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DOMESTIC ENERGY INDUSTRY

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

TO

RECEIVE TESTIMONY ON WHETHER DOMESTIC ENERGY INDUSTRY WILL HAVE THE WORKFORCE—CRAFTS AND PROFESSIONAL

NOVEMBER 6, 2007

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CONTENTS

STATEMENTS

APPENDIXES

APPENDIX I

APPENDIX II

DOMESTIC ENERGY INDUSTRY

TUESDAY, NOVEMBER 6, 2007

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

The committee met, pursuant to notice, at 9:59 a.m. in room SD–366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman of the committee, presiding.

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

The CHAIRMAN. OK, let me call the hearing to order. This is a hearing on the U.S. energy workforce. I'd like to thank all of the witnesses for coming today, we have two distinguished panels. Some came from out of town, and I know they have very busy schedules, so we appreciate them being here.

Let me just mention a couple of statistics. The Energy Information Administration's annual energy outlook projects that energy use in the United States is going to increase by 31 percent over the next 25 years. That will result in a very substantial increase in generating capacity for electricity in the country. EIA projects an addition of 4,761 miles of new natural gas pipeline, up by 50 percent from the 2007 projection that they had earlier come out with.

At any rate, these large increases in the projections by the Energy Information Administration indicate the Nation will require a trained workforce on hand to design and build this future energy generation, whether that's from fossil fuels, from nuclear power, from renewable sources, and the purpose of this hearing is to understand what policies we should be supporting and putting in place to help with the development of that workforce and avoid a workforce shortage in this critical period.

So, I very much appreciate folks being here, and let me defer to Senator Domenici for his comments.

[The prepared statement of Senator Bingaman follows:]

PREPARED STATEMENT OF HON. JEFF BINGAMAN, CHAIRMAN, FROM NEW MEXICO

Let me call today's hearing on the U.S. Energy Workforce to order. First, I would like thank all the witnesses for coming today, many of you came from out of town with very busy schedules in order to testify to the full committee.

Today's hearing addresses whether our existing and future workforce—both skilled and professional are capable of supplying the nation's energy needs.

Let me highlight a few statistics on our growing energy need.

The Energy Information Agency's Annual Energy Outlook 2007 projects that energy use in the U.S. is expected to increase by 31 percent over the next 25 years.

To help meet this increase in energy use the U.S. generating capacity is projected to increase by 199 GW of which 258 GW are from new generating units—or roughly 258 1000 MW plants.

For 2008, the EIA projects an addition of 4761 miles of new natural gas pipeline, up by 50 percent from the 2007 projection of 3195 miles.

These large increases indicate that the nation will require a trained workforce on hand to design and build the future energy generation whether it is from fossil, nuclear or renewable sources.

The Department of Labor estimates that the energy industry employs well over 1 million people and accounts for 4 percent of the Gross Domestic Product. However, the average age of energy industry workers is now over 50 with 500,000 expected to retire over the next 5 to10 years—a turnover rate of 50 percent. The impact of this energy workforce turnover is projected to be largest in the utilities—which employ over half of the current energy workforce.

We have assembled before this committee today representatives from the federal government, state government and industry to help this committee learn about what the workforce issues are and what we in the Congress can do to help address what appears to be a looming workforce shortage.

Again, let me thank everyone for coming today and I look forward to the testimony.

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

Senator DOMENICI. Thank you, Senator Bingaman, Mr. Chairman. Actually, this is one of the most important and exciting meetings that we're going to have regarding America's ability to solve our energy problems in the future.

It's obvious to me that many of our companies are ready to make investments to use innovative technology to build new things. It's obvious that nuclear power is, once again, exciting. Those who are thinking about using it, obviously, have to think about borrowing money, for the most part, a lot of money. They also have to find out whether they can build on some reasonable schedule.

All of the energy production has to worry about schedules, because they borrow money based on schedules, they build their business based on schedules. Frankly, many of them are going to have a very difficult time finding the employees that they expect to be available for major kinds of production facilities, be it a nuclear power plant, or any other kind of, let's say offshore drilling rigs with everything that goes with it. It's obvious that they're going to have trouble finding the equipment, and now we come to what we're talking about, having difficulty finding the trained people on the highest level, called engineers, and operational engineers, all the way through welding, even if these jobs pay well. The question is, who wants them? Who will take them? Where do we have them? Certainly, we can start the hearing knowing that we don't have enough of them on hand. It's not like we can just move them from one place to another, there just aren't enough electricians around for three or four nuclear power plants. You're going to have to find a way, business and America, are going to find ways to train these electricians, these welders, these engineers, and that's what the hearing is about, how are we going to do it?

I, myself, am interested in what industry thinks is the answer to how we're going to do it. I was telling Senator Bingaman that I've been thinking in my mind, that maybe we need a national effort with something like we might call a National Energy Workforce Training Act, and then figure out what the Federal Government can do to help organize and help see that the right kind of

information gets to our schools, so that community colleges would start training, maybe even vocational education programs can be reinstated at seniors in high school, so they will get, at least, excited about these kinds of things.

Now, that's not what I had in my opening statement——

[Laughter.]

Senator DOMENICI. So, Senator Bingaman, if you'll forgive me, I won't give the opening statement, that will be it, and I'll ask that it go in the record. I thank you for calling the hearing, and I join in thanking you all who came, especially those from far away.

We hope we get enough out of this to justify all you have done to help us.

Thank you, Mr. Chairman.

[The prepared statement of Senator Domenici follows:]

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

Good morning. I thank you all for your attendance and participation in today's hearing on the current and projected workforce needs of our nation's energy sector.

Our witnesses today will describe the pressing needs facing the energy sector in recruiting, training, and retaining skilled workers for their industries. The energy industry employs well over 1 million people and accounts for 4 percent of the Gross Domestic Product. Half of these workers—that's 500 thousand people—are expected to retire over the next five to ten years creating a turnover rate of 50 percent.

An analysis by Cambridge Energy Research Associates projects big delays for large oil and gas production projects worldwide owing to the expanding shortfall of qualified engineers and skilled workers. The workforce shortfall could be 10 to 15 percent by 2010, according to their comprehensive analysis of the engineering and project management staff needed to deliver the over 400 major projects expected to come on-stream over the next five years. Their analysis confirms that engineering and project management personnel are already insufficient to meet upstream project demand.

A recent study by the Global Energy Management Institute at the University of Houston estimated that the energy sector's talent shortage cost the industry more than $5 billion in pretax profits in 2006. This estimate includes costs due to higher wages offered when competing for workers, and lost business opportunities due to a lack of available workers.

Take, for instance, the current shortage of welders. At Williams, a unit of Canada's Flint Energy Services Ltd., the Rocky Mountain region's thin labor pool has hindered efforts to train more welders through an on-site training and apprenticeship program. Executives say the company could increase production by 20% to 25% if it had more welders.

Williams has raised its starting wage for welders by 30% over the past two years to $16 an hour. This year, it sent recruiters to job fairs as far away as Saginaw, Michigan to recruit welders from the declining auto industry.

Moreover, because these worker shortages are international in scope, we will not be able to simply import skilled workers to address national shortages. In Canada's Athabasca oil sands region, engineers and workers are relocating from as far away as Mexico and China to join the labor pool.

