of the use of the fuel. E85 could be an effective way to deal with that. If E85 were used largely in regions where the ethanol was produced, that could improve the overall efficiency of the distribution system. It would certainly require some sort of an effective trading system so that, in the parts of the country that were not using it, there would some way to account for that.

The second efficiency really refers back to the first chart in my testimony, which really demonstrates—and, as I said in my opening remarks, it really demonstrates that, while we have enough biomass resource accounted for in that DOE USDA study to have enough energy to replace about 60 percent of our petroleum, the overall processes that are used to convert that biomass into liquid fuels can only capture roughly about half of that energy. And so, that's why, in that chart, you'll see that we're really only able to produce, with today's technology, about 1.9 billion barrel-of-oil equivalents, even though the raw resource represents 3.5 billion.

So, the combination of the logistics of opportunities and the opportunity to really improve our conversion efficiency within the biorefineries are the two really outstanding opportunities that I see.

Senator TALENT. That highlights how young this technology is. It's——

Dr. PACHECO. Absolutely.

Senator TALENT. It's certainly mature enough to be a major factor, even today, in the Nation's energy supply, but we can expect a lot of gains in efficiency as this technology develops.

Dr. PACHECO. Absolutely, Mr. Chairman.

Mr. STANDLEE. If I could add, just briefly, to that, Mr. Chairman and Senator Bingaman. We have two significant projects underway right now, in cooperation with the Department of Energy. One of those is to improve the efficiency of traditional starch fermentation to improve the number of gallons per bushel, through everything from improved processes to improved enzymes and—which has generated partnership with—between our company and recognized enzyme companies who have a great interest in this industry. And we believe fully that there can be significant improvements made in that area, and we believe that we had made some significant improvements already.

So, in addition to alternative feedstocks, I think we also have the ability to increase traditional starch fermentation efficiencies. I think we have the ability to create new enzymes and the ability to, you know, make great strides that way.

Certainly, cellulosic ethanol, as I mentioned before, we believe, is a huge opportunity in the future, and that is our second project, which we are doing research on right at this point, and we believe that's possible.

Also, I certainly concur with Dr. Pacheco that E85 is a huge opportunity. I think it's always been a chicken-and-egg question. Do you produce more E85 vehicles, or do you improve and bolster the infrastructure? And certainly you have to do both at some point in time. I certainly applaud the vehicle manufacturers, particularly General Motors and Ford, who have come out recently in great support of new flexible-fuel vehicles. I think, you know, anything that we can do to encourage the availability of the flexible-fuel vehicle to the general public is going to be—is going to be better for our Nation in the long run. Other partnerships, such as the one that we have with GM and Kroger Stores, to improve the infrastructure—and, frankly, the—you know, the Energy Act, as well as the V-tech provisions of the jobs bill also have certain incentives to promote the building of that infrastructure for new E85. And I think that's going to be critical in expanding that, also.

Mr. JOBE. My comment on production efficiency—just a few years ago, the largest plants—when I started and took over as CEO in 1999, there were three plants producing biodiesel—three dedicated plants. I believe the largest one was about a 7-million-gallon production capacity plant. A 3-million-gallon plant would have been a large plant at that time. Now most of the plants that are being built are 30-million-gallon plants, and up. The major oil company CEOs and chairmen were on Meet the Press yesterday. Chevron just announced a 100-million-gallon plant, mentioned it during the panel session twice. And so, in terms of production efficiencies, much of that's happening on the production side. As Dr. Pacheco said, distribution is absolutely critical. Previously, all biodiesel was blended downstream from not only the refinery, but also from the terminal. It is now moving upstream to terminal blending and, ultimately, to refinery blending. And biodiesel in low blends can be moved on the pipeline, which makes it very different than most alternative fuels. And there is promising data to indicate that biodiesel—low blends of biodiesel can, and will, be moved on U.S. pipelines. It is used in 2- to 5-percent blends on pipelines in Europe right now, in billions of metric tons, without problems. So, that is one of the fastest and easiest ways to expand our supply and to streamline distribution.

Senator TALENT. I have more questions, but I'll recognize Senator Bingaman now.

Senator BINGAMAN. Thank you very much, and thanks for having this hearing.

Let me just start, and ask Mr. Standlee, first, I remember you taking me through your plant there in Portales. I enjoyed that very much. At the time we had that visit, I believe you told me that the plant of yours in Portales, was the furthest west of any of the ethanol plants in the country. Am I confused about that, or did you say something to that effect?

Mr. STANDLEE. It was the furthest-west plant of a significant size at the time. There's a small plant in California, I think. But, certainly at this point in time, additional plants are growing up right and left, and we no longer can make that claim. But, yes. And I also remember having the honor to host you in Portales, and we appreciate your visit.

We—that plant is—has some very unique opportunities due to the—in spite of the fact that it's not the cheapest grain in the world, we have great opportunities there because of the feedstocks. And, frankly, that's one of the other opportunities for improvement that the industry has, is to find a higher-value feedstock to improve the protein, make that available. In New Mexico, it's fantastic for the local dairy and cattle-feeding industry. And as we can maybe improve the protein and reduce the starch and fiber—fiber content, rather, perhaps there are other opportunities for improving the usage of the feed products from ethanol—as ethanol byproducts also.

Senator BINGAMAN. Let me ask—you have a couple of points here. You talk about the importance of the biomass production credits. Could you describe that a little bit, as to how that works and why that is significant?

Mr. STANDLEE. I think you're referring to the additional credit under the EPA's proposed credit-trading program that would allow two and a half times credit for biomass-produced ethanol and two and a half times that of a regular starch-produced credit. That's something that is already, of course, included in the energy bill and in the Energy Policy Act. We believe that's important, you know, in order to differentiate and to stimulate the growth of biomass, which is otherwise—you know, without certain of these incentives, it's going to be very difficult to find any kind of traditional financing for an unproven technology, such as the biomass-ethanol—biomass-to-ethanol-type plant. So, we believe that incentives such as that, and again, as I mentioned a few minutes ago, the full funding of the commercial demonstration biorefineries, the biomass production credits, and the loan guarantee programs—we think those are critical in order to give a young, infant industry that cannot really otherwise be financed without these supporting credits.

Senator BINGAMAN. Okay. Let me ask Mr. More. You talk about this blender's tax credit and how it is important that we maintain the blender's tax credit. My understanding is, that it is scheduled to expire next month. Am I right about that?

Mr. MORE. My understanding is, it's through the year 2010.

Senator BINGAMAN. 2010?

Mr. MORE. Yes.

Senator BINGAMAN. OK. All right. When does the continuation of it become a serious issue with you if it is already on the books for 2010?

Mr. MORE. I think most investors look at it as a much longer period. And I think it's been in existence for over 25 years, and has been extended many times. So, the people who are investing in the ethanol industry now are obviously counting on it through 2010, but are also hopeful that it will be extended, as it has been several times in the past.

Senator BINGAMAN. Now, are there other tax credits that we adopted as part of last year's energy bill, that are important to maintain, that are scheduled for expiration earlier than that——

Mr. MORE. No, that is the main——

Senator BINGAMAN [continuing]. That's——

Mr. MORE [continuing]. One that people would——

Senator BINGAMAN [continuing]. That's the main one——

Mr. MORE [continuing]. Have concern——

Senator BINGAMAN [continuing]. That relates to ethanol. Okay. Okay. All right.

Those are my questions, Mr. Chairman. Go right ahead.

Senator TALENT. I have a question also for Mr. More. As you can hear, the committee is very interested in the potential for large amounts of ethanol from cellulosic and biomass. Dr. Pacheco told us that as much as 3.5 billion barrels of ethanol might be produced from biomass such as corn stover and rice straw and other materials. What are the views of the investment community on that industry? I mean, how promising do they view it?

Mr. MORE. The answer is, they view it as very promising. I just think the capital will come from different areas than the public markets. I think I heard Mr. Standlee mention that it would really become—or is expected to become profitable in around 6 years. That is a very, very long time horizon for something to invest in, and probably wouldn't be appropriate for the public capital markets, which, as you know, look for dividends and earnings of a much nearer-term basis. That's why the ethanol industry has become so popular in the debt and equity markets, because it's making money right now.

Having said that, there is a tremendous amount of excitement about the cellulosic industry. But I think the capital will come from the groups I was talking about before, whether they're wealthy individuals, private equity funds, sort of venture capital funds, folks who are used to investing in something that may have 5, 6 years of not-too-much cash flow, if any cash flow, and then are betting on it to become a reality in the longer term.

Senator TALENT. It's sort of a natural progress of any new industry. The most mature segments of it go quickest into the public financing markets, public equity.

Mr. MORE. Exactly.

Senator TALENT. And then the leading-edge ones are left for the venture capitalists.

You suggested that some investors might be concerned that MTBE will remain a large part of the domestic fuel market, and that might render ethanol less desirable for blending with gasoline. Now, the recent evidence suggests that domestic fuel producers are moving away rapidly from the use of MTBE, in favor of ethanol. In view of that, to what extent to the fears still remain in the minds of investors?

Mr. MORE. I believe it's actually a small fear. I was just trying to list a litany of concerns that we heard from investors who recently invested in equities of ethanol producers. So, they would go through their checklist. But, as you can imagine, their main concerns are more of a macro-nature—tax credits, tariffs on imports, MTBE not being phased out as everyone expects. And, in the end, that's what they all got comfortable with, and that's why we think these investments have been so well received.

Senator TALENT. I was impressed, when I read your list, that most of the concerns relate to commonsense type of risks that ought to be pretty easily avoidable. And I'll guarantee you that we'll have enough corn production. I mean, I've got a lot of Mis-

souri farmers back home, and they'll produce the corn. You can go back and tell the investment community that.

Mr. Carey, can you explain how somebody would hedge their price risk using your contracts? And if you'd give us an example.

Mr. CAREY. It's no different than any other hedge that takes place. I mean, somebody with production would want protection on the downside, and somebody that was a blender or something would want protection on the upside. So, they would meet in our marketplace and put on a hedge until they—the timing of their actual production or their need came to the marketplace, and then they'd unwind the hedge. But it's like buying an insurance policy so that we've—as we've said, there's—I think we've got open interest out to 2007. And what it is, is, for the producer, especially the producer that's raised equity to finance these plants, to build capacity, they would want to put all the inputs together, no different than your Missouri farmer who buys his fertilizer and sells his corn on the board or to a large grain commercial, to lock in a price. So, it would be done pretty much the same way.

Senator TALENT. Could somebody producing ethanol from something besides corn use the contracts to hedge the risk?

Mr. CAREY. Yes, they could. Our ethanol contract does not differentiate. Today, it's corn, but it—the specifications are written such that any type of ethanol that meets the standards would be allowed into the contract.

Senator TALENT. So, you're ready for the advent of cellulosic as that comes along.

Mr. CAREY. Looking forward to it.

Senator TALENT. I'm sure you've had experience introducing other kinds of futures products. Are you pleased with how the ethanol future is developing? I mean, do you think it's on schedule?

Mr. CAREY. Well, we're excited with the convergence. We're looking at the developments in the industry. And we've had pretty good response. We've had—we trade about three- to five-hundred contracts a month, so we're excited about its infancy and where we can grow it, from here, going out.

Senator TALENT. Okay.

Mr. Jobe, you mentioned that fuel quality has become a paramount priority of industry stakeholders. And I know that this has been a concern with regard to biodiesel, in particular. There's a national fuel quality standard, the ASTM standard, and a voluntary quality program, BQ-9000. Can you describe for the committee how those efforts help to ensure fuel quality?

Mr. JOBE. Sure. Thank you, Mr. Chairman.

The biodiesel industry has had the advantage of following in the footsteps of the ethanol industry in the United States, and the more mature biodiesel in Europe. And in both of those experiences, fuel quality early on during the initial introduction and commercialization was an issue. As the industries were introduced and expanded and growing, new investors were getting into the marketplace, there was product that often got into the market that was substandard. What our industry has done is worked very hard to work with American Society of Testing and Materials, ASTM. They're the recognized fuel standards-setting organization in the United States. And we are working with all of the Federal enforce-

ment agencies and the State divisions of weights and measures to encourage them to rigorously enforce specifications to ensure that customers don't unknowingly receive substandard fuel, and also to protect the Nation's fuel supply—integrity of its fuel supply.

Senator TALENT. And the engine manufacturers, I know, in the past have been a little bit wary about using biodiesel. Your organization has done an enormous amount to try and reassure them. And I know a lot of those fears were really illusory. My sense of it is that there's a much greater level of acceptance now than there was even a short time ago. Is that your sense also?

Mr. JOBE. That is, indeed. And there has been tremendous progress. And, in fact, more and more OEMs are adopting factory fills of diesel fuel—for example the Jeep Liberty B2 factory fill and the John Deere—all of the combines and tractors rolling off the line by John Deere have 2 percent biodiesel. And they are growing in acceptance. But we have a long way to go, for the higher blends, to get clarified customer statements on higher blends of B20, for example.

Senator TALENT. We're making progress, but we can't let up.

Dr. Pacheco, your testimony states that NREL is partnering with oil industry technology developers to explore some novel options for integrating biomass streams into the existing refineries. I was curious what some of those options might be.

Dr. PACHECO. Mr. Chairman, let me first point out that, relative to our effort in cellulosic ethanol, those are very small programs, but they do hold a lot of promise in the long term for opening up additional options for biofuels. One such program, we've been working with a partner company, UOP, in Des Plains, Illinois, also in partnership with our sister laboratory, PNNL, in Washington, is a project where we're looking at taking the product of pyrolysis of biomass, which is a process that, in a fraction of a second, can turn woody biomass, or corn stover or other forms of biomass, into a black liquid that looks a little bit like petroleum crude oil. It's very different in its chemical composition than petroleum crude oil, and, therefore, there are a lot of technical challenges associated with trying to introduce that biocrude, if you would, into a traditional petroleum refinery. So, with the expertise at NREL and PNNL and the biomass pyrolysis concept, combined with the expertise at UOP in petroleum refining technology, we're trying to determine whether or not that's an option in the long term. It does have some advantages, but it's not nearly as far along as cellulosic ethanol, in terms of its technical availability.

Another area that we are in communication with a couple of the oil companies is talking about the concept of producing triglycerides, the same material that's used to make biodiesel, but, instead of producing them from food oils and grains, we'd be producing them from algae. NREL had a program, in the 1980's and 1990's, looking at growing algae specifically for the production of triglycerides. One of the real advantages of this, Mr. Chairman, is that, as everyone in the biofuels research community understands, we are severely limited by the arable soil, soil that can sustain crop growth, whether it's for forest or for ag use. Looking at a product, an aquatic species like algae, can take away that limitation. So, States such as New Mexico or Arizona, that might otherwise be

States that don't have very good agricultural opportunities, could have opportunities, because they have very good sunshine, and the algae species can grow in saline conditions. They can grow in saltwater.