Energy projects in the Arab Gulf region face delays and cancellations due to a massive shortage of engineers and laborers to build them. Analysts predict over the next five years, the Arab Gulf region will need an extra 100,000 engineers and contractors, and another 600,000 construction workers. To stay competitive as a nation, we need to continue to create good jobs in America's energy sector—and to make sure we are doing everything we can to recruit, train, and retain workers to support our energy industries.

I look forward to learning more about these challenges from our witnesses. Thank you.

The CHAIRMAN. Thank you very much.

Senator Corker, did you have an opening statement?

STATEMENT OF HON. BOB CORKER, U.S. SENATOR FROM TENNESSEE

Senator CORKER. I think you all opened very well, and I look forward to the testimony.

The CHAIRMAN. All right. We will start with our witnesses here, we have two witnesses from the Federal Government, and another witness on this panel.

Emily DeRocco, who is the Assistant Secretary of the Department of Labor, thank you for being here. Patricia Hoffman, Deputy Director in the Department of Energy, thank you for being here. Andra Cornelius, who is with Workforce Florida, Inc., in Tallahassee, thank you very much for being here.

Why don't we just go across the—if you could take 5 or 6 minutes and just summarize the main points, we will include your full statement in the record.

Senator DOMENICI. Senator Bingaman, might I state for the record that last, yesterday evening late, the Appropriations Committee called a conference meeting on the defense part of the bill, and I'm on that, and I think you would like me to go to that meeting, as well as I would like to go.

So, I'm going to go there, and try to come back as soon as I can. Thank you very much.

The CHAIRMAN. All right.

OK, Secretary DeRocco, go right ahead.

STATEMENT OF EMILY STOVER DEROCCO, ASSISTANT SECRETARY, DEPARTMENT OF LABOR

Ms. DEROCCO: Thank you, Mr. Chairman, Senators, for inviting the Department of Labor to testify at this very important hearing on the workforce challenges confronting the energy industry, and how we at the Department of Labor are helping the industry respond to these challenges.

To better understand the workforce issues of the energy industry, in 2004 and 2005, my agency—the Employment and Training Administration—conducted 7 forums for executives from all sectors of the industry—oil and gas, electric and natural gas utilities, nuclear, and mining. These forums provided us, and the workforce investment system, with the opportunity to gain deep understanding of the critical workforce needs of the industry, and to begin developing model solutions to meet their challenges.

Our discussions with the industry identified several key workforce development concerns.

First, a large percentage of current workers in the industry are nearing retirement. The average age of workers in the energy industry is now over 50, and the industry estimates that up to half of its current workforce—more than 500,000 workers—will retire within 5 to 10 years.

As experienced workers retire, they are difficult to replace, because too few entry-level workers are equipped with the advanced skills required by today's technologically sophisticated companies. Creative solutions are necessary to help experienced workers who will be retiring, transfer their knowledge and skills to their replacements, and to help new workers gain necessary skills as quickly as possible.

The situation is compounded by the problem that too few potential workers are interested in careers in the energy industry. Stereotyping of energy careers as "low skilled" causes qualified workers and youth to be unaware of the many highly skilled, well-paying career opportunities the industry has to offer.

An additional set of challenges arises because many training programs were reduced or eliminated during the downturn the industry experienced in the late 1980s and early 1990s. Programs have not expanded at the same rate that the industries need has rebounded.

Also, we know that employers in all sectors need workers who are more proficient than their predecessors in math, science, and especially technology skills.

Finally, it was noted at the forum that too few industry-defined, portable credentials have been developed in the energy industry. Additionally, some energy occupations lack clearly recognizable career ladders, necessary for instilling a new perception that working in the industry is an attractive and viable long-term career choice.

ETA began addressing these workforce challenges through an initiative called the High Growth Job Training Initiative. Launched in 2002, this initiative is the cornerstone of the Administration's efforts to create a workforce investment system, through which taxpayers invest over $15 billion a year, that is demand-driven, and balances the needs of America's workers with the demands of employers.

Under this initiative, we've awarded 11 grants, totaling $27 million, to help model how to meet the workforce needs of the energy industry.

A quick example is our investment with the State of Alaska's Department of Labor and Workforce Development. In order to meet the State of Alaska's demand in the energy sector, the State—in partnership with education and industry—is directing training resources directly toward energy-related competencies and occupations, while at the same time integrating their vocational and technical education program with energy skills training.

A key component of this initiative is the use of the apprenticeship model, a training tool that has been proven to improve job level skills, and workforce readiness across a number of sectors, including energy.

Our work in the high-growth sector revealed a critical shortcoming in the workforce development capacity of many regions. To address this capacity issue, the Administration has initiated the community college initiative, or Community-Based Job Training Grants, to address the need for expanded, affordable, flexible education and training capacity in local communities across the country. Due to their close connection to communities, community colleges are well-positioned to understand the intricacies of the industry's needs, and better prepare workers for occupations in these localized industries.

Of our current community college initiatives, 13 grants, totaling $20 million have been awarded, that focus specifically on the energy sector. Another example in this arena is with Montana State University at Billings, to develop an industry-driven model for just-in-time training, programs in the energy industry, responsive to

new technologies being used in mining, oil and gas, power generation and biofuels. This project will train over 1,000 individuals for careers in the industry.

Finally, building on the principles of both the High-Growth and Community College initiatives, we have begun the Workforce Innovation in Regional Economic Development Initiative, or WIRED. WIRED seeks to help regional economies transform their workforce investment, economic development, and education systems to support overall economic growth by fostering talent development in high- growth industries. Thirteen of our current 39 WIRED regions are focusing on the energy industry, and their talent development needs, and this includes, for example, the Central New Mexico region.

This regional initiative is led by New Mexico's technology triangle, an industry-driven regional development alliance affiliated with New Mexico Tech University in cooperation with a broad array of stakeholders, the alliance is coordinating an inter- regional effort to stimulate entrepreneurship, develop the technical workforce needed by the energy industry, and create a policy environment that supports and rewards innovation.

A very important element of WIRED has been our partnership with other Federal agencies, particularly the Department of Energy. We have engaged, since 2006, with the National Labs, represented here today by the National Renewable Energy Laboratory, which has become a full partner with the WIRED regions which are exploring alternative energy growth and opportunities to take advantage of the National Lab's resources, expertise and technical assistance, to increase industrial competitiveness, stimulate employment opportunities, and foster public/private collaboration in talent development.

We have many other initiatives I'd like to share with you, they're in my written testimony. Perhaps the most important of which are two we conducted with the 16 Southern States, an energy Skilled Trade Summit, just a few months ago, to deal with the issue of advancing careers in the construction industry tied to new construction in the energy industry, and we have also launched a partnership with the Departments of Energy and Interior to conduct the study called for in the Energy Policy Act, on the availability of skilled workers in the industry. This study will be done by the National Academy of Sciences.

We understand that energy is a critical driver in America's economic growth and competitiveness in the 21st Century economy, and that high wage opportunities with established career pathways are awaiting American workers in the energy industry. The Department of Labor is prepared to continue to support these efforts.

[The prepared statement of Ms. DeRocco follows:]

STATEMENT OF EMILY STOVER DEROCCO, ASSISTANT SECRETARY, LABOR EMPLOYMENT AND TRAINING ADMINISTRATION, DEPARTMENT OF LABOR

Mr. Chairman and Members of the Committee, thank you for the opportunity to provide the Department of Labor's perspective on the workforce challenges confronting the energy industry. Recognizing the importance of this sector of our economy to the Nation's overall global competitiveness, the Department of Labor has been actively helping the energy industry respond to the workforce challenges it faces.

The U.S. energy industry is undergoing a dramatic transformation as advanced technologies revolutionize the traditional methods of energy extraction and refinement. In addition, the renewable and alternative energy field presents a whole new set of opportunities for the industry that did not exist a decade ago. We recognize this transformation as critically important for our economy as a whole, and that a successful transformation requires a highly-skilled workforce. Therefore, we are working with the energy industry to understand their business processes, market dynamics, and skilled workforce needs.

Leaders in the energy industry, along with other high growth sectors of the economy, express the need for more highly trained and highly skilled workers in order to grow and be competitive in the years ahead. Most of the new jobs created today require at least some post-secondary training, whether it be a vocational degree or certificate, apprenticeship training, or a four-year degree from a college or university. However, the skilled workers that companies need are becoming increasingly difficult to find. This is where the Department of Labor has an important role to play.

High-wage employment opportunities with established career pathways are awaiting American workers in the energy industry, but first, some key workforce challenges must be overcome. Now, and over the next few years, the public workforce investment system, private industry, the education system, and the entire energy community must work together to address the following challenges: the aging of the energy workforce and the lack of highly-trained workers in the pipeline to replace them; outdated misconceptions about careers in the energy sector; the lack of energy training and education programs due to elimination of programs during the recession of the early 1990s; the demand for workers with higher levels of science, technology, engineering, and mathematics skills; and the need for industry-recognized credentials and better career pathways for workers in the energy industry.

The Role of the Workforce Investment System Currently, the Federal government invests over ten billion dollars annually in job training and employment assistance programs. The Employment and Training Administration (ETA) administers many of these programs, through the public workforce investment system, with a goal of preparing workers for jobs of the 21st century. The workforce system is an important resource that the energy industry can draw upon to secure a skilled workforce.

ETA has strived to build a "demand-driven" workforce system to provide America's economic engine—businesses—with the highest quality workers possible, and to link the two together for their mutual benefit. This relationship allows businesses to be more competitive in the global economy and workers to live more productive and prosperous lives. Key to the success of a demand-driven system is the workforce investment system's ability to respond to the needs of the labor market by partnering and working collaboratively with businesses, educators and trainers, and community leaders in a strategic effort to prepare workers for opportunities in high growth sectors of the economy. In recent years we have undertaken a series of initiatives to better do this, starting with the High Growth Job Training Initiative.

THE PRESIDENT'S HIGH GROWTH JOB TRAINING INITIATIVE

ETA began working to address the workforce challenges of the energy industry through the President's High Growth Job Training Initiative. Launched in 2002, this initiative is the cornerstone of the Department's efforts to create a workforce investment system that is demand-driven and balances the needs of America's workers with the demands of employers. Under the High Growth Job Training Initiative, ETA has partnered with 14 high growth industries and economic sectors, including energy, to evaluate their skill needs and ensure that workers are being trained with the skills these businesses require.

Through the High Growth Job Training Initiative, ETA has invested $288,517,000 in 156 partnerships among employers, education programs, and the workforce investment system. Each project targets the skill and talent needs of high growth, high demand industries in our nation's economy and provides the resources necessary to develop the capacity to train workers in the skills demanded by the 21st century economy. By training workers with the skills employers want, more workers will obtain quality jobs that pay higher wages, while enabling employers to address their skill shortages and better compete in today's changing economy.

To better understand the workforce issues of the energy industry, in 2004 and 2005, ETA conducted seven forums for executives from all segments of the oil and gas industry, electric and natural gas utilities, nuclear energy, and mining. These forums provided us and the workforce investment system with the opportunity to gain further understanding of the critical workforce needs of the industry and develop workforce solutions.

Our discussions with the energy industry in these forums identified several key workforce development concerns. First, a large percentage of current workers in the energy industry are nearing retirement. The average age of workers in the energy industry is now over 50, and the industry estimates that up to half its current workforce—more than 500,000 workers—will retire within 5 to 10 years. As experienced workers retire, they are difficult to replace because too few entry-level workers are equipped with the advanced skills required by today's technologically-sophisticated companies. Creative solutions are necessary to help experienced workers who will be retiring transfer their knowledge and skills to their replacements and to help new workers gain necessary skills as quickly as possible.

The situation is compounded by the problem that too few potential workers are interested in careers in the energy industry. Stereotyping of energy careers as low-skilled causes qualified workers, especially youth, to be unaware of the many highly skilled, well-paying career opportunities the industry has to offer.

An additional set of challenges arises because many training programs were reduced or eliminated during the downturn the industry experienced in the late 1980s and early 1990s. Programs have not expanded at the same rate that the industry's need has rebounded. Also, we know that employers in all sectors of the industry need workers who are more proficient than their predecessors in math, science, and especially, technology skills.

Finally, it was noted at the forums that too few industry-defined, portable credentials have been developed in the energy industry. Additionally, some energy occupations lack clearly recognizable career ladders necessary for instilling a new perception that working in the industry is an attractive and viable long-term career choice.

Working from this foundation of information about the workforce challenges faced by the energy industry, investments were made under the High Growth Job Training Initiative to implement solutions to the identified challenges. Of 156 current investments under the initiative, 11 grants totaling $27,093,668 have been awarded to help meet the workforce needs of the energy industry. One example is our investment with the State of Alaska's Department of Labor and Workforce Development. In order to meet the growing workforce demand in the energy sector, the State of Alaska, in partnership with education and industry partners, is directing training resources towards energy-related occupations while at the same time integrating vocational and technical education with skills training. A key component of this grant is also apprenticeship training—a training tool that has proven to improve job skill levels and workforce readiness across a number of industry sectors, including energy. To build upon the current investments, ETA anticipates announcing a Solicitation for Grant Applications targeting the energy industry under the High Growth Job Training Initiative later this year.

COMMUNITY-BASED JOB TRAINING GRANTS

Our work under the High Growth Job Training Initiative revealed a critical shortcoming in the workforce development capacity of many regions: many communities are not positioned to meet the training demands of our high growth industries because of limited training capacity and outdated curricula and training delivery systems. To address this need for expanded affordable, flexible education and training capacity in local communities across the country, President Bush established the Community-Based Job Training Grants program. The initiative provides grants to help community and technical colleges train workers for jobs in high growth sectors though the use of community and technical colleges.

Due to their close connection to local labor markets, community colleges are well positioned to understand the intricacies of local economies and better prepare workers for occupations in these localized industries. To date, the Department has provided $250,000,000 to 142 community colleges, One-Stop Career Centers and other entities under this initiative. A third round of Community-Based Job Training Grants totaling $125,000,000 is currently under review by the Department and award announcements are expected soon.

Of the current investments, grants totaling $20,405,604 have been awarded that focus on the energy sector. One of those investments is a $1,998,885 grant to Montana State University at Billings to develop an industry-driven model for just-in-time training programs in the energy industry, including mining, oil and gas exploration and production, power generation, biofuels, bioproduct development, renewable resources and energy-related construction. The grant expects to train over 1,000 individuals for jobs in energy and establish an Energy Workforce Training Center that will focus on jobs in the energy industry and will support training programs and degrees that serve the developing biofuels sector.

WORKFORCE INNOVATION IN REGIONAL ECONOMIC DEVELOPMENT

Building on the principles of the High Growth Job Training Initiative and Community-Based Job Training Grants is the Workforce Innovation in Regional Economic Development Initiative, or WIRED. The WIRED Initiative is also answering the call for competitiveness by fostering innovation through regional workforce and economic development. Though global competition is often seen as a national challenge, it is actually at the regional level where solutions must be developed and the challenges met. It is in regional economies where companies, workers, researchers, educators, entrepreneurs and government come together to create a competitive advantage and where new ideas and new knowledge are transformed into advanced, high-quality products or services.