Senator TALENT. And if we can make it out of cactus, we'd be in good shape, too.

Dr. PACHECO. But that's just to mention a couple of the examples that we're working on. Again, I just want to point out that those are very small programs, relative to the very focused effort that we have with the Department of Energy on making sure that we have the technology available to ensure the success of cellulosic ethanol in the next 6 years.

Senator TALENT. Well, I have just one more. I don't know if Senator Bingaman has another round. We had Mr. Wehrum, from the EPA, here, and the feedback we've had is that EPA has done a pretty good job in outreach to different leaders in different segments of the industry. I think many of you have said that. Do you have a specific opinion about that? Do you have any particular concerns regarding, you know, how EPA has handled these new regulations, or perhaps their role in the future regarding this? Do you have any comments you want to make? I didn't want to let the EPA entirely off the hook if anybody had anything they wanted to say.

[No response.]

Senator TALENT. One issue, as we continue to consider this—and I mentioned this before, Senator—is, this is with EPA because it was always considered to be a clean-air tool, which it certainly is. But, as it grows, it's more and more of an energy tool. One issue here is whether EPA ought to be continuing to administer it.

Well, Senator, do you have any further questions?

Senator BINGAMAN. Mr. Chairman, I did want to ask Dr. Pacheco one line of question. And that is—you refer to plug-in hybrids as one of the areas you're looking at. Could you give us a little more information as to what you're doing there? There was a group here, a month or so ago, that had a plug-in hybrid that they were urging people to look at seriously, that would get over 100 miles per gallon. I drove it around. I think quite a few members drove it around. Could you tell us what you're doing there and whether there's—what you see as the prospects for actually seeing that turned into a commercially available product?

Dr. PACHECO. Well, Senator Bingaman, this is a very big laboratory that I work at. And the work that you're referring to is conducted in another part of our laboratory. I'm only familiar with it from a distance, so I will tell you this, that my colleagues in that part of NREL, in the transportation center, are very excited about plug-in hybrids and the technology. And I've heard the same numbers that you've heard, of the potential to get to 100-mile-per-gallon type of vehicle economies.

The technology is very exciting, because it opens up a different opportunity for recharging the batteries that are used in the hybrids. And the hybrid technology could be useful with an E85 vehicle, as well, with such a technology like that. When you look at—the fuel economy per gallon of petroleum that's used can become

very, very substantial, because so much of the fuel in the fuel tank is ethanol, and then the batteries can be recharged at home.

So, it's very, very promising technology, and my colleagues that work in the transportation center speak very highly of it.

Senator BINGAMAN. Thank you, Mr. Chairman.

Senator TALENT. Well, I thank you.

I don't have any further questions. I just, mainly, wanted to sum this up.

Senator Salazar spoke very compellingly about how excited we are regarding renewables. And I just wrote down some of the reasons. There's already a substantial market for renewables, with a growing distribution infrastructure; recognized benefits across a broad spectrum; considerable interest already in the equity markets, as well as venture capital; tested technology, but still new, so I think people feel a high level of confidence that significant new economies and efficiencies will still be realized; and strong bipartisan support here in Washington.

So, we're pleased to have you here, and pleased to continue our role in partnering with you and people like you, and monitoring the progress, and continuing to assist it in any way we can.

I thank our witnesses today. And, if there's nothing further, I'll adjourn the hearing.

[Whereupon, at 4:09 p.m., the hearing was recessed, to be reconvened on June 27, 2006.]

[The following statements were received for the record:]

STATEMENT OF HENRIK ERAMESTA, PRESIDENT, NESTE PETROLEUM, INC., HOUSTON, TX

Mr. Chairman and members of the committee, on behalf of the Chairman of our Board and our shareholders worldwide we would like to thank you, Mr. Chairman, for your continued leadership on energy issues and for holding a hearing on the implementation of the Renewable Fuels Standard (RFS) as part of the Energy Policy Act of 2005. We share your excitement about the potential contribution that renewable fuels will make toward America's energy supply—as well as overall supply around the world.

High energy prices, the abundance of renewable energy feedstocks, and the policy directives of this Congress have created a more favorable market climate than ever to expand the production and use of renewable fuels in America. This is similar to the experience that Neste Oil, as a leading technology developer for clean fuels, has had in Europe.

Neste Oil is a leading independent Northern European refining company with a commitment to producing the highest-quality petroleum products for cleaner traffic. We have a 60-year history of innovation and leadership in delivering cleaner fuels around the world, and in developing bioethanol-based gasoline components. Neste Oil delivers a large amount of high-quality gasoline from our refineries in Finland to the United States.

Neste Oil is proud of its long and well-established track record of product stewardship, and as an innovator of new technologies that promote environmental sustainability and energy security. Consistent with this commitment, Neste Oil has developed NExBTL®, a breakthrough in renewable diesel technology. It is the development NExBTL® a high-quality renewable diesel fuel derived from a variety of vegetable oils and animal fats, which leads us to submit testimony to the Committee today.

NExBTL® is a superior, clean and renewable fuel that can be used to upgrade and expand diesel supplies and reduce air pollution. As a testament to its superiority Neste was recently awarded the Innovation Award by the Chemical Industry Federation of Finland for NExBTL®. The fuel and emission characteristics of NExBTL® include:

- Cetane value close to 100
- Cloud point as low as 30 °C below zero

- Good storage stability with no "use-by" date
- Free of aromatics and sulfur
- Renewable content is greater than 97%
- Fits into the existing fuel infrastructure
- Air emissions are greatly reduced; compared with fossil diesel:
  —Life cycle greenhouse gas emissions are reduced by over 60%
  —NO_X emissions are reduced by over 15%
  —Particulate matter emissions are reduced by over 25%
  —Hydrocarbon emissions are reduced by over 20%
  —Carbon monoxide emissions are reduced by over 5%

Neste has announced plans to build three plants in Finland, France and Austria with two partners. We are now looking to team with an American partner to locate one or more facilities here in the United States. However, much of our effort to build any facility here will depend on the stability and certainty of the policies which the Congress chooses to support. In enacting the Energy Policy Act of 2005, Congress foresaw the promise of renewable diesel by providing for its inclusion in the RFS, and enacting a tax credit to promote its production and use.

It is important in considering how to best implement the RFS that Environmental Protection Agency (EPA) regulations for registering fuels be streamlined to help expedite the delivery of renewable fuels into the market place. Neste has submitted comments to the EPA and this regard, and wish to acknowledge and thank the EPA for its responsiveness and assistance in this matter.

Moreover, efforts to extend tax credits for alternative fuels well into the future are extremely helpful in tipping the balance for investment in this area. Thus, an expedited rulemaking that will implement Section 1346 of the Energy Policy Act of 2005 is crucial for our company, and indeed all renewable fuel producers, going forward. In our specific case, we encourage the Internal Revenue Service (IRS) to give the fullest consideration to the meaning and interpretation of "renewable diesel" so that it is not confined to one particular chemical reaction process. Neste Oil has submitted comments to the IRS that will assist them in their final rule making.

In conclusion, Neste Oil welcomes the Committee's support and continued participation in exploring what policy applications can expedite and provide additional infrastructure and supply in the growing renewable fuels market. Neste looks forward to continuing to work with the Committee, the United States government, industry, stakeholders and other global leaders to provide the maximum amount of cost-effective renewable diesel to American consumers, and to assist in the quest for domestic energy security. In addition to this testimony, we are providing several attachments for your inclusion in the record about our company, and NExBTL Renewable Diesel.

Thank you for the opportunity to provide testimony for the Committee's Consideration.

STATEMENT OF THE AMERICAN TRUCKING ASSOCIATION, INC.

The American Trucking Associations (ATA) appreciates the opportunity to submit written testimony concerning the use of biodiesel in the over the road trucking fleets. ATA is a federation of motor carriers, state trucking associations, and national trucking conferences created to promote and protect the interests of the trucking industry. ATA's membership includes trucking companies and industry suppliers of equipment and services. Directly and through its affiliated organizations, ATA encompasses over 37,000 companies and every type and class of motor carrier operation.

BACKGROUND

The trucking industry is the lynchpin of the transportation system, hauling nearly 70% of all the domestic freight transportation tonnage in the United States and accounting for more than 80% of the nation's freight bill. Over 80% of the communities in the U.S. receive their goods exclusively from trucks. Trucking also accounts for over 70% of the value of trade between the U.S. and Mexico and Canada. Simply put, without the trucking industry, the U.S. economy would come to a grinding halt.

Diesel fuel is the lifeblood of the trucking industry. The trucking industry consumes 36 billion gallons of diesel fuel each year. As such, the quality, supply and price of diesel fuel are of paramount importance to the trucking industry and the U.S. economy. ATA projects that the trucking industry will spend over $98 billion in 2006, $10.6 billion more than last year and more than double the amount spent

just four years ago.[1] For most trucking companies diesel fuel is their second largest expense, after labor, and accounts for up to 20 to 25 percent of their total operating expenses.

The proliferation of boutique diesel fuels, including state biodiesel mandates, is problematic for the trucking industry and our nation's economy. Boutique fuels stress an already overburdened fuel distribution system, exacerbate temporary fuel shortages, and result in higher and more volatile fuel prices.

A. A Sensible Approach to Biodiesel

State biodiesel mandates distort the free market and allow biodiesel producers to charge more for their mandated product. What follows is a sensible approach to biodiesel that promotes biodiesel growth without harming the consumer or the trucking industry.

The high cost of petroleum-based diesel fuel, coupled with the desire to eliminate the United States' dependence upon foreign sources of oil has resulted in renewed interest in the production and use of biodiesel. Subject to the following caveats, ATA supports the incorporation of biodiesel into the national diesel standard and the voluntary use of biodiesel in blends up to five percent as a means to help extend the nation's supply of diesel fuel and reduce particulate emissions in older vehicles:

- Any biodiesel used must be tested and certified to be in compliance with the American Society of Testing Materials (ASTM D 6751) standard.
- Biodiesel should not be used in blends exceeding five percent for on-road uses, and all finished blends must comply with the ASTM D 975 standard.
- All pumps dispensing biodiesel for on-road use should be properly labeled to indicate the amount of biodiesel in the blend.
- No state should be permitted to create a boutique fuel by mandating the use of biodiesel in on-road diesel fuel.

1. Ensuring Biodiesel Quality is Critical

The recent experience in Minnesota (the only state with a fully-implemented biodiesel mandate) highlights the need to enact federal requirements that ensure that biodiesel used in on-road engines complies with the ASTM specifications and does not cause operational difficulties for over the road trucks. Earlier this year, shortcuts taken by certain biodiesel producers resulted in a biodiesel that did not meet the ASTM specifications. This poor quality fuel found its way into the on-road diesel supply and caused numerous trucks to malfunction and become stranded. Some of the malfunctions were the result of poor quality biodiesel, some were due to biodiesel's reduced cold weather performance, and some were caused by the fact that biodiesel acts as a solvent and dislodges the sediment that naturally accumulated in truck fuel systems over time. To prevent this situation from being repeated, government must require all biodiesel used in on-road engines to be tested and certified to be in compliance with the ASTM D 6751 standard.

2. Biodiesel Blends Should be Limited to 5% for On-Road Use

Low percentage blends of biodiesel that meet the ASTM specifications should perform comparably to today's petroleum based diesel fuel. However, blends exceeding 5% present operational challenges for the trucking industry.

- High percentage blends of biodiesel could create difficulties with manufacturer warranty claims—most heavy-duty truck engine manufacturers do not recommend biodiesel in blends exceeding 5%.
- High percentage blends of biodiesel gel at a higher temperature than petroleum-based diesel and may cause trucks to become stranded in cold weather.
- High percentage blends of biodiesel have a lower energy value, requiring more fuel to be purchased to perform an equivalent amount of work.
- Biodiesel acts like a solvent and will dislodge sediment that accumulates in truck fuel systems, requiring a fuel filter change in advance of regularly scheduled maintenance.

Over-the-road trucks are particularly vulnerable to these operational challenges, since they often travel far from their base of operations and routine maintenance (i.e., changing fuel filters) may be difficult to perform in between regularly scheduled vehicle check-ups. It is important to distinguish between off road diesel fuel, which is used in vehicles that do not travel far from their base of operations, and on-road diesel fuel, which is used by the commercial trucking industry for vehicles that travel hundreds of miles away from their base of operations. Cold weather performance and unscheduled fuel filter changes are manageable issues for most off

[1] Source U.S. Department of Energy, Diesel Price Forecast (May 2006).

road engine applications; while over-the-road trucks may have difficulty overcoming these operational challenges. For this reason, Congress could allow higher percentage blends of biodiesel for off road sources; however, high percentage blends should not be permitted for on-road diesel fuel.

3. High Percentage Biodiesel Blends Are Not Necessary to Support the Biodiesel Industry

Last year the trucking industry consumed more than 36 billion gallons of diesel fuel. Other modes and off road engines also consumed billions of gallons of diesel fuel. In 2005, the biodiesel industry produced only 75 million gallons (0.2% of the total on-road diesel fuel used by the trucking industry). This year the biodiesel industry is expected to produce 150 million gallons (0.4% of the on-road diesel fuel used by the trucking industry). With the continuation of financial incentives, the biodiesel industry may reach a billion gallons by 2015, but even at a billion gallons biodiesel would account for only a few percentage points of the diesel fuel consumed by the trucking industry alone. As such, there is no reason to allow blends of biodiesel that exceed 5%.* A 5% cap on biodiesel blends will protect the trucking industry from operational problems and will ensure that the biodiesel industry can continue to grow for many years to come.

4. On-Road Diesel Pumps Should be Labeled to Indicate the Amount of Biodiesel Being Used

Presently there is no law requiring fuel dispensers to be labeled to indicate the quantity of biodiesel being used. This presents a problem for the consumer, who has no way of knowing whether they are refueling with a high percentage biodiesel blend that could present operational challenges (e.g., cold weather performance issues) or result in difficulty with a future engine component warranty claim.