WIRED focuses on labor market areas that are comprised of multiple jurisdictions within a state or across state borders. It seeks to help regions transform their workforce investment, economic development, and education systems to support overall regional economic growth by fostering collaborative partnerships among universities, businesses, government, workforce and economic development organizations, and other key regional partners. Many of the regions selected have been affected by global trade or Base Realignment and Closures (BRAC) activities, are dependent on a single industry, or are recovering from natural disasters. Under the WIRED Initiative, ETA has invested $325 million and is providing expert assistance to 39 regions across the nation to implement strategies that will create high-skill and high-wage opportunities for American workers.

To date, 13 of the 39 WIRED Regions are focusing on the energy industry, including the Central New Mexico region. The regional initiative is led by New Mexico's Technology Triangle, an industry-driven non-profit regional development alliance affiliated with New Mexico Tech University. The alliance supports the growth of entrepreneurship, talent and innovation in the state's green manufacturing industries, including renewable energy, green building, aerospace and aviation, microelectronics, and optics. In cooperation with a broad array of stakeholders within and beyond the eight-county region, the alliance seeks to coordinate an inter-regional effort to stimulate entrepreneurship, advance the development of the technical workforce, and create a public policy environment that supports and rewards innovation.

An important element of the WIRED Initiative is the partnerships that ETA has developed with other Federal agencies. ETA has worked with 10 other Federal agencies, including the Department of Energy (DOE), to provide funding, technical assistance, and other support to the WIRED regions. Beginning in 2006, ETA began working with the national laboratories of DOE, including Oakridge National Laboratory and the National Renewable Energy Laboratory (NREL) to increase WIRED region access to Federally-funded technologies at Federal laboratories. Site visits at both locations led to increased discussion on how DOE and DOL can work together to share resources, experience, technology, information and infrastructure in solving our workforce challenges in the energy industry. Our partnership with NREL is particularly noteworthy because it is the only national laboratory dedicated to renewable energy and efficiency research and development. The assets and resources at NREL were shared with WIRED regions during a two-day institute, April 18 and 19, 2007, at which WIRED regional leaders were introduced to methods to increase industrial competitiveness, stimulate wealth creation and employment opportunities, foster public-private collaboration in technology development, and increase innovation, all of which are essential elements in today's "knowledge economy."

ADDITIONAL ENERGY INITIATIVES

ETA has also undertaken a number of other initiatives to more fully understand the workforce development challenges of the energy industry and to ensure that the industry has highly skilled workers, including holding an Energy Skilled Trade Summit, utilizing apprenticeship as an important pipeline of workers into the industry, and launching a study on the workforce needs of the industry.

Energy Skilled Trade Summit

To address the workforce challenges faced by the Energy Skilled Trades sector, ETA, in partnership with the energy industry and the construction firms and labor management organizations that support it, embarked on another initiative to improve the pipeline of craftsmen and utility workers, with a focus on the Southeastern United States. To kick off the initiative, ETA convened an Energy Skilled Trades Summit in August 2007 in Biloxi, Mississippi, as part of the Southern Governors' Association meeting, hosted by Governor Haley Barbour. Additional key sponsors were the Nuclear Energy Institute, Edison Electric Institute, the American Petroleum Institute, and the Center for Energy Workforce Development (CEWD).

Among the over 300 attendees were four Governors and 20 CEOs of major energy and construction firms. Summit participants discussed strategies to align Federal, state, and local resources to increase the supply of workers for high growth, high demand careers in the energy and construction industries, and began to develop state action plans for improving synergy between industry and the education, workforce, and economic development systems. ETA and industry leaders have pledged their continued support for this initiative.

Apprenticeship Programs

ETA administers the National Apprenticeship Act, which establishes the framework for registered apprenticeship programs. The apprenticeship model continues to use the time-tested method of learning on-the-job in combination with related technical and theoretical instruction in the classroom to train workers in skilled occupations. Apprenticeship is an industry driven system that develops employee skills, competencies, and knowledge in order to meet the workforce development needs of business. Currently, there are over 900 active apprenticeship programs in energy industries, involving 5,900 apprentices in occupations such as power plant mechanic, boilermaker, line erector, and operating engineer. These numbers will continue to grow. As the energy industry builds new facilities and adopts new processes due to technological advances, the apprenticeship system works closely with program sponsors to adapt apprenticeship programs to keep pace with these changes.

Study of Energy and Mining Workforce Supply

The Energy Policy Act of 2005 directed DOE to enter into an agreement with the National Academy of Sciences to conduct a study on the availability of skilled workers in the energy and mining industries. Given our interest and expertise in workforce issues, ETA approached DOE and proposed to administer this study on their behalf. ETA is prepared to commit $750,000 to the study, and is executing a Memoranda of Understanding with DOE to carry out this study. The Department of Interior is also interested in this issue and will contribute funding to the study. ETA will soon execute a procurement with the National Academy of Sciences to conduct the study, which we expect to be completed by next fall. This study will provide significant information about the availability of workers to meet energy and mining industry demands. In turn, this will help us learn about strategies on how to best meet those demands, thus contributing to securing the Nation's energy future.

CONCLUSION

In conclusion, Mr. Chairman, energy remains a critical driver of America's economic growth and competitiveness in the global economy of the 21st century. High-wage employment opportunities with established career pathways are awaiting American workers in the energy industry. The programs and initiatives I have described will not only help address the structural changes the energy industry is facing, but they will provide a skilled workforce that can take advantage of the employment opportunities that exist in the industry. At this time I would be pleased to answer any questions that you or other Committee Members may have.

The CHAIRMAN. Thank you very much.

Ms. Hoffman, go ahead.

STATEMENT OF PATRICIA A. HOFFMAN, DEPUTY DIRECTOR, DEPARTMENT OF ENERGY

Ms. HOFFMAN. Mr. Chairman and members of the committee, thank you for this opportunity to testify on behalf of the Department of Energy on the nation's domestic energy sector workforce.

Our nation's technical workforce is the backbone of our economy. Given looming retirements in the energy workforce, success in ensuring America's future energy security will depend on our ability to recruit, educate, and train highly skilled workers. Energy security is undeniably linked to our national interests.

In 2006, the Department of Energy released a report to Congress on workforce trends in the electric utility industry, pursuant to Section 1101 of the Energy Policy Act. Although the report did not forecast an immediate threat to the reliability of the electric sys-

tem, it raises awareness of the need to plan for, and proactively address this workforce transition.

One example of a successful public-private partnership in this area is the Department's designation of Bismarck State College in North Dakota as the National Power Plant Operations Technology and Educational Center.

The Administration, through efforts such as the Advanced Energy Initiative, supports the enhanced use of renewable electricity generation. It is clear that continued innovation and a strong workforce is an important part of unlocking and sustaining our energy future with renewable technologies. DOE also estimates there may be additional workforce needs in the building sector, ranging from trade skills to building professionals. DOE is working with a consortium of universities to develop multi-level, multidisciplinary building science curricula, to support the long-range needs of the home building industry.