5. State Biodiesel Mandates Are Not Necessary and Should be Prohibited

State biodiesel mandates harm the trucking industry by artificially increasing fuel costs and preventing diesel fuel from simply being transported from one jurisdiction to another in times of shortage. The trucking industry is comprised of primarily small businesses with relatively slim profit margins. While the trucking industry may pass along some of the added fuel costs to shippers (which ultimately impacts consumers), frequently not all such costs are recouped by motor carriers. Rapid escalations in the price of diesel fuel from biodiesel supply disruptions, are difficult to pass-on and will result in business failures, lower capital investment, and negative employment trends.

The trucking industry, and the supply of on-road diesel fuel, would benefit from a single national diesel fuel standard. Should improvements in the diesel fuel quality be deemed necessary or the increased use of biodiesel in our national interest, then those improvements should be required federally, rather than on a state-by-state basis.

ATA remains opposed to state biodiesel mandates, which harm the trucking industry. Congress should prohibit states from enacting boutique biodiesel mandates. Generous federal (and state) tax incentives already make the cost of producing biodiesel less expensive than the cost of petroleum based diesel. State boutique biodiesel mandates are not necessary to ensure that there is a market for biodiesel. However, state boutique fuel mandates will harm the trucking industry.

- State biodiesel mandates distort the free market and allow biodiesel producers to charge more for their mandated product.
- Boutique biodiesel mandates preclude fuel fungibility between jurisdictions, which exacerbate temporary fuel shortages and may result in dramatic price spikes.
- Boutique fuels create artificial price differentials and an uneven playing field for the trucking industry.
- Boutique fuels create incentives for locally-based trucking companies to refuel outside the local jurisdiction, which results in more vehicle miles traveled, undermining environmental benefits and increasing traffic and safety concerns.

CONCLUSION

We greatly appreciate the opportunity to address the Committee concerning a sensible approach towards biodiesel and the adverse impacts of state biodiesel mandates on the trucking industry and the U.S. economy.

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*Higher percentage blends of biodiesel may be permitted for off road vehicles and state and municipally-owned vehicles, which seldom travel far from their base of operation.

It is critically important to the health of the trucking industry and the U.S. economy to ensure that there is a single national on-road diesel standard. A single national diesel fuel standard will limit the duration and magnitude of fuel price spikes, which are devastating to the economic health of the trucking industry. We continue to believe that low percentage biodiesel blends have a place in our national diesel fuel standard; however, individual state biodiesel mandates harm the trucking industry and are an inefficient way to encourage biodiesel production. Congress should protect the trucking industry by preempting state on-road biodiesel mandates. There are other ways to ensure the continued growth of the biodiesel industry without harming the over-the-road trucking industry.

APPENDIX

RESPONSES TO ADDITIONAL QUESTIONS

U.S. NUCLEAR REGULATORY COMMISSION,
OFFICE OF CONGRESSIONAL AFFAIRS,
Washington, DC, June 30, 2006.

Hon. PETE V. DOMENICI,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: The Nuclear Regulatory Commission appeared before the Committee on Energy and Natural Resources on May 22, 2006. From that hearing, you forwarded questions that were submitted for the hearing record. The responses to your questions have been reproduced and are enclosed.

If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

REBECCA L. SCHMIDT,
Director.

[Enclosure.]

RESPONSES TO QUESTIONS FROM SENATOR DOMENICI

Question 1. What steps can be taken by the NRC to make the licensing process as efficient as the licensing process in other countries?

Answer. Many countries use a licensing process that is similar to the NRC's 10 CFR Part 50 construction permit and operating license process. The U.S. Congress amended the Atomic Energy Act and the NRC promulgated 10 CFR Part 52 to establish a more efficient and predictable one-step licensing process.

The NRC continues to take steps to make our licensing process more efficient. This is being accomplished through the ongoing 10 CFR Part 52 rulemaking. The NRC is working through the rulemaking process, which includes the opportunity for public comment, to enhance efficiency, while also ensuring safety. In addition to the 10 CFR Part 52 rulemaking, the staff plans to use a design-centered review approach which will increase the review process efficiency. This approach will use, to the extent practicable, a "one issue-one review-one position" strategy in order to optimize the review effort; that is, the staff will conduct one technical review for each reactor design issue and use this one decision to support the design certification and multiple COL applications. See also responses to questions 11 and 13.

Question 2. What guidance will the Commission be giving to the ASLBs that are formed for combined license applications, with regard to the conduct of the hearing, admissibility of contentions, disposition of contentions, and schedules?

Answer. The Commission substantially revised its hearing procedures in 2004, to address these matters and, more recently, in 2005, adopted model milestones for the conduct of proceedings. If necessary, the Commission may provide additional guidance to its Boards to ensure fair and expeditious conduct of proceedings in the form of an updated adjudicatory policy statement, or in individual cases, by issuing case specific orders (similar to those issued at the start of the LES and USEC enrichment facility adjudications and the order issued to set up the three ESP adjudications) that establish deadlines, emphasize the use of expediting processes, and provide early guidance on particular policy matters that may be involved in the case.

Question 3. The Part 52 licensing process is meant to be more efficient. NRC review schedules indicate that it will take 42 months to review a combined license application, even if the applicant referenced a certified design and an early site permit.

What is the basis for this estimate?

Answer. The 42 month schedule includes 30 months for the technical review and an estimated 12 months for the mandatory hearing and completion of the hearing

process. The overall hearing process, starting with prehearing activities, starts upon docketing of an application, but commencement of the hearing itself is dependent upon completion of the principal staff review documents—the Safety Evaluation Report and Final Environmental Impact Statement. The review schedule is based on the NRC staff and industry experience with other complex technical safety reviews including the four completed Design Certifications and takes into account the expected efficiencies associated with standardized reviews.

Question 4. What can be done to reduce the schedule after that initial first plant has received its combined license?

Answer. The 30 month technical review includes a significant period of time for NRC questions and applicant answers to address incomplete or inadequate elements of the COL application. More complete and higher quality applications are therefore an obvious area for reducing the schedule. To clarify the requirements for, and to facilitate the quality of COL applications, and to incorporate lessons learned from related reviews, the NRC has issued a proposed revision to 10 CFR Part 52 and is working closely with stakeholders to develop COL application guidance. Several workshops and meetings have already been held and more are planned.

In addition, the NRC staff has recently accelerated its efforts on the staffs review guidance (i.e. the Standard Review Plans) and expects to complete all necessary updates by the Spring of 2007, well in advance of the expected applications. The staff also intends to employ a "Design-Centered" review approach one issue-one review-one position—for standardized applications to establish a "reference application" and utilize the positions developed for the multiple applications conforming to the reference application.

Question 5. What NRC activities are being performed to ensure that there will be an efficient implementation of the ITAAC (inspections, tests, analyses and acceptance criteria) process, including consistent application and interpretation of ITAAAC sign-off criteria between different inspectors and different projects?

Answer. ITAAC are part of the combined license and define specific requirements to be met prior to operation. To gain staff efficiencies, facilitate knowledge transfer, and ensure consistency in NRC activities related to the implementation of ITAAC, all construction inspection management and resources will be located in a single NRC region which will schedule all construction inspections nationwide.

Question 6. Why is NRC proposing such a substantial revision to part 52 on the eve of so many new plant applications?

Answer. The NRC proposed changes to Part 52 to provide a greater level of clarity and specificity of the existing requirements, to incorporate lessons learned from related recent reviews, and to address operational program information to implement recent Commission policy decisions on this matter. Prospective combined license applicants can use the requirements in the Part 52 proposed rule to prepare their applications and still be in compliance with the current requirements.

Question 7. Doesn't the scope of the proposed revision inject regulatory uncertainty and confusion at a critical time? Isn't it likely that plant applications may be delayed for no reason other than potential applicants will take time to try to understand so many changes to the rule?

Answer. The NRC believes that completing this rulemaking will benefit the NRC's stakeholders by affording a high degree of predictability to the licensing processes in Part 52 and providing increased clarity to all parties involved in the licensing process. Issues resolved in the rulemaking will not have to be addressed on a case-by-case basis during NRC review of applications. While the timing of issuance of the proposed rule could be causing some apprehension for prospective applicants preparing COL applications in 2006, the NRC believes that resolution of generic issues in the rulemaking provides added regulatory predictability that outweighs possible short-term concerns being expressed by some prospective COL applicants. In addition, given the steady stream of COL applications that the NRC expects to receive in the coming years, there does not appear to be a more desirable time to implement these changes.

Question 8. Why is it necessary to have such a complex and substantial revision to part 52? Why can't the NRC implement the Rule as presently structured?

Answer. The NRC has consistently held the position that it could implement the rule as presently structured. However, the Commission believes that this rulemaking action will improve the effectiveness and efficiency of the licensing and approval processes for future applicants. If the Commission decided not to go forward with the current rulemaking, the NRC and its stakeholders would lose the value gained from incorporating lessons learned during early site permit and design certification reviews, and during interactions with stakeholders on the COL process. In addition, the NRC believes that completion of the rulemaking will provide early res-

olution of generic issues that would otherwise have to be addressed during NRC's review of the first COL applications.

Question 9. Do any of the proposed revisions to Part 52 conflict with Congress' goal in the Energy Policy Act of 1992 to achieve efficiency and certainty in the regulatory process? Do you agree with me that the number of applications currently planned demonstrates public confidence in the reliability and regulatory certainty of the current rule?

Answer. The NRC believes the proposed revisions to Part 52 are consistent with Congress' goal of achieving efficiency and certainty in the regulatory process. In fact, the NRC believes the revisions will achieve greater efficiency and certainty. Should the NRC determine through the public comment phase of the rulemaking process that some elements of the rulemaking conflict with Congress' goal to achieve efficiency and certainty in the regulatory process, the NRC will take appropriate action to address such unintended consequences at the final rule stage. With regard to the number of applications currently planned, we believe that passage of the Energy Policy Act of 2005, which provides incentives for companies that take the lead to construct new nuclear power plants, is in great part responsible for the current interest in new reactors.

Question 9a. In particular, do any of the proposed revisions increase the probability that issues that would have been finalized at an early stage in the process under the current version of Part 52, such as at the early site permit stage, will be subject to another review at the COL stage if the proposed revisions are adopted? Is that a desired result?

Answer. Part 52 contains provisions designed to preserve the finality of issues at the COL stage that have been previously resolved at an earlier stage in the licensing process, e.g., at the early site permit or design certification stage. The NRC did propose to modify Part 52 to require a COL applicant referencing an Early Site Permit (ESP) to update the emergency preparedness information provided under the ESP application. This modification was proposed by the industry after one of the States suggested that emergency plans approved as part of an ESP review be kept up to date throughout the duration of an ESP and the construction phase of a COL.

In addition, the NRC proposed revisions to its environmental regulations in 10 CFR Part 51 to require that a COL application referencing an ESP contain any new and significant information on the site or design. The issuance of a COL to authorize construction and operation of nuclear power plant is a major Federal action significantly affecting the quality of the human environment; consequently, the NRC must consider environmental impacts of the action. For matters resolved at the ESP stage, if there is no new and significant information that materially affects the NRC's decision on issuance of the COL, then the staff will rely upon the conclusions provided in the ESP environmental impact statement for such matters. Such matters will not be subject to litigation at the COL stage. The NRC has recently received stakeholder comments on this aspect of the proposed rule and recently held public discussions on regulatory guidance for these proposed requirements. We are considering all of these inputs in formulating further revisions to the rule language for the final rulemaking.

Question 9b. What can Congress do to help the NRC conduct its reviews of the various stages of the plant licensing process more efficiently? Would legislation according finality to NRC's findings at various stages of the process be something that NRC would welcome?

Answer. The existing statutory authority provided by the Atomic Energy Act of 1954, as amended, as well as by the Energy Policy Act of 1992 and the recent Energy Policy Act of 2005, is, in our view, sufficient, and new legislation is not needed to provide stability and finality for NRC processes. Under our current authority, we have developed a regulatory framework in our regulations in 10 C.F.R. Part 52, as well as in our Rules of Practice in 10 C.F.R. Part 2, which, we believe, will enable the NRC to complete the licensing process for new reactors—both the technical and environmental reviews and any associated hearings—in a timely and efficient manner. In order realize this potential, the NRC expects that the forecasted applications will include complete information to minimize the need for requests for additional information, and that they will maximize the level of standardization among applicants to reduce the need for customized and repetitive reviews. We also believe that ability of a Combined License applicant to reference previously-approved Early Site Permits and certified designs can help ensure the overall effectiveness and efficiency of the licensing process.

Question 10. Would you also agree that substantial revisions to Part 52 that are perceived to eliminate some of the regulatory certainty might cause potential applicants and the financial to lose some of that confidence. Do you agree that public confidence that the licensing process is efficient and reliable is important?

Answer. The Commission believes that regulatory certainty will be increased under the proposed revisions. The Commission shares the goal of an efficient and predictable licensing process and agrees that this is important. The Commission believes that the general public's confidence in our licensing processes is based on opportunities for their participation and on the safe operation of nuclear power plants.

Question 11. Would you also agree that the efficiency of the licensing process, particularly the potential for duplicative reviews at the COL stage of issues that should have been foreclosed at an earlier stage, such as the early site permit or design certification stage, cause NRC to need more reviewers and is generally an inefficient way to do business?

Answer. One of the NRC's main goals in promulgating 10 CFR Part 52 in 1989 was to resolve issues early in the licensing process. The NRC is committed to avoiding multiple reviews of the same information, as evidenced by our commitment to a design-centered approach in the review of multiple COL applications that reference the same design. This approach will use, to the extent practicable, a "one issue-one review-one position" strategy in order to optimize the review effort and resources needed to perform these reviews; that is, the staff will conduct one technical review for each reactor design issue and use the result of this review in multiple applications to the extent practicable.

Question 12. Several potential applicants have indicated that they would like to consider a hybrid approach for a COL application, where the COL application references either an application for Design Certification or ESP application. I understand that the reference of an application is explicitly authorized in your Part 52, but there is no guidance on how the processing of such a COL application would be accomplished. Why don't the proposed revisions to Part 52 expressly provide guidance to the industry and the Commission regarding how to process such applications in an efficient, straightforward way?

Answer. As noted in the question above, Part 52 already allows combined license applicants to reference a docketed application that has not been granted. The Commission is currently preparing guidance on the information that those types of applications should contain. A COL applicant is authorized to reference an application for an early site permit pursuant to 10 C.F.R. §52.27(c), and/or an application for a certified design, in accordance with 10 C.F.R §52.55(c). Based on longstanding Commission case law and fundamental principles of administrative practice, a pending application for either an ESP or certified design cannot be treated as having received NRC approval and, therefore, is not entitled to any finality unless and until acted on and approved. Thus, a COL applicant choosing to reference a pending ESP or design certification application, rather than addressing the matters in the context of its Combined License application, must await the outcome of the ESP proceeding or design certification rulemaking to obtain the finality needed to foreclose re-review by the staff and possible relitigation in connection with the COL itself.