The expansion of nuclear power in the United States offers our nation the opportunity to foster continued economic growth. DOE's Nuclear Energy Research Initiative, which focuses on developing nuclear science and technology, recently announced the selection of 11 U.S. University-led grant recipient teams, to receive up to $30.7 million for cooperative research projects.

The Department also supports the White House Initiative on Historically Black Colleges and Universities (HBCU's) in developing the energy sector. This is administered within the U.S. Department of Education. In the last three Fiscal Years, the Department's National Nuclear Security Administration (NNSA) has awarded 41 grants to 25 HBCUs, totaling over $47 million. These grants cover research related to NNSA's nuclear security and nonproliferation mission requirements.

DOE's Office of Economic Impact and Diversity also facilitates numerous mentor-protégé relationships. This past summer, for example, the Oak Ridge National Laboratory and Morehouse College signed the first of the such agreements between an HBCU and a DOE Office of Science Laboratory. This new joint initiative will assist students in the college's science programs, as well as promote research collaborations at both institutions.

To meet future workforce requirements, the Department has several recommendations for the committee.

First, foster math and science education. The DOE's Office of Science has been a long-dominant Federal sponsor of basic research in the physical science. These research programs are supported by a dedicated effort designed to recruit, train and retain the next generation of Americans who are interested in science, technology, engineering and mathematics.

One example of this is DOE's annual "Day of Science" at Oak Ridge National Laboratory in Tennessee, which this year was attended by more 1,000 students from 125 universities.

Second, support strategic research in engineering. University curricula should strike an effective balance between addressing the short-term needs of industry and promoting the strategic research necessary to maintain America's long-term competitiveness. Without strong support for strategic research in engineering and with-

out qualified replacements for retiring faculty, the strength of our nation's university-based engineering programs will wane.

To help address this trend, the Department's funding for the Power Systems Engineering Research Center—a multi-university, multidisciplinary National Science Foundation-sponsored center—develops broadly trained power engineers, as well as future power engineering faculty candidates.

Third, develop cross-cutting understanding. An analysis of the interdependencies of the workforce across the entire energy flow is required to ensure the energy reliability will not be impacted by a national shortage of skilled personnel. The Department of Energy is partnering with the Department of Labor (DOL) to arrive at a better understanding of the energy sector workforce issues. As Assistant Secretary DeRocco mentioned, the Department of Energy is working with DOL to fulfill the requirements of Section 385 and 1830 of EPACT. As you know, these sections require DOE to enter into an arrangement with the National Academy of Sciences to conduct a study on the availability of skilled workers in the energy sector.

This concludes my statement, Mr. Chairman, and I look forward to answering any questions that you and your colleagues may have.

[The prepared statement of Ms. Hoffman follows:]

STATEMENT OF PATRICIA A. HOFFMAN, DEPUTY DIRECTOR, DEPARTMENT OF ENERGY

Mr. Chairman and Members of the Committee, thank you for this opportunity to testify on behalf of the Department of Energy (DOE) on the nation's domestic energy sector workforce.

Our nation's technical workforce is the backbone of our economy. These individuals have accumulated a wealth of experience and knowledge that cannot be duplicated overnight. If America is to remain the world's leader in science and technology and continue to lead the world in energy innovation, the energy industry needs to invest in a vibrant workforce.

Given looming retirements in the energy workforce, success in ensuring America's future energy security will depend on our ability to recruit, educate, and train highly skilled workers to meet the demands of our rapidly evolving, technology-driven energy industries. As traditional sources of energy become more stretched by the growing demand for energy domestically and globally, our nation's energy sector will undergo significant changes. Energy security is undeniably linked to our national interest. The move to diversify our energy supply from the conventional sources of the past requires equipping our workforce with the skills, technology, and creativity required to achieve a sustainable energy future.

ELECTRIC SECTOR

In 2006, DOE released a report to Congress on "Workforce Trends in the Electric Utility Industry," pursuant to section 1101 of the Energy Policy Act of 2005 (EPACT). The report examined workforce trends associated with the electricity delivery industry, which is the primary focus of my office, OE. For electric utilities, whose service quality and reliability depend on maintaining an adequate, knowledgeable workforce, managing the upcoming retirement transition is a particular challenge.

Although the report did not forecast an immediate threat to the reliability of the electric system, it raises awareness of the need to plan for and proactively address this workforce transition. For the purposes of this analysis, trends associated with electrical lineworkers and electric power engineers were considered representative of the broader electric utility workforce. Electrical lineworkers' responsibilities include erecting poles and light or heavy-duty transmission towers and installing or repairing cables or wires used to carry electricity from the power plant to the customer; they represent the physical labor required to operate and maintain the electric grid. Electric power engineers traditionally focus on systems and devices for the conversion, delivery, and use of electrical energy. These applications enable tech-

nology enhancements that significantly improve the capability, performance, and reliability of the entire electricity system.

ELECTRIC LINEWORKERS

Since 2000, the electric utility industry's employment level for lineworkers, which experienced declines from the early 1990s into the early 2000s that coincided with restructuring of the industry, has been steadily increasing. This hiring trend is driven by utilities' anticipation of increased demand, and is a response to the long periods of little or no capital investment. Utilities, concerned at the prospect of meeting rising demand for electricity using the existing transmission lines, have embarked upon a hiring program to provide the employees necessary to maintain, upgrade, and expand the electric utility system. The August 2003 U.S.-Canada blackout also focused attention on the fragile state of the grid, which put pressure on utilities to ensure that they were meeting reliability standards.

Growth in the industry is outpacing the number of available and qualified personnel. In 2005, there were approximately 31 lineworker-training programs across the country, with a total of 1,360 active students in various stages of lineworker training. Should the present trend continue, the number of pre-apprenticeship lineworker training institutions across the country could increase to 45 institutions by the year 2015. Yet, even with the increased interest of students in entering these training programs, the numbers may still not be enough to compensate for the expected retirements. Across the organizations contacted for the section 1101 report, retirement eligibility and the percentage of the workforce expected to retire within the next five to ten years varies from about 11 percent to as high as 50 percent. One utility indicated that the high level of retirements that began a few years ago is expected to persist for the foreseeable future due to this demographic profile, which includes a very high percentage of the lineworker and engineering workforce.

The electric industry is being proactive in addressing the lineworker shortage by building awareness, encouraging training initiatives, and increasing interest in the lineworker profession at an early age. It is important to note, however, that the magnitude of the impact on individual utilities varies significantly. Even with the addition of new lineworkers to the labor pool, the loss of historical knowledge (and perhaps productivity due to the more inexperienced workforce) might by itself have a detrimental effect on the reliability and security of the grid.

Adequate training is the key to sustaining a qualified pool of lineworkers. Preparing a highly skilled electric utility lineworker can require 10 to 12 years, including classroom instruction and on-the-job experience. Potential lineworkers pass through various stages of career development, from "Introductory Training" to formal apprenticeship programs to on-the-job learning. Since the attrition rate is very high for new lineworkers, these courses help orient trainees to the mindset needed for lineworker careers before utilities make a large investment in the employee's career development. In many cases, however, utilities will bring trainees directly into their apprenticeship programs without the student having completed an introductory training program.

Strong public-private partnerships are necessary to promote the energy industry as a viable employment option, to develop strategies for encouraging retirement-eligible workers to remain employed in the industry, and to ensure adequate training and education opportunities. Developing and using technology to increase productivity and fostering knowledge transfer may also be beneficial.

One example of a successful public-private partnership, although geared toward operator training and not lineworkers, is the Department's designation of Bismarck State College in North Dakota as a National Power Plant Operations Technology and Educational Center. Bismarck State's programs in power plant, process plant, electric power, electrical transmission systems, and nuclear power technologies will educate and train many of our future energy sector workers. It also uses the latest technologies via the internet and training simulations to speed up the knowledge transfer process.

ELECTRIC POWER AND TRANSMISSION ENGINEERS

Jobs for new power engineering graduates began declining in the 1980s when utilities saw a decline in electric consumption, and the job market remained challenging with deregulation in the 1990s. However, by 2001 and 2002, power engineering graduates were able to find positions at generation companies, transmission companies, power traders, independent system operators, independent power producers, consulting companies, and large processing and manufacturing companies that have extensive electrical facilities.

As detailed in the section 1101 report, the projected demand for power engineers will grow to 11,113 by 2014, which represents an 8.1 percent increase. The average annual demand for electrical engineers in the electric utility industry is 749 per year for the 10 year period from 2004 to 2014. International competition and the use of engineering services performed in other countries may limit employment growth domestically; nevertheless, the projected strong demand for electrical devices such as giant electric power generators could provide employment opportunities in the U.S.

Over the past decades, there has been a decline in the United States in the number of students considering power engineering careers. In contrast, in many countries outside of the United States, the power engineering profession enjoys more prestige and thus, experiences higher enrollment levels. There are indications that the power engineering education system in the United States is actually weakening, and the rate of weakening will likely escalate as faculty retirements occur without replacement. Without strong support for strategic research and without qualified replacements for retiring faculty, the strength of the university-based power engineering education programs will continue to decline. This is in part because some schools do not rehire power faculty and instead use the faculty slots to hire individuals with other technical knowledge.

DOE supports Gonzaga University in Spokane, Washington in developing an online certificate program in transmission and distribution engineering aimed at practicing utility engineers who seek to broaden and upgrade their skills. In addition to basic electric design, construction, operation, and maintenance courses, this program also plans to offer courses in related disciplines that would examine the environmental and legal aspects of electric line design, which have become inherent components of modernizing the grid. The availability of this course online minimizes the disruption to the engineer's work schedule and reduces the employer's cost for the training.

RENEWABLE ENERGY SECTOR

The Administration, through efforts such as the Advanced Energy Initiative, supports new, bold steps toward the goal of a reliable, affordable, and clean energy future for all Americans. In the energy sector, the enhanced use of renewable electricity generation—from such sources as solar photovoltaics, high-efficiency wind power, and biomass—would help reduce emissions of air pollutants and greenhouse gases. It is clear that continued innovation is an important part of unlocking our energy future.

The Department has conducted surveys of key market participants to better understand the time required for training qualified photovoltaic (PV) installers. These surveys 5 indicate that the time to train a qualified PV installer ranges from 6 weeks to 3 months if the trainee already has basic training in a key "enabling" trade, for example, as an electrician or roofer.

DOE also estimates there may be additional workforce needs in the buildings sector, including trained trades and trades management (electrical, plumbing, HVAC techs, etc.); mid-level construction managers and building operators/energy managers; skilled professionals (lighting designers, building commissioners, energy auditors, construction specifiers/purchasing agents, etc); and building professionals (architects, engineers, designers, etc.). DOE is working with a consortium of universities to develop multilevel, multi-disciplinary building science curricula to support the long range needs of the home building industry. The Department is also working with professional organizations like AIA, ASHRAE, IESNA, and IALD to promote the integration of efficiency technologies and practices into their professions as well as to draw upon their knowledge as we implement our programs.

NUCLEAR SECTOR

The expansion of nuclear power in the United States offers our nation the opportunity to foster continued economic growth, to raise living standards, and to be responsible stewards of the environment by reducing greenhouse gas emissions. DOE's Nuclear Energy Research Initiative, which focuses on developing nuclear science and technology, recently announced the selection of 11 U.S. university-led grant recipient teams to receive up to $30.7 million for cooperative research projects.

WHITE HOUSE INITIATIVE ON HISTORICALLY BLACK COLLEGES AND UNIVERSITIES

The Department also supports the White House Initiative on Historically Black Colleges and Universities (HBCUs) in developing the energy sector, which is administered through the office of the Secretary within the U.S. Department of Education. In the last three fiscal years, the Department's National Nuclear Security Adminis-

tration (NNSA) has awarded 41 grants to 25 HBCUs totaling over $47 million. The grants cover research related to the NNSA's nuclear security and nonproliferation mission requirements, curriculum development in science and technology programs, and infrastructure improvements.

DOE's Office of Economic Impact and Diversity also facilitates numerous mentor-protégé relationships. This past summer, for example, the Oak Ridge National Laboratory and Morehouse College signed the first such agreement between an HBCU and a DOE Office of Science laboratory. The new joint initiative will assist students in the college's science programs and promote research collaboration at both institutions. Many students from Historically Black Colleges and Universities have participated in the Department's internship programs. Interns from summer 2007 in our offices in Washington, DC and Germantown, Maryland, worked on projects in nuclear energy, computer technology, radioactive waste, energy efficiency, scientific research, and environmental management. An additional 40 students were assigned to DOE's national laboratories and field facilities. Finally, the Dr. Samuel P. Massie Chairs of Excellence Program, funded by DOE, is named after an African-American chemist of national reputation who was a leader in championing the cause of minority education in the United States. The program now comprises nine HBCUs that graduate more than 30 percent of the minority engineers in the United States.

MEETING WORKFORCE DEMANDS

The following are ways in which the federal government can address future energy workforce demands in the United States:

Foster Math and Science Education

DOE's Office of Science has long been the dominant federal sponsor of basic research in the physical sciences, including physics, chemistry, and related fields. The Office of Science also supports computer sciences, mathematics, environmental sciences, materials research, nanotechnology, and engineering. These research programs are supported by a dedicated effort designed to recruit, train, and retain the next generation of Americans who are interested in science, technology, engineering and mathematics (STEM) careers. The Office of Science, through its Office of Workforce Development for Teachers and Scientists, currently supports more than 600 undergraduate internship experiences at DOE laboratories and 200 K–12 educators who work with master educators and mentor scientists to hone their classroom skills. The Office of Science, through its research grants, also supports the training of thousands of graduate students and post-doctoral researchers, and has several dedicated graduate fellowship programs in the physical, computer, and life sciences. The Office of Science is in the process of working with DOE offices—including OE—that could benefit from focused placements of internships and fellowships in dedicated research assignments of importance to the U.S. electric utility industry.

In addition, the Office of Science promotes science literacy and interest in the STEM careers through the National Science Bowl, which annually attracts 20,000 middle school and high school students to competitions at 100 regional events located throughout the U.S., and other efforts. One example is DOE's annual "Day of Science" at the Oak Ridge National Laboratory in Tennessee, which this year was attended by more than 1,000 students from 125 universities, including many Historically Black Colleges and Universities. Students from across the country participate in scientific presentations, innovative technology demonstrations, and one-on-one interactions with laboratory researchers. Faculty from universities also participate in this annual event and attend workshops designed to help them understand how to compete for DOE research grants and participate in DOE's research enterprise.

Support Strategic Research in Engineering

As noted earlier, university-based research and education is an engine for innovation, exploration, and ingenuity. Curricula need to strike an effective balance between addressing the short-term needs of industry and promoting the strategic research necessary to maintain America's long-term competitiveness. Without strong support for strategic research in engineering and without qualified replacements for retiring faculty, the strength of our Nation's university-based engineering programs will wane, and along with them, the foundation for innovation in the energy sector to meet our future challenges. We need to ensure adequate funding for academic programs in energy-related disciplines to attract the most talented students to these programs.