Question 13. Wasn't there a provision for a phased licensing approach under the old Construction Permit—Operating License process? Is NRC prepared to allow the same flexibility under the Part 52 process? Can Congress assist NRC in giving it direction to pursue these kinds of efficiencies in its processes?

Answer. The Construction Permit—Operating License process (i.e., the 10 CFR Part 50 process) can still be used. Under the 10 CFR Part 50 process, an applicant for a Construction Permit could obtain a Construction Permit on the basis of more preliminary design information than is today required of a Combined License (COL) applicant. The lack of the more detailed information in this approach precluded finality of Construction Permit findings and exposed applicants to a second staff review and possible relitigation of issues at the Operating License stage. The Commission created 10 CFR Part 52 to provide a more efficient and predictable licensing process. In addition, because of the difficulties in simultaneously designing and building nuclear plants under the 10 CFR Part 50 phased licensing approach, the Commission encourages potential applicants to use the Part 52 processes.

Under Part 52, an applicant has considerable flexibility in preparing a COL application. An applicant for a COL may reference a previously-issued Early Site Permit or provide the necessary environmental and siting information in the COL application. In similar fashion, a COL applicant may reference a certified standard design or provide the necessary design information otherwise required of an applicant for an Operating License under Part 50 (10 CFR. §50.34) in the COL application. In both instances, a COL applicant must provide its proposed Inspections, Tests, Analyses and Acceptance Criteria (ITAAC).

In addition, a Limited Work Authorization (LWA)—which enables an applicant to undertake certain limited activities at a site before obtaining full authority to engage in safety-related construction as would be permitted under a Construction Permit or COL—is provided by both the Part 50 approach and the Part 52 approach.

In similar fashion, a COL applicant may reference a certified standard design and provide the additional site-specific information as well as information demonstrating compliance with the interface requirements and other procurement, construction and installation and technical details, or, if its chooses not to reference a certified design, it may provide that information otherwise required of an applicant for an Operating License under Part 50 (10 C.F.R. § 50.34). In both instances, a COL applicant must provide its proposed Inspections, Tests, Analyses and Acceptance Criteria (ITAAC).

Question 14. Does NRC have firm milestone schedules for completing hearings on early site permits and COLs? Why aren't the suggested milestones in Appendix B to Part 2 of your rules binding on the Atomic Safety and Licensing Boards? How can we make sure that the milestone schedules for hearings are realistic and enforceable?

Answer. Although the Commission, in revising its Rules of Practice several years ago, declined to establish rigid schedules for adjudications, it nonetheless stressed the importance of setting and adhering to milestone schedules such as those set out in Appendix B to Part 2. This approach was adopted in recognition of the need, on the one hand, to ensure that our hearings provide a forum for resolution of issues material to the licensing process that is fair to all participants and can accommodate potentially widely varying complexity of litigation, and, on the other, to avoid unnecessarily protracted proceedings. Our Atomic Safety and Licensing Boards and the parties have been mindful of the foregoing—both have recognized that extensions of time beyond that provided by the regulations will not be granted casually, but only for good cause, and Boards have, in the few situations encountered since the revision of the Rules of Practice two years ago, kept the Commission informed if delay of the overall schedule would exceed the expectations of the milestone schedule.

Response to Question From Senator Craig

Question 1. Please explain how well NRC's projected workforce needs compare with projections for graduates in nuclear engineering and sciences.

Answer. The NRC's ability to successfully execute activities in support of our mission depends on our highly skilled and experienced work force. Like other government agencies, the NRC continues to be challenged by an aging workforce complicated by substantial growth in new work at a time when senior experts are increasingly eligible to retire. To mitigate the impact of these challenges, the agency has developed human capital strategies to find, attract, and retain critical-skill staff.

The NRC is aggressively recruiting a mixture of recent college graduates and experienced professionals which positions us to meet our hiring challenges. Approximately 25% of the agency's technical new hires are entry-level (i.e., recent college graduates). The remaining 75% are experienced professionals from nuclear generating companies, architect-engineering firms, consultants, military, etc. New positions will be filled with a mixture of entry-level and experienced staff with education or expertise in a number of engineering or scientific disciplines including digital electronic engineering, electrical engineering, materials engineering, chemical engineering, mechanical engineering, human factors, quality assurance, health physics, environmental sciences, fire protection engineering, risk and reliability engineering, project management, and reactor systems/nuclear engineering.

A 2006 report from the Oak Ridge Institute for Science and Education indicates a substantial increase in the number of nuclear engineering enrollments and degrees. Although this appears to be a recent trend, the total number of enrollments and degrees still don't match those from the mid-1990's. There have been more job opportunities than graduates in nuclear engineering over the years, even without growth in the nuclear industry. If dramatic growth materializes in the nuclear industry, the job market competition for these graduates would also increase. To remain competitive, NRC will continue to utilize a variety of recruitment and retention incentives but expects it will likely become more difficult for the Commission, as for many Federal agencies, to hire and retain personnel with the knowledge, skills, and abilities to conduct the safety reviews, licensing, research, and oversight actions that are essential to our safety mission.

As our nation prepares for the potential resurgence of commercial nuclear energy coupled with the increase in retirements among the current nuclear workforce, continued Federal support will help ensure high quality and robust university nuclear engineering and science programs and contribute to the availability of highly skilled graduates when they are most needed. Provisions of the Energy Policy Act of 2005 authorized the NRC to fund scholarships, fellowships, and support grants to universities which may help to partially support these programs.

DEPARTMENT OF ENERGY,
CONGRESSIONAL AND INTERGOVERNMENTAL AFFAIRS,
Washington, DC, June 26, 2006.

Hon. PETE V. DOMENICI,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: On May 22, 2006, Dennis Spurgeon, Assistant Secretary, Office of Nuclear Energy, testified regarding nuclear power provisions contained in the Energy Policy Act of 2005.

Enclosed are the answers to seven questions submitted by you and Senator Craig for the hearing record. The remaining answers are being prepared and will be forwarded to you as soon as possible.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Lillian Owen, at (202) 586-2031.

Sincerely,

JILL L. SIGAL,
Assistant Secretary.

[Enclosures.]

RESPONSES TO QUESTIONS FROM SENATOR DOMENICI

Question 1. What is the number one priority for the Office of Nuclear Energy at DOE?

Answer. The Administration has stated a policy goal of expanding safe and reliable nuclear power in the U.S. and around the world. The resurgence of nuclear power is a key component of President Bush's Advanced Energy Initiative and a key objective contained in the President's National Energy Policy. The Administration is taking many important actions to help ensure that this goal is achieved, including the Nuclear Power 2010 program, the Global Nuclear Energy Partnership, and moving forward with Yucca Mountain. As such, the highest near-term priority of the Office of Nuclear Energy is to work with industry through Nuclear Power 2010 to get a firm plant order for a new nuclear power plant as soon as possible. Toward this goal, we expect the first Construction and Operating License application to be submitted to the Nuclear Regulatory Commission by the end of 2007.

Question 2. What does DOE see as issues most likely to impede new nuclear plant construction and inhibit commercial operations from being initiated in 2014?

Answer. Financial uncertainty is the largest barrier to new plant construction. Because the new nuclear plant designs are not yet completed, the final construction cost is still uncertain. Adding to these uncertainties is the untested regulatory process. The Nuclear Regulatory Commission is only now preparing the Regulatory Guides and Standard Review Plans for the new licensing process. While the NRC is moving forward, until this new regulatory process is tested, there will remain the potential for delays to the start of construction of a new plant.

Question 3. What measures can/will DOE take to eliminate these impediments?

Answer. The Nuclear Power 2010 program is specifically designed to demonstrate the untested regulatory process for licensing of new nuclear plants. As part of the Nuclear Power 2010 program, industry is preparing topical reports for submission to the Nuclear Regulatory Commission to address generic licensing issues prior to the submission of the Construction and Operating License (COL) applications. Additionally, the Nuclear Power 2010 program is cost-sharing the design certification and design finalization costs of the Westinghouse AP 1000 and GE Economic Simplified Boiling Water Reactor (ESBWR), which will go a long way toward reducing the uncertainty.

Financial uncertainty is also a key barrier to new plant construction. However, EPACT 2005 contains key provisions aimed at addressing economic risks associated with building new plants. These provisions include the creation of a loan guarantee program for advanced low-emissions energy systems, including nuclear energy; the creation of a production tax credit program for new advanced nuclear generation; and, risk insurance to cover costs associate with certain delays. These provisions will all help to mitigate financial uncertainty.

The interim rules for standby support, there are requirements that a coverage seeker must fulfill first in order to qualify.

In addition, to having the reasonable expectation of the requirement of a docketed COL application, the sponsor must also submit the following information to the Department:

- Summary of project schedule,
- Plan of intended financing for the project including the credit structure,

- Estimated loan cost for the insurance,
- Estimated incremental cost associated with project,
- Estimated percentage of the amount the sponsor will allocate to the Program and Grant Accounts.

Question 4. Does the Office of Nuclear Energy have the experts in place or plan to have in place the right people with good financial and business backgrounds to evaluate criteria I just listed? My concern, is that one day in the near future DOE will receive a flurry of these "packages" from industry and there will be a bottleneck in the evaluation process.

Answer. Currently, the Department has one full-time staff person dedicated to the standby support program and draws on existing staff to support the program when necessary. The Department also has a contract in place with a financial services company that has experience with similar Federal programs to assist with the review of the standby support program. The Department anticipates that the sponsors of advanced nuclear power plants will apply for a conditional agreement with the Department in late 2007 or early 2008, after they obtain a docketed combined operating license application. The Department will increase staffing as needed to meet the demands of the program.

RESPONSES TO QUESTIONS FROM SENATOR CRAIG

Question 1. Please provide the Department's best estimate, as well as its most optimistic estimate, for the total number of new and existing nuclear power reactors expected to be operating in the U.S. by 2030, assuming that the industry is able to utilize as many of the EPACT incentives as is practicable.

Answer. The Energy Information Administration (EIA) projects that between 108 and 110 reactors will be in operation in 2030. This projection assumes that 104 existing, licensed reactor units will be in operation in 2030 (although four of these current units' renewed licenses will expire before 2030), and six gigawatts of new capacity, resulting from the incentives of the Energy Policy Act of 2005, which is equivalent to four to six new units ranging from 1,100 to 1,600 megawatts each, will be built.

However, 13 U.S. utility companies have made announcements that they are preparing a total of 20 combined Construction and Operating License (COL) applications for submission to the Nuclear Regulatory Commission (NRC). In addition, three unannounced utility letters of intent for five more applications have been received by the NRC for a total of 25 new units, representing at least 30 gigawatts of new capacity. Industry now believes that more new nuclear plants will be built than projected by EIA and that as many as 125 to 129 reactors could be in operation in 2030. Additionally, by 2030, following the Next Generation Nuclear Plant demonstration, it is possible that at least two Generation IV reactors could be in commercial operation, summing to as many as 127 to 131 reactors being in operation.

Question 2. Does the Department foresee a program (or programs) to continue the current mission of Nuclear Power 2010 after NP2010 expires?

Answer. The NP 2010 program is focused on demonstrating the combined Construction and Operating (COL) licensing process and completing the standardized designs for the Westinghouse AP-1000 and GE ESBWR nuclear power plants. We are optimistic that the currently planned activities will lead to significant utility orders for new plants. However, we will continue to monitor new nuclear plant construction and, if needed, propose additional activities.

Question 3. Please explain the Department's position as to whether and how the Next Generation Nuclear Plant (NGNP) might be structured as a cost-sharing enterprise with industry in such a way that the project could be eligible for the loan guarantees stipulated in Title XVII of the 2005 Energy Policy Act.

Answer. The Next Generation Nuclear Plant (NGNP) is presently a research and development program with an EPACT-compliant schedule for launching design activities in 2011. Prior to launching design activities, the Department will develop an acquisition strategy for the NGNP which will examine potential partnering arrangements between DOE and the commercial industry to cost-share in the NGNP. Any number of models might be attractive to industry, including the Office of Fossil Energy model for the FutureGen carbon sequestration coal-fired demonstration plant. We expect that industry cost-share could qualify for loan guarantees under Title XVII of the 2005 Energy Policy Act. The details of how industry partners may configure a legal entity for receipt of loan guarantees are not known at this time.

[Responses to the following questions were not received at the time this hearing went to press:]

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC, May 25, 2006.

Mr. JAMES K. ASSELSTINE,
Managing Director, Lehman Brothers, Inc., New York, NY.

DEAR MR. ASSELSTINE: I would like to take this opportunity to thank you for testifying before the Senate Committee on Energy and Natural Resources on Monday, May 22, 2006, to give testimony regarding the nuclear power provisions contained in the Energy Policy Act of 2005.

Enclosed herewith please find a list of questions which have been submitted for the record. If possible, I would like to have your response to these questions by Thursday, June 8, 2006.

Thank you in advance for your prompt consideration.

Sincerely,

PETE V. DOMENICI,
Chairman.

[Enclosure.]

QUESTIONS FROM SENATOR DOMENICI

Question 1. From the perspective of the financial community, please tell us the major concerns associated with financing new nuclear power projects?

Question 2. Is the financial community starting to look at electricity generation from the perspective that some people in Washington tend to; forms of generation that do not emit green house gases or other pollutants?

Question 3. Assuming all significant risks are identified and appropriately hedged, do you believe the financial community will be prepared to finance multi-billion-dollar nuclear power projects?

Question 4. Would you please provide for the record your assessment of the NRCs current efforts toward readiness to license new nuclear plants in an efficient and timely manner?

QUESTION FROM SENATOR CRAIG

Question 1. The 2005 Energy Policy Act provides eight-year production tax credits for up to 6 GigaWatts of new capacity before 2021. Do you believe there should be additional (or renewed) incentive programs after the current EPACT incentive programs expire?

MONDAY, JUNE 12, 2006

ENTERGY NUCLEAR, INC.,
NUCLEAR BUSINESS DEVELOPMENT,
Jackson, MS, June 26, 2006.

Hon. PETE DOMENICI,
Chairman, Energy and Natural Resources Committee, U.S. Senate, Washington, DC.

DEAR SENATOR DOMENICI: I am honored to have been given the opportunity to testify before the Senate Committee on Energy and Natural Resources. As you know, I am quite passionate about nuclear energy and enthusiastically support efforts that help realize its full potential in the energy mix of the future.