For instance, the Department's funding of the Power Systems Engineering Research Center (PSERC), a multi-university, multidisciplinary National Science

Foundation-sponsored center, develops broadly trained power engineers as well as future power engineering faculty candidates.

Promote Interest in Energy-Related Careers

There are significant opportunities for creativity and innovation in the energy sector to meet the challenges of the 21st century. It is important to highlight that supporting energy infrastructure is a national strategic priority. Federal agencies could work with the private sector to communicate what the energy industry is about, to emphasize the high-tech nature of future challenges, to identify the direction the industry is moving, and to build awareness for the careers of tomorrow.

Capture Existing Workforce Knowledge

Even as we grow our workforce, the loss of historical knowledge as the so-called baby boomer generation retires, could be detrimental to productivity. For instance, a shortfall in experienced lineworkers would create longer restoration times after a disruption. Training, workforce retention, and phased retirements could help mitigate any consequences.

Develop Cross-cutting Understanding

An analysis of the interdependencies of the workforce across the entire energy flow—from coal miners and well riggers to electrical lineworkers and engineers—is required to ensure energy reliability will not be impacted by a national shortage of skilled personnel.

The Department of Energy is partnering with the Department of Labor (DOL) to arrive at a better understanding of energy sector workforce issues. As Assistant Secretary DeRocco mentioned, the Department of Energy is working with DOL to fulfill the requirements of Sections 385 and 1830 of EPACT. As you know, those sections required DOE to enter into an arrangement with the National Academy of Sciences to conduct a study on the availability of skilled workers in the energy sector. Assistant Secretary DeRocco's testimony further describes this effort, and DOE is looking forward to working with DOL and the National Academies.

Think Globally

In the past, declines in the domestic science and engineering labor force could be compensated for by attracting the best and brightest scientists and engineers from around the world. However, with new cutting-edge research infrastructure being built overseas, and with strong employment prospects in several developing regions, there is perhaps less of an incentive for students to remain in the United States upon graduation. Statutory caps on high-skilled temporary work visas and employment-based immigration limit the number of students and professionals that are able to either enter or remain in the United States.

Conclusion

In order to maintain our economic preeminence in an increasingly competitive world, U.S. industry must invest in its human capital to ensure the next generation of skilled personnel, scientists, and engineers capable of maintaining American leadership in critical science and technology areas as we work to meet the energy and economic challenges of the 21st century.

This concludes my statement, Mr. Chairman. I look forward to answering any questions you and your colleagues may have.

The CHAIRMAN. Thank you very much.

Ms. Cornelius, go right ahead.

STATEMENT OF ANDRA CORNELIUS, VICE PRESIDENT, WORKFORCE FLORIDA, INC., TALLAHASSEE, FL

Ms. CORNELIUS. Chairman Bingaman, Senator Corker, other members of the committee, my name is Andra Cornelius, I am Vice President of Business Outreach for Workforce Florida. Thank you for the opportunity to provide testimony on behalf of Workforce Florida, the State's workforce investment board.

We have worked very hard in Florida over the last 18 months to better understand the energy industry's workforce needs in our State. We have identified it as a critical sector, because of the role this industry plays in keeping our economy strong, and in the event of storm activity, helping us to regain normalcy.

This industry, like others in our State, is facing workforce shortages. Since 2002, Florida has had one of the lowest unemployment rates, and strongest job growth rates among the Nation's largest States. Florida is forecast to be the third-largest State in the country in 2011, just behind California and Texas. We gain about eight to nine hundred new residents daily.

While every industry is collectively concerned about where to find skilled talent, with this much growth, our energy industry will need to develop new power sources. Additional workers will be needed to generate, transmit and distribute power. Our Governor has also set very bold guidelines to ensure our State stays as green as possible, so we're looking ahead to alternative sources of power generation, as well.

One of the steps we took toward developing solutions was to form the Florida Energy Workforce Consortium, comprised of all of our major energy partners, workforce representatives, educators and associations to identify workforce issues impacting the energy industry, including the large number of expected retirements. We also needed to better understand the existing training option in our State, and the output from our schools—the pipeline, if you will—and how companies are transferring knowledge from their existing workers to the new ones.

We also needed to identify what the specific occupations of critical concern were, and last, to begin developing solutions to meet the workforce needs now and in the future.

What are the lessons from Florida, thus far? First, build effective partnerships—engage industry, labor, education partners, and the workforce system to collectively craft solutions for all. Second, build a talent pipeline. Many companies are finding it difficult to recruit younger job candidates with the skills needed for success. We will need to replicate feeder programs, like the Gulf Power Academy in Pensacola, which uses company instructors and equipment, and conveys company values to young people while still in high school. This is very critical in Florida, where 6 out of 10 ninth-graders drop out, or do not go onto college.

The energy industry provides excellent jobs with great earning opportunities that can change young peoples' lives, and these jobs are never off-shored.

Our Consortium works closely with the National Center for Energy Workforce Development. This Center has a "Get Into Energy" website, among other tools, to foster career awareness.

Finally, in addition to partnerships and deploying pipeline development strategies, we are implementing policies that will allow us to meet new challenges related to increasing energy demand, both traditional and alternative.

Florida's experience leads us to believe that any national solutions for addressing this industry's workforce challenges should take into account three things.

First, make the energy industry workforce development effort, and economic development priority. Reliable power is the backbone for any growing economy.

Second, focus on talent pipeline development and career awareness, support programs like the Gulf Power Model that emphasize skills with documentable results.

Third, align investments for solutions through partnerships to reduce redundancy and leverage funding.

Chairman Bingaman, this concludes my remarks, I want to thank you again for this opportunity to testify before this committee.

[The prepared statement of Ms. Cornelius follows:]

PREPARED STATEMENT OF ANDRA CORNELIUS, VICE PRESIDENT, WORKFORCE FLORIDA, INC., TALLAHASSEE, FL

INTRODUCTION

Chairman Bingaman, Ranking Member Domenici, and other distinguished members of the Committee: My name is Andra Cornelius, CEcD, and I am Vice President of Business Outreach for Workforce Florida, Inc. I am honored to have this opportunity to appear before you today on behalf of Workforce Florida, the state's workforce investment board. As such Workforce Florida is charged with fulfilling responsibilities outlined in the federal Workforce Investment Act. Working with the Florida Agency for Workforce Innovation and 24 regional workforce boards throughout the state, Workforce Florida's mission is to develop our state's business climate through strategies that help Floridians enter, remain and advance in the workforce, becoming more highly skilled and successful, benefiting our enterprises and the entire state. Our success at strengthening Florida's economy also boosts our national economic outlook.

FLORIDA WORKFORCE SYSTEM BACKGROUND

We are very proud of the accomplishments of Florida's public workforce system, which has been recognized as a national model for its innovative solutions to meeting workforce needs. The system was restructured in 2000 to create Workforce Florida, which is a nonprofit, public-private partnership. What makes our system unique is that a majority of Workforce Florida's Board of Directors represents Florida businesses and this workforce investment board is empowered to set policy by directing the appropriated resources. This ensures Florida's workforce system remains demand-driven and flexible to meet needs in an ever-changing economy. The Florida Agency for Workforce Innovation is our state-level partner and it is charged with administrative oversight of the regional workforce boards, governing compliance and providing technical assistance. At the local level, where most of the service delivery occurs, the also business-led regional workforce boards direct programs and resources for businesses and job seekers that are tailored to meet each community's unique needs.