Enclosed herewith, please find my response to your questions regarding the testimony I gave on June 12, 2006.

If I can be of further assistance in this regard, please do not hesitate to contact me.

Respectfully,

DANNY R. KEUTER,
Vice President.

[Enclosure.]

RESPONSES TO QUESTIONS FROM SENATOR DOMENICI

Question 1. In your testimony, you state that one of the greatest advantages of high temperature gas-cooled nuclear reactors, like the NGNP in the next decade, is that it would be more efficient than today's nuclear or coal-fired power plants, converting the reactor's heat to electricity at an efficiency rate of 48 percent, a 50% improvement over today's power plants. Tell us why that's a big deal?

Answer. There are several key points relating to higher efficiency of this technology which make its development and eventual deployment so important.

- First, from the fuel utilization aspect, the higher efficiency in electrical power generation conserves nuclear fuel (more power produced per unit of fuel consumed). This higher efficiency also means that less fossil fuel will be consumed as part of the energy mix (by way of displacement).
- Second, from an environmental standpoint, the higher efficiency means that less waste heat will be rejected to the environment and that less cooling water will be required (as compared to either today's nuclear or coal-fired plants). This not only means a more moderate impact on the receiving streams and bodies of water, but also suggests added flexibility in siting these plants in areas where limited cooling water is available. Further, as with today's nuclear plants, this advanced technology will generate power free of greenhouse gas emissions. Since these plants operate more efficiently, the amount of avoided emissions per unit of fuel consumed will be greater.
- Third, from the waste generation aspect, the higher efficiency will result in less fission product waste per unit of power generated. Further, it is our understanding that the higher efficiency coupled with higher projected fuel burnup will result in less transuranic waste per unit of power generated.
- Fourth, from an economics and commercial applications standpoint, the higher efficiency coupled with the characteristic high temperatures of this technology appear to provide process heat with competitive economics and no carbon emissions. Studies have shown that this process heat can be used competitively to produce products like hydrogen to replace use of natural gas in industrial applications and processes (e.g., refining, fertilizers).

Question 2. Everyone here knows very well that I am a supporter of the President's Global Nuclear Energy Program (GNEP) program. A return to nuclear recycling by our nation in my view is long over due. In your testimony you point to what you believe is a connection between the NGNP and the GNEP program and how they could be complimentary of each other. What do you mean by this?

Answer. Although these programs are under development, it appears that there are several areas where collaboration (to the mutual benefit of both programs) should be considered.

- First, it is our understanding that the NGNP gas-cooled reactor concept has the potential for "deep burn" thereby achieving better utilization of the uranium fuel and reducing the extent of high heat load from actinide bearing waste. This "deep burn" capability can serve to reduce high level waste demand on the re-

pository. If this concept is proven viable, the NGNP can be part of the overall management of transuranics—a central theme of the GNEP program. As we understand the longer term deployment phase of GNEP, the NGNP technology might well serve in a complementary role to the Advanced Burner Reactors. It seems logical that this course of action would not only reduce the technology development risks but also the number of Advanced Burner Reactors in the deployment phase. Further, the utilization of the NGNP technology in the deployment phase would offer increased flexibility in siting as well as in application (use of high temperature process heat).

- Second, as it is presently conceived, GNEP does not currently address or contemplate the future use of nuclear power in process heat applications. Based on a variety of studies, we believe the market for high temperature process heat (from nuclear energy) exists today and is growing rapidly. Because the NGNP technology appears to hold the most promise for applications where high temperature process heat is used (e.g., hydrogen production), it seems logical and prudent to include the NGNP fuel cycle within the GNEP program.
- Third, the NGNP modular reactors could be the GNEP "small reactor" for deployment in other countries. It appears that the NGNP technology might well satisfy key criteria such as scalability, safety, security, and proliferation-resistance—as described in GNEP program plans. Furthermore, the cooling water requirements for the NGNP are lower than those inherent in other technologies—providing more flexibility for siting plants in various parts of the world.

Question 3. Is the spent fuel of the NGNP recyclable?

Answer. We understand that the spent fuel can be reprocessed and is recyclable. This has yet to be demonstrated at large scale and should be an area of focus within GNEP technology demonstration.

MPR ASSOCIATES, INC.,
Alexandria, VA, June 29, 2006.

Senator PETE V. DOMENICI,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR SENATOR DOMENICI: It was my pleasure to testify before the Senate Committee on Energy and Natural Resources on June 12. I hope my testimony is helpful with regard to a successful implementation of the Next Generation Nuclear Plant Project.

Your letter of June 19, 2006 forwarded three additional questions regarding my testimony; these questions were submitted for the record by Senator Thomas. Please find enclosed copies of those questions along with my response. I coordinated this response with Dr. Michael Corradini, the Chairman of the NERAC Generation IV Subcommittee.

Sincerely,

DOUGLAS M. CHAPIN,
Principal Officer.

[Enclosure.]

RESPONSES TO QUESTIONS FROM SENATOR THOMAS

Question 1. It sounds like your group is looking at other uses for the next generation of nuclear plants. What happens if we have not converted to a hydrogen economy by 2020?

Answer. High Temperature Reactors (HTRs) are useful for process heat applications whether there is a hydrogen economy or not; HTRs allow displacing of natural gas and other fossil-based fuels for that purpose, thereby saving these resources for other uses and avoiding the production of greenhouse gases.

Question 2. Can you simply generate additional electricity from the steam that will be produced by these high temperature reactors?

Answer. Yes, but this is not likely to be economical; the best likelihood for generating electricity is to use the helium coolant of the reactor directly to run a turbine and avoid the inefficiency of a steam cycle.

Question 3. Are there other, more efficient uses of the steam that could be pursued?

Answer. As noted above, it is probably not desirable to use HTRs primarily to generate steam. Rather, we would use the direct cycle to generate electricity or use the available heat for process purposes, at a higher temperature than available from a steam plant.

RESPONSES OF LARRY BURNS TO QUESTIONS FROM SENATOR THOMAS

Question 1. What will come first—hydrogen cars in the showroom or filling stations with hydrogen pumps?

Answer. We need both to occur together because hydrogen availability will be a key factor for consumers in determining whether to purchase a fuel cell vehicle. Hydrogen infrastructure development needs to be closely coordinated with early vehicle sales to reduce the financial risks associated with transforming the industry and to minimize the scope of the "chicken-and-egg" problem. It is critical for the energy and auto industries to work closely with government to manage the transition.

Question 2. When do you realistically think that hydrogen vehicles will be widely available for consumers?

Answer. The key is to reach the "tipping point" where the market drives growth of fuel cell vehicle demand and supply. The first step is to develop fuel cell technology that is competitive with internal combustion engines. GM has publicly stated that we are targeting to design and verify a fuel cell system by 2010 that has the performance, durability, and cost (assuming scale volumes) of today's internal combustion engine systems. Following this, the next step will be low-volume introduction of fuel cell vehicles in selected markets to generate cycles of learning about real-world use. We believe that our technology progress will enable us to approach volume-capable fuel cell vehicles by the middle of the next decade, assuming the required infrastructure evolves on the same timetable to ensure affordable, convenient, and safe hydrogen is available for our customers.

Question 3. What other countries are pursuing hydrogen-based transportation?

Answer. The U.S. is competing with China, Japan, Korea, the European nations, Iceland, Dubai, and Abu Dhabi, among others, on hydrogen-based transportation initiatives. This clearly is a global opportunity.

Question 4. Do you think the United States will be the first place we see hydrogen cars on the road?

Answer. It depends on whether the U.S. has the collective will to lead the world in this direction. Japan and China are aggressively pursuing hydrogen fuel cell vehicles. To be first, we will need automotive-competitive technology, economical energy pathways and infrastructure, codes and standards, and the national resolve to make it happen.

In general, we think that since the transition to a hydrogen economy is largely driven by societal factors (energy security and environmental concerns), the federal government has an important role to play in helping to reduce investment risk during the initial period of transition. The federal government has historically played this role in transportation initiatives that address societal needs—for example, the creation of the federal interstate highway system. Low-interest financing, appropriate vehicle purchase incentives, tax credits for investment in hydrogen refueling infrastructure (timed and regionally focused to match the roll-out of fuel cell vehicles), or other meaningful tax incentives would encourage the investments necessary to ensure development of fuel cell vehicles and a geographically coordinated network of hydrogen filling stations.

RESPONSES OF JEFFREY SERFASS TO QUESTIONS FROM SENATOR THOMAS

Question 1. In the short term, what is the most environmentally-friendly way to produce hydrogen?

Answer. There are several options for producing hydrogen with zero air pollution and zero greenhouse gas emissions. In the short term, the most environmentally friendly ways to produce hydrogen will use sources of emission-free electricity to power an electrolyzer, which splits water into pure hydrogen and oxygen. These sources of electricity include wind, solar, hydro, geothermal and existing nuclear power.

"Well-to-wheel" studies have found that many hydrogen production methods (including hydrogen made from natural gas or water using renewable or nuclear energy) will release 10-40% less carbon dioxide into the atmosphere than using gasoline in conventional or hybrid electric vehicles.

Of the resources listed above, wind, geothermal and hydro-power can also be cost-effective in the near-term and should be emphasized in policy decisions. Nuclear power can produce, with no greenhouse gas emissions or other pollution, a significant portion of the new hydrogen required, provided that waste management and safety issues are addressed. Off-peak electricity from nuclear power is cost-effective for hydrogen production today.

In the longer term, carbon sequestration technology can be used to produce hydrogen from domestic resources, such as coal and natural gas, with near-zero emissions.

Question 2. What is the cheapest way to produce it?

Answer. Currently, the cheapest way to produce hydrogen is from natural gas in a large centralized facility. Steam reformation of natural gas (which very basically involves running very high temperature steam though natural gas to break the chemical bonds) is used to produce over 95% of the nearly 10 million tons used in the U.S. each year. In 2004, the National Academy of Engineering estimated that using current technology, hydrogen could be provided at the pump for less than $2.50/gallon of gasoline equivalent (gge). Since the additional efficiency of fuel cell vehicles was included in their estimation, this shows that hydrogen can be available at a "per mile" price comparable to gasoline.

In the longer term, coal and advanced nuclear technologies offer the promise of being cost competitive or lower than today's cost of producing hydrogen from natural gas.

Question 3. How are we going to get the infrastructure built to deliver hydrogen?

Answer. It is worth noting that a hydrogen infrastructure for industry exists today. Current hydrogen production capacity could fuel at least 1 million vehicles today. One industrial gas supplier claims:

- 100 million gallons of liquid hydrogen (LH2) is trucked over 8 million miles/year
- 100 million standard cubic feet (SCF) of gaseous hydrogen is delivered every day by pipeline
- 10 million SCF of LH2 is delivered every day
- 2 million SCF of gaseous hydrogen is delivered every day by tube trailer
- 12,000 hydrogen deliveries are made each year

(1 gallon of gasoline = 1 kilogram of hydrogen = 423 SCF H2)

Regarding a refueling infrastructure: how can we provide hydrogen at local refueling sites, offering both convenience and acceptable cost to consumers? Today's existing natural gas and petroleum distribution systems are not necessarily good models for future hydrogen distribution.

To expand the existing infrastructure a creative, evolving approach is needed, eventually leading to a system that serves both stationary and mobile users, with hydrogen from small and large hydrogen production facilities, using a wide variety of feedstocks with carbon dioxide capture and sequestration where fossil fuels are used. In the very early stages, hydrogen might be delivered by truck from a central plant serving industrial customers as well as refueling stations. Or hydrogen might also be produced on-site at the station from natural gas or electricity (including electricity from renewables and nuclear power).

In addition, many experts believe that a clustering approach to expanding the infrastructure will be most effective. Each cluster would have all the elements of a hydrogen pathway: production, distribution, storage, dispensing and use. An example could be a cluster with a small refueling station at an airport (with hydrogen delivered or produced on-site) that fuels airport tugs or support vehicles, back-up power systems and maybe a few rental cars. That cluster would expand into a small web by adding more fueling sites, vehicles and hydrogen powered fuel cell systems. At some point, another cluster could be launched in a city nearby and then commuters could travel between the clusters. Eventually, the networks would grow outside individual regions, across state lines and across the country.

Question 4. We're talking about NGNP, which would require major, centralized hydrogen delivery infrastructure. What do you think the odds are that this will be done in a more distributed way?

Answer. There will be a combination of both. There are certainly advantages to developing part of the hydrogen infrastructure based on a distributed production scheme. There are also advantages to incorporating centralized facilities in the expansion of the hydrogen infrastructure. The decision of where each system should be used will be based largely on the quantity of hydrogen needed in each geographical location. The most effective infrastructure will most likely include a mix of distributed and centralized hydrogen production facilities where the strengths of each are maximized according to the way hydrogen is used in that location.

Question 5. Are there advantages to having a more distributed infrastructure system?

Answer. Distributed hydrogen production will be a key part of expanding the hydrogen infrastructure. Some feel that the hydrogen economy will initially be based on distributed generation of hydrogen. A distributed infrastructure system allows companies to meet small needs with small appliances and scale up as necessary. In

addition the relative small size of distributed systems often mean smaller capital costs which can be an important factor when implementing the first hydrogen systems into a new area. For this reason, distributed infrastructure systems are great for early adoption of hydrogen technologies and can hopefully be used around the world in developing areas in need of clean energy technologies on a smaller scale than the larger demand created by industrialized needs.

However, a distributed infrastructure will not meet all needs. In cities with dense populations, central production and pipelines would probably become the lowest cost option, once a sizeable fraction of vehicles run on hydrogen. The transportation fuel, electricity and chemical industries might become more closely coupled as a result since the economics can sometimes be improved by co-production of electricity, hydrogen and chemical products. Transitions would proceed in different ways depending on the regional resources, and geographic factors.

[Responses to the following questions were not received at the time this hearing went to press:]

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC, June 19, 2006.

Hon. DENNIS SPURGEON,
Assistant Secretary for Nuclear Energy, U.S. Department of Energy, Washington, DC.

DEAR MR. SPURGEON: I would like to take this opportunity to thank you for testifying before the Senate Committee on Energy and Natural Resources on Monday, June 12, 2006, to give testimony regarding the implementation of Sections 641 through 645 of the Energy Policy Act of 2005, the Next Generation Nuclear Plant Project within the Department of Energy.

Enclosed herewith please find a list of questions which have been submitted for the record. If possible, I would like to have your response to these questions by Friday, June 30, 2006.

Thank you in advance for your prompt consideration.

Sincerely,

PETE V. DOMENICI,
Chairman.

[Enclosures.]

QUESTIONS FROM SENATOR DOMENICI

Question 1. The Congress gave the Department $40 million for the NGNP in FY06, yet in FY07 you requested $23 million. Since that time, gasoline prices have skyrocketed for the Spring and Summer. Americans are just getting over the high natural gas prices from this past winter. We clearly need alternative sources of fuel for our homes and cars. I understand very well how tight budgets are and how precious dollars are. You get a pass as you were not here when the FY 07 budget was prepared. Will you commit to working with this committee to advance the NGNP project as close to the energy bill blueprint based upon the promise this technology has for the nation in the long term?

Question 2. In your testimony you highlight the connection between the NGNP and "end-users"—they being the petrochemical industry, chemical processing industry, manufacturing industry, and of course the electric utilities. You state your belief that the entities who will directly benefit from the technologies must drive the technology requirements. Can you expand on that statement for us and give us an example?

Question 3. The energy bill directed the Secretary to seek international cooperation in developing the NGNP. What is the progress?

Question 4. The energy bill directs that the Nuclear Regulatory Commission (NRC) will have licensing and regulatory authority for any NGNP reactor. To what extent has the DOE engaged the NRC in this issue?

QUESTIONS FROM SENATOR THOMAS

Question 1. In terms of efficiency, what are the advantages of using heat to break water into hydrogen rather than simply taking electricity from the plant and using it for electrolysis?

Question 2. We talk about terrorist threats and proliferation concerns, how exactly is the next generation of plants going to be better on these issues?

Question 3. What are the short-comings in these areas for the current fleet?

Question 4. The Energy Bill requires international cooperation on this project. Other than Japan, what countries are actively pursuing these next generation plants?

MONDAY, JUNE 19, 2006

CHICAGO BOARD OF TRADE,
Chicago, IL, July 6, 2006.

Hon. PETE V. DOMENICI,
Chairman, U.S. Senate Committee on Energy & Natural Resources, Washington, DC.

DEAR CHAIRMAN DOMENICI: Thank you for the opportunity to testify before your Committee on June 19 regarding the Renewable Fuel Standard in the 2005 Energy Policy Act and the future of ethanol and biofuels in the U.S.

I have received your letter forwarding questions from Senator Bingaman and offer the responses below:

Question. How much interest/activity has the CBOT had in its new ethanol futures contract?

Answer. Within its first 15 months of trade, interest from the industry in the CBOT Ethanol futures contract has been significant, likely because the CBOT price represents the first transparently discovered ethanol price in the U.S. industry. We are pleased with the level of interest in this promising contract and optimistic about its potential for growth as the contract and industry mature.

Question. What is average daily volume?

Answer. Average daily volume in the contract has been slowly trending upward. Average daily volume this June was 31 contracts, the most liquid month since the contract was listed. Attached is a graph showing the history of average daily volume in the CBOT Ethanol futures contract.*

Question. Monthly volume of open interest?

Answer. Open Interest in the CBOT Ethanol futures contract grew rapidly during the second half of 2005. So far in 2006, open interest has become more stable at between 700 and 900 contracts (20.3 million gallons and 26.1 million gallons). Peak open interest of 914 contracts (26.5 million gallons) occurred on April 13th of this year. Attached is a graph showing daily open interest and volume since the launch of the contract.

Question. How much is held by hedge funds?

Answer. At this point, there is no material hedge fund involvement in the contract.

Thank you again for the opportunity to participate in the hearing.

Sincerely,

CHARLES P. CAREY,
Chairman of the Board.

NATIONAL RENEWABLE ENERGY LABORATORY,
Golden, CO, July 7, 2006.

Hon. PETE V. DOMENICI,
U.S. Senate, Committee on Energy and Natural Resources, Washington, DC.

DEAR SENATOR DOMENICI: Thank you for inviting me to testify before the Committee on Energy and Natural Resources. It was an honor to provide testimony to your committee's June 19th hearing on the Renewable Fuels Standard and the future potential of biofuels, such as ethanol and biodiesel.

Attached are NREL's responses to the list of questions which were submitted by Senators Bingaman and Salazar.

Please understand that NREL's answers to the questions about our required funding for FY07 to achieve $1.07 per gallon for cellulosic ethanol by 2012, and the maximum amount of funding that NREL could effectively utilize in FY07 and FY08 are direct answers to the questions asked by Senators Bingaman and Salazar. NREL's answers to these very specific questions do not take into account the prioritization of NREL's work in the context of all the other important work funded by our sponsoring office, the Office of Energy Efficiency and Renewable Energy within DOE. Our work is only one part of the overall body of work needed to meet our nation's biofuel needs.

Your committee is to be commended for its attention and support of biofuels and alternative vehicle/engine technologies. Biofuels provide a sustainable solution to end our "addiction to oil", mitigate global warming, and provide economic growth opportunity for U.S. rural communities. Alternative vehicle/engine technologies pro-

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*The graph has been retained in committee files.

vide a means of significantly reducing the amount of transportation fuel we use in the U.S.

Please contact me if I can provide any additional information on these subjects.

Sincerely,

DR. MICHAEL A. PACHECO,
Director, National Bioenergy Center.

RESPONSES TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. On page 4 of your testimony you note the ambitious target goal of reducing the cost of producing cellulosic biomass ethanol to $1.07 per gallon by 2012. What kind of annual budgetary outlays are required to be funded in order for NREL to meet this goal? Does the current FY07 budget as proposed include adequate funding?

Answer. First, it is important to recognize that the $1.07 by 2012 goal is a DOE Biomass Program goal, not just an NREL goal. NREL's work represents one contribution to achieving this important DOE goal. There are many other parts of the Biomass Program's overall plan that are equally important to achieving the $1.07 goal.

The DOE cost target of $1.07 per gallon (in 2002 dollars) for cellulosic ethanol was first established in 2002. It is based on a very comprehensive NREL process design study published by Aden, et al. in 2002. This cost target relies on a well-defined set of technical targets, and serves as the compass for guiding the Biomass Program and NREL's research. For the past several years, DOE and NREL have been targeting the year 2020 for achieving this goal.

Based on an unexpected rise in gasoline prices and the increased national priority on biofuels, DOE moved the target date up to the year 2012. The revision in the target date was based on our nation's needs. To meet this new and aggressive goal, the President's proposed budget includes an increase in biomass funding from $92 million in FY06 to $150 million in FY07, and a planned increase of NREL's operating budget for biomass R&D from $14.3 million in FY06 to $27.5 million in for FY07.

An annual budgetary outlay of $31 million for R&D operations and a one-time $15 million capital investment in DOE's Integrated Biorefinery Research Facility (IBRF) is what the Lab's management feels NREL needs in FY07 to meet our specific goals. These goals were developed between DOE and the Lab in order to ensure that DOE would be on a track for achieving its target of $1.07 by 2012. NREL's goals are all linked to reducing the cost of converting biomass. Other parts of DOE's Biomass Program deal with additional advances, such as reducing feedstock costs and developing suitable ethanol fermentation organisms, all of which are critical to reaching the $1.07 target.

The current FY07 budget proposed for NREL is $27.5 million for R&D and $15 million for the IBRF. This is $3.5 million below the operating budget we feel is necessary for NREL's contribution to the needed R&D. The $3.5 million discrepancy simply represents a compromise between what NREL feels it needs, DOE's overall budget, and other competing priorities that the Biomass Program must fund to complete all the other parts of achieving $1.07 by 2012.

It is intended that between 80-90% of the R&D funding NREL receives in FY07 will be used for in-house research, and the remaining 10-20% will be used for research subcontracts to universities and private companies as appropriate to maximize NREL's overall efficiency.

As I stated during the Q&A following my testimony on June 19th, NREL re-evaluates the "state of technology" every year. These evaluations provide the basis for the cost chart on page 4 of my testimony, and serve as a basis for an annual re-evaluation of whether DOE's and NREL's funding levels are sufficient to achieve the aggressive target of $1.07 by 2012.

In closing, I'd like to stress that NREL's work is only one part the overall DOE effort within the Biomass Program. Our focus is to develop and demonstrate cost-effective biomass conversion technology on a pilot scale with corn stover as a model feedstock. Work by many other organizations is needed to achieve the $1.07 goal by the year 2012. And, additional work on feedstocks other than corn stover will be needed in later years to achieve the longer-term goal of producing 60 billion gallons of ethanol by 2030.

Question 2. On page 6 of your testimony you note that one of the barriers to market penetration for biofuels is the need to develop new fuel quality standards. Fuel quality standards are of course important. What exactly is NREL doing on the topic of biofuels?

Answer. NREL's ongoing biodiesel research program has components directed at supporting the development of new and improved fuel quality specifications, and in particular, ASTM specifications. The two most important components of this program are biodiesel fuel quality surveys and oxidation stability studies. Fuel quality surveys are intended to provide a snapshot of fuel quality in the market place, and thereby assist the biodiesel industry in understanding their progress towards meeting existing quality specifications, and also to provide some guidance on what additional parameters might be important in quality specifications. Biodiesel oxidation stability has been identified by the automotive industry as their most important concern with biodiesel quality. Data from NREL's ongoing stability research was instrumental in the passage of an oxidation stability requirement for biodiesel at the ASTM meeting in June 2006. Future research will address other quality parameters including purity, low temperature operability, and water separation. Expansion of this effort to examine fuel grade ethanol and E85 quality is proposed.

Question 3. You also mention on page 6 NREL's Center for Transportation Technologies promising technologies such as "plug-in hybrids." Can you tell me a little more about what NREL is doing with plug-in hybrids? It seems to me that this is an important bridge technology that we should be pursuing.

Answer. NREL has over a decade of experience working on hybrid vehicles. Specific areas of research conducted at NREL for "plug in hybrids" include energy storage (thermal management of batteries), systems analysis and tradeoff for maximum efficiency gains, electrification of auxiliary loads such as vehicle air conditioning (applicable to all vehicles not just hybrids), and finally thermal control of power electronics and electric motors.

- Energy Storage: One critical component of the "plug in hybrid" is energy storage. Batteries are improving, most notably the class of Lithium Ion—which we expect will be installed in normal hybrids in the next 3-5 years. NREL is specifically leading the effort in thermal management of batteries. Some Lithium batteries under load can have thermal run-away if not managed properly. NREL is working with various manufacturers to identify and solve thermal management issues.
- Systems Analysis: The sizing of the battery in a plug in hybrid depends upon many conflicting demands—engine control strategy, duty cycle, all electric range, equivalent electric range, weight, volume, cost, state of charge control, depth of discharge and so on. Math based analysis tools allow us to help set performance targets for both emission and efficiency based upon all these tradeoffs. These analyses help DOE to set component targets of performance for various plug in vehicle configurations.
- Auxiliary Load Electrification: With greater on board battery capacity, auxiliary load electrification such as air conditioning, becomes a very important strategy. NREL is working to minimize the huge impact of air conditioning on fuel economy degradation.
- Thermal Control of Power Electronics and Electric Motors: Plug in hybrids will have power electronics which control the switching of power to and from the batteries and the electric motors. Any heat generated by these components, must be managed, both from an efficiency standpoint, and a component reliability standpoint for the concept to be viable in the marketplace. NREL is working with component manufacturers to eliminate or minimize these losses.

It should be noted that in all electric drive vehicle scenarios—whether it be electric hybrid, plug in, or fuel cell—these basic science and engineering activities support these classes of vehicles—both light and heavy duty.

Responses to Questions From Senator Salazar

Question 1. Millions of American cars are flex-fuel vehicles that can run on regular gasoline or on E85—Fuel that is 85% ethanol and 15% gasoline. Are the tax credits that encourage filling stations to increase the number of E85 pumps working?

Answer. In the Energy Policy Act of 2005, SEC. 1342 established a tax credit for the installation of alternative refueling stations. This covered facilities which provide refueling infrastructure for alternative fuels including E85.

The allowed credit is 30% of the cost of installing clean-fuel vehicle refueling equipment, (e.g. E85 ethanol pumping stations) or $30,000 per installation, whichever is less. This credit came into effect on January 1, 2006 and continues through December 31, 2010. The IRS has just issued guidance for this tax credit in May 2006. It is therefore too early to tell if this credit is working.

While the efficacy of this incentive is yet to be determined, one can tell that various other incentives and government actions have contributed to what appears to be exponential growth in the number of E85 refueling stations in the United States. Figure 1* shows this growth rate and how it relates to some of the federal incentives that encourage E85 use.

The acceleration point in new refueling station growth was is in 2005. This year also saw a considerable jump in gasoline prices (as can be seen in Figure 2). Higher gasoline prices tend to raise interest in fuels and awareness of domestic alternatives.

Another influence not listed on Figure 1 is the Clean Cities grants program to promote alternative fuels. This program provided money largely devoted to E85 infrastructure development according to the schedule in Table 1. The amounts listed were given out on a cost-share basis with at least 50% of project funding coming from other sources.

Table 1.—CLEAN CITIES E85 FUNDING

1999	$221,758
2000	$400,000
2001	$361,285
2002	$807,308
2003	$521,225
2004	$273,030
2005	$355,191
Total	$2,939,797

DOE's Clean Cities and EPAct Fleet Programs also support local and fleet-based initiatives for developing infrastructure and increasing E85 sales by providing technical information and resources at NREL. Local Clean Cities coordinators often work with fleets, FFV dealers, and E85 retailers to help maximize fuel sales once stations are installed.

A regional strategy to maximize the use of E85 in the Midwest where it is produced might help E-85's growth. It could allow vehicle manufacturers and fueling station operators to focus on PADD-2 (Petroleum Administration for Defense District #2) for early adoption of E85. Ethanol transportation costs, Flexible Fuel Vehicle (FFV) availability, and fueling station conversion are all impediments to E85's growth. Ethanol production is centered in PADD-2. If E85 were used in half of the vehicles in PAAD-2, this would represent about 25 billion gallons of ethanol, based on 2004 gasoline usage.

Question 2. How many more E85 pumps are there as a result of tax credits?

Answer. These tax credits have just come into effect. Therefore, the IRS does not yet have data as to the number of claims taken on this credit. The federal tax credit is being assisted by complementary state programs, such as that just enacted by Iowa (which provides additional E85 incentives and additional funding for infrastructure construction) and the well established program that Minnesota is running.

Minnesota's program is very successful in promoting infrastructure development, which has led them to construct almost 1/3 of the nation's E85 refueling stations. In addition to the federal incentives, Minnesota has a 20 cent per gallon ethanol production tax incentive and aggressive requirements for their state fleet to procure AFVs, fill them with alternative fuels, and reduce their emissions. In September 2004, Governor Pawlenty signed an executive order requiring state agencies to reduce gasoline use in on-road vehicles 25% by 2010 and 50% by 2015. The Twin Cities Clean Cities Coalition (TC4) in Minnesota coordinates an innovative public-private effort that is integral in spreading the E85 conversion beyond state fleets to the wider public. More information about TC4 can be found at www.cleanairchoice.com/outdoor/TC4Mission.asp.

Question 3. Regular gasoline powered vehicles can run on E10—gasoline with 10% ethanol added—without modification. For every 10 gallons of E10 sold in the United States, we save one gallon of gasoline. What can we do to increase the blending and sale of E10?

Answer. An increase in the ethanol usage requirements of the renewable fuels standard in future years (beyond the Energy Policy Act goal of 7.5 billion gallons in 2012) is one way to increase the blending and sale of E10. The rapid scale-up of the U.S. ethanol industry production capacity might also make it possible to in-

*Figures 1 and 2 have been retained in committee files.

crease the requirements prior to 2012. Any further incentive provided to the customer for using E10 could create greater demand for E10 even in areas where oxygenated fuels are not required by law.

Use of E10 can also be stimulated by a variety of voluntary programs. These include programs promoting consumer awareness of the environmental, health and national security benefits of E10, and technical and financial assistance to service station operators for E10 brand awareness programs.

Ethanol has been traditionally blended into gasoline for two reasons: to add octane to the base gasoline and to provide oxygenate in those areas not in attainment with Clean Air standards (for either carbon monoxide or ozone levels). E10 is generally produced by splash blending of ethanol and base gasoline at a gasoline terminal. The resulting E10 is then trucked to local filling stations. The Energy Policy Act of 2005 eliminated the requirement for certain levels of oxygenate in non-attainment areas, and substituted the Renewable Fuels Standard. Recently, state required phase-out or elimination of the most common gasoline oxygenate additive, MTBE, led by California and New York, has sharply stimulated demand for ethanol for gasoline blending, primarily to add octane.

Gasoline blending in areas in compliance with Clean Air standards may or may not use ethanol, depending upon factors such as local ethanol cost, availability of transportation links to ethanol plants, etc. As new ethanol plants spread geographically from the corn belt to states as distant as California and New York State, increasing the availability and lowering the local costs of ethanol, E10 will become more common.

Question 4. The NREL budget for Fiscal Year 2006 is less than the funding for FY2005. Was funding the National Bioenergy Center at NREL reduced because of this budget cut? Did that cut affect NREL's work on cellulosic ethanol?

Answer. Yes, the National Bioenergy Center's funding was reduced in FY06 and this had a very significant impact on our cellulosic ethanol research.

Our total biomass funding in FY06 was $15.5 million, this includes a $1.2 million "Continuation of Operations" installment we received in February. While the February installment allowed us to re-hire 2 employees that had been laid-off, and allowed other affected employees to return to their original hours; the February installment did not erase the damage that was done by the FY06 cuts.

Our funding in FY05 was $20.4 million. Thus, we absorbed a 24% reduction in funding from FY05 to FY06. This had a detrimental impact on NREL's cellulosic ethanol research. We have drastically cut variable expenses to levels that reduce the effectiveness of our researchers. We have cut to near zero the sub-contracting of research tasks to universities. These actions were taken to preserve NREL's researchers. We also have opted not to replace 4 staff members who left NREL in FY06 to pursue other opportunities.

The FY06 budget represented the third reduction in annual budgets in as many years. NREL's biomass funding has declined from $34.5 million in 2003. Of the 29 regular employees that have left or been laid off from the National Bioenergy Center since 2003, we have been unable to replace 20 of these employees due the reductions in our budget. Also, we have had to allow the number of post-doctoral researchers to decline. The erosion of our research staff, the drop in our work with universities, and fewer post-Doctoral researchers, all reduce our effectiveness in carrying-out our important mission.

The proposed increase to $27.5 million operating funds and $15 million for the IBRF in FY07 would allow NREL to replace many of the technical staff we've lost since 2003, improve the effectiveness of our research, and equip NREL to aggressively attack the key technical barriers to cellulosic ethanol at a level commensurate with the importance of this goal.

Question 5. Did that cut affect NREL's work on biodiesel?

Answer. No, funding for biodiesel fuel quality work actually increased in FY06 relative to FY05, but at the expense of reduced funding in other areas. NREL is not doing any research on biodiesel production technology.

Question 6. Did that cut affect NREL's work on engine technology?

Answer. No, the funding for engine technology research was not affected.

Question 7a. I request that you submit to this Committee two detailed statements:

First, please provide a detailed statement; include specific line items, of the impact of this year's budget cuts on these three NREL program areas: cellulosic ethanol R&D, biodiesel R&D and engine technologies.

Answer to the first part of question 7: The biodiesel and engine technologies research was not adversely impacted by this year's budget cuts. Table 2 provides a detailed summary of the FY06 reduction in NREL's cellulosic ethanol funding compared to FY05:

TABLE 2

	Funds for FY05	Funds for FY06
Thermochemical Conversion	$4,308,000	$2,963,000
Biochemical Conversion	$8,598,000	$6,797,000
CRADAs with Industry	$3,396,000	$1,894,000
Strategic and Economic Analysis	$1,813,000	$920,000
Technical Support to DOE Golden Field Office and Washington DC Office	$1,333,000	$1,028,000
Miscellaneous Projects	$959,000	$680,000
February "Continuation of Operations" funding installment	.....	$1,214,000
Total NREL Biomass Funds	$20,407,000	$15,496,000
Oxydiesel Line Item	$496,000	$0

These cellulosic ethanol R&D funding reductions had the following impact on NREL's research:

- We reduced the number of experiments in the biological and thermochemical conversion research. This slowed our rate of progress and prevented us from effectively utilizing NREL's facilities to address the key technical barriers for cellulosic ethanol.
- We do not have sufficient funds to produce lignin residue from the bio-chemical pilot plant and process this residue in our thermochemical pilot plant. This integration of the two platforms is critical to meeting the nation's goal of 60 billion gallons of cellulosic ethanol by 2030.
- We suspended plans to study feeds other than corn stover. This prevents determining accurate conversion costs for these other feedstocks. The goal of 60 billion gallons by 2030 ("30x30") will require the utilization of other feedstocks in addition to stover.
- We reduced the number of biomass composition analyses and eliminated R&D on new biomass composition analysis techniques. The chemical analyses of biomass and process intermediates provide critical insight into the shortcomings of the existing conversion technology, and the clues we need to overcome these technical barriers.
- We have reduced our activities on Cooperative Research & Development Agreements (CRADA's) with several leading technology developers. This slows our progress toward commercialization and creates some inefficiency between what industry and the national labs are each working on. CRADA's are one of DOE's best mechanisms for quickly transferring DOE Lab knowledge and technology to industry.
- We dramatically cut back on our Strategic and Economic Analysis, and completely eliminated Life Cycle Analysis work. These analyses are critical to the effective integration of all the different technologies/systems, availability of accurate public cost and cost-sensitivity data, and for the environmental and energy efficiency assessment of our options and alternate pathways for producing cellulosic ethanol. These analyses help us prioritize the research needed to succeed.

Question 7b. Second, please provide a detailed statement of the maximum level of funding that NREL could effectively utilize in the same three program areas in Fiscal Year 2007 and—given the necessary lead time to incorporate expanded personnel and contract programming—in Fiscal Year 2008.

Answer. Cellulosic Ethanol: Table 3 provides a summary of the maximum funding level that NREL could effectively utilize in FY07 and FY08 for cellulosic ethanol research. The number for FY07 is higher than our response to Q#1 from Senator Bingaman, as this question by Salazar asks what NREL could "effectively utilize." It is important to note that Table 3 does not include all the other critical activities within the DOE Biomass Program. Moreover, the Office of the Biomass Program within DOE would have to weigh the benefits of increasing NREL's budget to these levels against other possible uses for the funds if this level of funding became available FY07 and FY08.

It is also important to note that we are running down NREL's FY06 biomass funds to avoid staff reductions in FY06 such that we will have essentially zero carryover into FY07. Therefore, it is critical that there be little or no delay in the funding increase beyond October 1st. A continuing resolution (CR) budget situation in

the beginning of FY07 and the limitations imposed on new budget authority under a CR could result in staff losses in the first few months of FY07.

The increases in Table 3 would allow NREL to reverse the erosion of our research staff, rebuild our work with universities, and re-establish an appropriate number of post-doctoral researchers. This would allow us to attack the technical barriers in the most aggressive manner possible, increase our effectiveness in carrying-out our mission, and contributing to the success of the Biomass Program within DOE. In this scenario, we estimate about 80% of this funding would be used for in-house R&D at NREL and the remaining 20% would be used for a number of research subcontracts to universities and private companies as appropriate to maximize NREL's overall efficiency.

Table 3.—CELLULOSIC ETHANOL

	Maximum level of biomass funding that NREL could effectively utilize	
	FY07	FY08
Thermochemical Conversion	$6,500,000	$8,500,000
Biochemical Conversion	$17,000,000	$27,000,000
CRADA's	$5,000,000	$5,000,000
Strategic and Economic Analysis	$2,000,000	$2,500,000
Technical Support to DOE Golden Field Office and Washington DC Office	$1,500,000	$1,500,000
Miscellaneous Projects	$2,000,000	$3,000,000
Total NREL Biomass Operating Funds	$34,000,000	$47,500,000
Base capital for IBRF	$15,000,000	
Additional capital for new equipment in IBRF	4,000,000	
Other Capital Equipment funds	$2,000,000	$3,000,000
Total NREL Capital funds	$21,000,000	$3,000,000
Maximum Biomass Funding that can be effectively utilized at NREL	$55,000,000	$50,500,000

Biodiesel: NREL is doing no research on biodiesel production. NREL's current biodiesel program is funded at $1,925K out of the Non-Petroleum Based Fuels line, Vehicle Technologies. This work is all directed toward fuel quality and engine performance. The FY06 program funding is shown in Table 4, along with the maximum funding levels NREL could effectively use in the area of biofuel performance testing in FY07 and FY08.

Table 4.—BIODIESEL AND ETHANOL FUEL TESTING

Program breakdown	Current FY06	Maximum level that NREL could use	
		FY07	FY08
Biodiesel engine and vehicle testing	$875,000	$1,300,000	$3,000,000
Biodiesel quality and stability	$450,000	$650,000	$850,000
Biodiesel in-use fleet evaluation	$300,000	$300,000	$500,000
Ethanol engine and vehicle testing	0	0	$500,000
Ethanol quality studies	0	$250,000	$350,000
Outreach, management, administration	$300,000	$300,000	$350,000
Capital	0	$1,000,000	$500,000
Total	$1,925,000	3,800,000	$6,050,000

For FY07 NREL could effectively utilize $2,800K on ongoing programs and a new initiative to examine ethanol quality, and an additional $1,000K for capital equipment to expand engine and vehicle testing capability, distributed as indicated in the Table 4. For FY08 NREL could significantly expand in-house testing based on the prior year's capital investment, moving forward more quickly to address technical issues for greater markets for renewable fuels.

Engine Technologies: The maximum level for increased funding of engine technology research that can be effectively utilized at NREL is summarized in Table 5:

Table 5.—ENGINE TECHNOLOGIES

Project	Maximum level that NREL could use	
	FY07	FY08
Analysis		
Vehicle/Building/Utility/Renewablesm	$3,000,000	$3,000,000
Energy Storage Lifetime vs. SOC, size, etc.	$1,000,000	$1,000,000
Ancillary Loads Reduction	$1,000,000	$1,000,000
Integrated thermal control	$3,000,000	$3,000,000
Validation		
Advanced Power Electronics	$2,000,000	$2,000,000
Energy Storage	$3,000,000	$4,000,000
Ancillary Loads Reduction	$1,000,000	$1,000,000
PHEV Fleet Demonstration/Validation	$2,000,000	$5,000,000
Total	$16,000,000	$20,000,000

As stated in the response to the first part of question #7, NREL's funding for engine technology work was not reduced in FY06; however, there is a reduction for FY07 in the proposed budget. The FY06 actual and FY07 proposed budget numbers for NREL work in three key engine technology areas is summarized in Table 6:

Table 6.—ENGINE TECHNOLOGY R&D

	FY06	FY07 proposed	Reduction
Advanced Power Electronics	$2,300,000	$1,900,000	$400,000
Advanced Heavy Hybrids	$4,500,000	$0	$4,500,000
Vehicle Ancillary Loads Reduction	$1,100,000	$300,000	$800,000
Total Reduction			$5,700,000

The impact of this reduction in Advanced Power Electronics research will delay testing of advanced thermal control devices for plug-in hybrid electric vehicles (PHEV), which operate electric motors and energy storage devices at peak operating conditions for much longer duration of time than current hybrid electric vehicles.

Advanced Heavy Hybrids was a collaborative effort between government and industry that was leading to promising HEV technologies for Refuse Haulers, Buses, and Delivery Vans as well as heat-recovery from all engines using thermoelectric devices. This collaboration will cease in FY07 due to no funding. This project was a good example, with working prototypes of fuel-saving propulsion systems.

The Vehicle Ancillary Loads project has received great automotive media attention and is supported financially by DOD, EPA, NASA, SAE, and automotive suppliers. The funding in FY07 is to provide one-year of closeout costs. The cessation of this task does not allow DOE to take advantage of its significant investment in laboratory facilities, including its state-of-the-art thermal manikin, and integrated modeling capabilities that assist industry in developing technologies for reducing fuel used for automotive air-conditioning—estimated at 5.5% of our light-duty fuel use. The impact of this task is nationally significant and delays near-term reduction of our imported oil. Additionally, plug-in hybrid electric vehicles will need to rely on energy storage systems for cabin heating and cooling which can seriously reduce range or increase fuel consumption by requiring the use of the engine for heat.

NATIONAL BIODIESEL BOARD,
Jefferson City, MO, July 7, 2006.

Hon. PETE DOMENICI,
Chairman, Senate Committee on Energy and Natural Resources, Washington, DC.

DEAR CHAIRMAN DOMENICI: The enclosed information is in response to your 23 June letter providing a list of follow up questions from my June 19, 2006 testimony before the committee.

I am faxing the information and providing a hard copy by mail. I hope this information fits the committee's needs. I am at the committee's service to provide any further information as needed. Thank you for your important work on America's energy future.

Sincerely,

JOSEPH JOBE,
Chief Executive Officer.

[Enclosure.]

RESPONSES TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. You refer to several studies on the potential of biofuels. (LEGC, etc.) We would be interested in taking a look at these. May I ask you submit copies for the record please?

Answer. Please see the attached study by LEGC.*

Question 2. In your testimony (bottom of page 1) you note that "It is anticipate that a significant amount of biodiesel will be used in ULSD as a renewable lubricity additive." How much exactly do you predict will be used for this purpose?

Answer. We do not have an exact prediction of the amount of fuel that will be sold in total or in individual markets, but here are some figures that might be helpful:

a. On-road diesel fuel (which will encompass the first phase of ULSD) amounts to approximately 40 billion gallons per year. The majority of this fuel will need a lubricity additive in order to meet the new lubricity requirement in the diesel fuel specification. If all on-road diesel fuel were additized with 2% biodiesel, it would amount to 800 million gallons of biodiesel. We do not expect at this time that biodiesel will achieve complete market penetration in this area. However, it would not be unrealistic to imagine that biodiesel could achieve 50% penetration within 5 years, amounting to 400 million gallons per year.

b. The estimate above assumes the extension of the energy policy measures mentioned in my testimony and sustained medium to high diesel fuel prices.

c. In addition to low blend markets, we expect to see significant growth in 5%, 10%, and 20% blends as well.

Question 3. The trucking industry has expressed concern over the blending of Biodiesel into ultra-low sulfur diesel (ULSD). They are concerned about temperature control issues, quality and volumes. What are you doing to ensure that there is 1) adequate supply and 2) a consistent quality? In order to continue to move goods across this country we must resolve these questions.

Answer. At NBB's recent board meeting in Washington, DC, NBB passed a resolution on an aggressive fuel quality compliance policy. That policy is attached. The policy outlines the measures that NBB is taking to enhance fuel quality. Certain aspects of the policy are still in development. In addition to the fuel quality policy, NBB has formed a joint working group with the American Trucking Association to address further policy issues that the two organizations can work on together.

Question 4. Trucking is an important industry in my state of New Mexico. Section 757 of the Energy Policy Act of 2005 "Biodiesel Engine Testing Program" is something that I know the trucking industry is very interested in. Can you help me to understand its current status? What are you as an industry doing to support this provision?

Answer. NBB has entered into a CRADA (cooperative research and development agreement) with DOE's National Renewable Energy Laboratory to conduct testing and has teamed up with the major diesel engine manufacturers and the United Soybean Board to raise funding for this federal engine testing research program. NBB is coordinating this effort in order to leverage federal dollars with private dollars and show broad support for this program. NBB has coordinated letters from stakeholders including engine manufacturers to the Senate Energy Committee regarding

*The study has been retained in committee files.

the importance of the engine testing program. And a letter signed by 10 Senators was sent to the Energy Committee expressing strong support for the program. NBB has also had discussions with the American Trucking Association and other stakeholders to support appropriations for the program. As of last week, the appropriations committee approved its Energy and water appropriation, which included $1.5 million in funding for the $5 m program. Although full funding would have been preferred, we are very grateful that some funding was included.

RESPONSES TO QUESTIONS FROM SENATOR SALAZAR

Question 1. Is it correct that European nations primarily produce Biodiesel from canola type seeds, while the United States today produces almost all of our Biodiesel from soy beans?

Answer. Yes, rapeseed is the primary oilseed crop in Europe, while soybeans are the primary oilseed crop in the United States. European soil and climate as well as their crushing capacity and trade markets are conducive to rapeseed. Historically, grain crop production and processing is driven more from the demand for the meal product than for the oil. Even the high oil content crops such as canola are over 55% meal. Traditionally, the oil has been a byproduct of crushing oilseeds. However, as the oil becomes an increasingly valuable co-product of oilseed processing, the economics increasingly favor higher oil content crops such as canola.

Question 2. American farms have the capacity to produce huge quantities of canola and related seeds. What is the National Biodiesel Board doing to encourage the production of Biodiesel from canola and related seeds?

Answer. Please see my response to you regarding oilseeds regarding your question from the 4-26-06 Ag Committee hearing, where I laid out in detail how virtually all of NBB's research and development efforts have enabled and encouraged the use of all agricultural oils and fats for biodiesel production.

In addition to that I will say that canola can be used very effectively for biodiesel production in the United States today. However, at present it is a higher value oil than soybean oil.

RESPONSES TO QUESTIONS FROM SENATOR WYDEN

Question 1. What in your view is the quickest, most reliable and cost-effective way to build out the infrastructure that's needed to sell ethanol fuels to the public? DOE is funding the National Ethanol Vehicles Coalition; various tax incentives are being proposed; several producers are partnering with vehicle manufacturers; the federal government could mandate that gasoline stations install ethanol pumps . . . are any of these approaches going to make E85 more available any faster?

Answer. I believe question 1, 2, and 4 were intended for one of the ethanol industry experts on the panel.

Question 2. Many analysts have pointed to the fact that ethanol is still more expensive than gasoline both in the spot markets and on an "energy-equivalency" basis. Yet, consumers see only the retail sales price of E85 and other blends at the pump as being cheaper than or close to the price of gasoline. When will the "energy-equivalent" price of ethanol become competitive with the price of gasoline? Is there a point in the supply and demand curves for ethanol where these prices converge?

Question 3. When and how will the price of Biodiesel become competitive with the price of a gallon of diesel fuel?

Answer. This is a legitimate question to which no one has the answer. No one knows what diesel prices will do in the future and no one knows what global vegetable oil prices will do in the future, and therefore, no one knows when the confluence of those two variables will converge to make lower total costs for biodiesel than for diesel fuel. I can only discuss current cost structures and future trends and projections.

When I started working for the National Biodiesel Board in 1997, bulk wholesale (pre-tax) diesel fuel prices were approximately $.40 per gallon. I was also routinely purchasing biodiesel for engine testing, and by the time I purchased biodiesel (a specialty fuel at the time) and shipped 55 gallon drums from Omaha to Texas, it amounted to prices as high as $6.00 per gallon. Last summer diesel fuel prices topped $3.25 per gallon after the hurricane damage to Gulf refinery capacity. Meanwhile, more than 40 biodiesel plants were producing over 75 million gallons of biodiesel, and with the blender's tax credit, it was competitive with and in some cases even less expensive than diesel fuel. Industry observers stated confidently, that America would never see $2 per gallon diesel fuel again. By December, diesel fuel was averaging $1.92 per gallon again.

Now diesel fuel is topping $3 per gallon again in some areas. Biodiesel manufacturers are selling as much biodiesel as they can produce and more than 40 plants

are under construction. However, it is not hard to imagine that the laws of supply and demand might soon dictate that biodiesel prices will increase in the short term while diesel fuel prices could easily drop between now and the winter heating oil/Christmas delivery season.

Efforts to predict long-term trends in petroleum pricing have been consistently inaccurate. However, in the long term, I do believe that as biodiesel demand and production continues to grow, volumes and economies of scale grow, and distribution logistics continue to improve, biodiesel cost efficiencies will continue to increase. Likewise, as biodiesel demand grows, it will likely result in an agricultural response for higher oil content crops, more oil crop research for yield improvements, and increased overall oilseed crop production acres.

This should position the biodiesel industry to continue to increase its competitiveness relative to petroleum-based diesel fuel; to continue to grow our overall refinery capacity with new biodiesel plants, and to increase our overall domestic supply of energy.

The petroleum industry has benefited for over 50 years (and continuing today) by favorable energy policy that has resulted in the investment of huge assets and infrastructure. Incentives for investment in the biodiesel industry are working, but will take some time to make a substantial impact on our energy situation.

Question 4. Hearing testimony stated that by 2030 ethanol and alternative fuels could provide as much as 9% of the nation's fuel supply. How much of a solution is ethanol currently to our energy problem? How much will it be when the Renewable Fuel Standard is fully implemented in 2012?

[Note: Responses to the following questions were not received at the time the hearing went to press:]

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC, June 23, 2006.

Mr. DANIEL MORE,
Managing Director and Head of Renewable Energy Investment Banking, Morgan Stanley, New York, NY.

DEAR MR. MORE: I would like to take this opportunity to thank you for appearing before the Senate Committee on Energy and Natural Resources on Monday, June 19, 2006 to give testimony regarding implementation of the Renewable Fuel Standard in the 2005 Energy Bill and the future potential of biofuels such as biodiesel, cellulosic ethanol, and E85.

Enclosed herewith please find a list of questions which have been submitted for the record. If possible, I would like to have your response to these questions by Friday, July 7, 2006.

Thank you in advance for your prompt consideration.

Sincerely,

PETE V. DOMENICI,
Chairman.

[Enclosure.]

QUESTIONS FROM SENATOR WYDEN

Question 1. What in your view is the quickest, most reliable and cost-effective way to build out the infrastructure that's needed to sell ethanol fuels to the public? DOE is funding the National Ethanol Vehicles Coalition; various tax incentives are being proposed; several producers are partnering with vehicle manufacturers; the federal government could mandate that gasoline stations install ethanol pumps . . . are any of these approaches going to make E85 more available any faster?

Question 2. Many analysts have pointed to the fact that ethanol is still more expensive than gasoline both in the spot markets and on an "energy-equivalency" basis. Yet, consumers see only the retail sales price of E85 and other blends at the pump as being cheaper than or close to the price of gasoline. When will the "energy-equivalent" price of ethanol become competitive with the price of gasoline? Is there a point in the supply and demand curves for ethanol where these prices converge?

Question 3. When and how will the price of biodiesel become competitive with the price of a gallon of diesel fuel?

Question 4. Hearing testimony stated that by 2030 ethanol and alternative fuels could provide as much as 9% of the nation's fuel supply. How much of a solution is ethanol currently to our energy problem? How much will it be when the Renewable Fuel Standard is fully implemented in 2012?

QUESTIONS FROM SENATOR SALAZAR

Question 1. Are there differences in industry-recognized technical standards for biodiesel in Europe and the United States?

Question 2. Will those differences make it difficult for international vehicle manufacturers to fully embrace biodiesel and provide full warranty protection for vehicles using B20 or B100?

Question 3. Can we achieve the full potential of biodiesel in the United States and the world in the absence of a uniform international standard?

Question 4. Can we establish an international market for biodiesel in the absence of a uniform international standard?

Question 5. Millions of American cars are flex-fuel vehicles that can run on regular gasoline or on E85—fuel that is 85% ethanol and 15% gasoline. Are the tax credits that encourage filling stations to increase the number of E85 pumps working?

Question 6. How many more E85 pumps are there as a result of these tax credits?

Question 7. Regular gasoline powered vehicles can run on E10—gasoline with 10% ethanol added—without any modification. For every ten gallons of El0 sold in the United States, we save one gallon of gasoline. What can we do to increase the blending and sale of E10?

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC, June 23, 2006.

Mr. CHRIS STANDLEE,
Vice President, Abengoa Bioenergy, Chesterfield, MO.

DEAR MR. STANDLEE: I would like to take this opportunity to thank you for appearing before the Senate Committee on Energy and Natural Resources on Monday, June 19, 2006 to give testimony regarding implementation of the Renewable Fuel Standard in the 2005 Energy Bill and the future potential of biofuels such as biodiesel, cellulosic ethanol, and E85.

Enclosed herewith please find a list of questions which have been submitted for the record. If possible, I would like to have your response to these questions by Friday, July 7, 2006.

Thank you in advance for your prompt consideration.

Sincerely,

PETE V. DOMENICI,
Chairman.

[Enclosure.]

QUESTIONS FROM SENATOR BINGAMAN

Question 1. Your company is truly global in its pursuit of biofuel technologies. You are pursuing projects in Europe and here in the U.S. Do you see opportunities for technological cooperation internationally?

Question 2. How competitive are American biofuel companies internationally?

Question 3. Can you help me to understand what exactly is meant by the term "biorefinery"? I have heard this term used to talk about existing ethanol plants, new ethanol facilities and future production sites for cellulosic biomass ethanol. What is the correct use of this term and does it refer to a facility that will produce a slate of fuels (i.e. gasoline, jet fuel, naphtha, diesel, asphalt and chemicals) as an oil refinery does today, or is there only one product supplied—ethanol or biodiesel?

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC, June 23, 2006.

Mr. WILLIAM WEHRUM,
Acting Assistant Administrator, Office of Air and Radiation, U.S. Environmental Protection Agency, Washington, DC.

DEAR MR. WEHRUM: I would like to take this opportunity to thank you for appearing before the Senate Committee on Energy and Natural Resources on Monday, June 19, 2006 to give testimony regarding implementation of the Renewable Fuel Standard in the 2005 Energy Bill and the future potential of biofuels such as biodiesel, cellulosic ethanol, and E85.

Enclosed herewith please find a list of questions which have been submitted for the record. If possible, I would like to have your response to these questions by Friday, July 7, 2006.

Thank you in advance for your prompt consideration.

Sincerely,

PETE V. DOMENICI,
Chairman.

QUESTIONS FROM SENATOR BINGAMAN

Question 1. Mr. Wehrum, in your testimony (on page 2) you note that "Based on data demonstrating ethanol use in 2005, and projections for 2006, it is expected that far greater than 4.0 billion gallons of renewable fuels will be used in 2006 in the U.S." What is meant by "far greater"? By exactly how much does your Agency estimate that we will exceed the 4.0 billion gallon mandate in 2006?

Question 2. On page four of your testimony you note that your Agency ". . . continues to work with affected parties to develop an RFS program that where possible, utilizes existing EPA systems for collecting data and submitting records while avoiding duplicative burden." In the Energy Policy Act of 2005 we enacted a provision to authorize the Energy Information Administration to collect data on renewable fuels by enacting a renewable fuels survey. Has EPA talked with EIA about ways to achieve the data collection mandates in Section 1508—Data Collection?

Question 3. Trucking is an important industry in my state of New Mexico. Section 757 of the Energy Policy Act of 2005 "Biodiesel Engine Testing Program" is something that I know the trucking industry is very interested in. Can you help me to understand its current status? What are you as Agency doing to support this provision?

Question 4. How does a BTU based credit encourage oil savings or reducing greenhouse gases? Are you considering this in your final rule? Is the system going to be BTU-based?

Question 5. Would a lifecycle based credit serve the goals of the RFS better?

Question 6. It seems that there are differences of opinion regarding the relative merits of the BTU and lifecycle approaches. Perhaps EPA should propose and seek comments of both approaches before deciding which is preferable. Would EPA be willing to do this?

Question 7. What are you doing to help the market develop environmentally differentiated fuels?

Question 8. Are you considering the inclusion of environmental performance in the credit tracking system?

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