In my testimony today, I seek to address the intent of this hearing by providing a state workforce investment board's perspective on whether our Nation's energy industry will have the available workforce, both craft and professional, to meet growing needs and whether gaps exist that Congress should act to address. In doing so, I would like to speak to what Florida's workforce system has done over the past 18 months to better understand the energy industry's workforce needs in our state, our accomplishments to date, and the challenges and opportunities we believe are ahead in implementing lasting workforce solutions for this vital sector. Finally, I would like to offer a few suggestions for this committee to consider as you continue to develop strategies in this critical area. Simply stated, I would like to share with you the three P's we have learned are essential in order to meet existing and future workforce challenges facing Florida's—and our Nation's—energy sector. They are: partnership, pipeline and, your influential role, policy.

CREATING NEW PARTNERSHIPS

Developing lasting workforce solutions requires partnerships among industry, education, economic development and workforce. Across the Nation, our workforce systems are challenged to provide services within the reality of a global economy. Prosperity in the New Economy requires a highly skilled and productive workforce. Improving the skills of our Nation's workers to meet technological advances and support economic expansion has been identified as one of the most pressing needs facing our communities today. That need holds true too for the energy industry. Florida's energy industry is made up of a diverse mix of electric companies: investor-owned utilities, municipals and rural cooperatives. These companies employ about 26,350 people statewide, often in well-paying jobs that exceed the state and national annual average wages, but I'll discuss this more a bit later. Our state is fortunate

that our economic outlook has remained strong with low unemployment and, though slowing, continued job growth. With a labor force of more than 9.2 million, Florida's 4 percent unemployment rate in September 2007 was below the national rate of 4.7 percent. Our state's unemployment rate has been below the national average since mid-2002 and based on nationwide data the September rate was the lowest of the 10 most populous states. Simultaneously, Florida ranked third in job growth among the most populous states, behind Texas and California, with an employment growth rate of 1.3 percent in September, representing 105,700 new jobs over the same period a year ago. The statewide job growth rate was slightly higher than the national job growth rate of 1.2 percent for September. Still, as our Governor Charlie Crist has proclaimed: We in Florida are not just focused on creating jobs, but good jobs that lead to a better quality of life for Floridians and keep our economy strong.

Our state workforce investment board has chosen to direct Florida's mostly federal funding for workforce development to programs and services that lead to high-skill, high-wage employment and advancement opportunities in high-value industries. These are targeted industries that drive our regional and state economies, thus aligning with our state's economic development plan. It's only recently that the energy industry has become one of those workforce development targets, contributing to Workforce Florida's leadership role last year in the formation of the Florida Energy Workforce Consortium (FEWC), which is one of the key collaborative efforts I wish to discuss today. I must say too that in creating this consortium we had some extraordinary motivation.

UNDERSTANDING ENERGY WORKFORCE NEEDS

You likely remember the four uninvited visitors to our state in 2004: Hurricanes Charley, Frances, Ivan and Jeanne. Hurricane Dennis followed them in 2005. In the wake of the destruction of each of those storms, our utilities were essential in the rapid recovery of our businesses and citizenry. Line technicians were literally our heroes. They restored our power enabling us to get our businesses and our lives back in order. Prior to these storms, the energy industry was never one of Florida's economic development targets—in other words, it was not an industry we actively recruited, expanded or retained. However, after the series of storms, we realized just how vital this industry is to our state's economic stability. We knew we needed to begin our outreach by hearing from our industry partners, so we asked colleagues at Gulf Power Company and Progress Energy to help us get started and to ensure we had all of the major players at the table.

Formed in April 2006, the consortium seeks to identify and develop solutions to meet the needs of the utility industry in Florida. The consortium is comprised of representatives from energy companies and associations, the workforce system, secondary and post-secondary educational institutions, labor organizations, and the national Center for Energy Workforce Development (CEWD). I'll discuss more about the national center's role and support later too. Interestingly, all of Florida's investor-owned utilities are at the table and have been from the beginning. This is noteworthy because these companies traditionally are seen as strong competitors who keep collaboration at a minimum, but their mutual need for skilled talent brought them to the table and is driving their participation in the consortium, which now has more than 50 members. The consortium's primary goals are to:

- Identify workforce issues impacting the energy industry in Florida, including the large number of expected retirements with few prepared workers to replace them.
- Better understand existing training options as well as to identify opportunities to transfer knowledge from the existing workforce to entry-level workers.
- Bolster labor market projections about future energy workforce needs—by occupation—with real-time utility company validation and to prioritize those occupations by critical need.
- Develop a three-pronged approach to energy industry talent development. First by growing our own skilled workforce deliberately focusing on youth and career awareness of occupations in the industry. Second by attracting suitable workers from previously untapped or under-tapped labor pools. Finally by re-training workers from other industries who can transition into in-demand energy sector occupations.

As the consortium got to work, energy companies brought to our attention that it's not just more line technicians who are needed to help keep the power flowing to businesses, residences, schools, hospitals, and elsewhere, but also power plant technicians, maintenance staff at plants, plant construction crews, and many others. Perhaps one of our industry partners best summed up the driving force that has

led to this unprecedented effort in Florida to seek solutions to energy sector workforce needs when he said, "We can continue to compete for a talent puddle or work to create a talent pool."

Before we could begin to identify ways to create this pool, we needed to better understand the current and future energy and workforce demands. Growth, of course, is at the top of this list. By 2011, Florida is on target to become the third most populous state behind California and Texas. By 2020, our state's population is expected to top 23.5 million Floridians. We are by no means alone. Our Nation's population is projected to increase to more than 419 million by 2050, according to the U.S. Census Bureau. Today and closer to home, the Southern states account for 38 percent of the U.S. population—with growth in the region outpacing national growth. Almost everyone uses power or needs it, so demand will continue to soar as will the need for additional infrastructure to generate, transmit and distribute power. According to the Florida Public Service Commission, more than 73 percent of energy in our state is generated from fossil fuels and nearly 12 percent comes from nuclear energy. Renewables account for 2 to 3 percent, but under the policies being developed and implemented under the leadership of Governor Crist, who is also a member of the Workforce Florida Board of Directors, we expect this percentage to increase. Meanwhile to meet projected power demand, energy companies have indicated to the Florida Public Service Commission their interest in bringing online up to 18 new fossil fuel units by 2015 as well as two new nuclear units beginning in 2016.

Additional major issues affecting the industry's workforce in Florida, and other states, include the aging power delivery networks that will have to be replaced; the restructuring of companies due to deregulation in the 1990s that led many utilities to cost pressures and cost reductions, especially associated with hiring, training and retaining skilled craft workers; new technology; and the anticipated wave of retirements as more than half of the industry's workers nationwide, such as line technicians and power plant operators, are scheduled to retire in the next five to 10 years. These challenges along with the limited current pipeline for entry-level workers have led to a perfect storm. Unless we undertake long-term solutions to expand the energy sector workforce, we'll face exceptional challenges to keep our lights on.

A national Black & Veatch Electric Utility Industry Survey released about a year ago found that replacing the aging workforce was the No. 1 issue of concern cited by municipal power companies and the No. 3 issue identified by investor-owned companies. Other issues at the top of the list were infrastructure and reliability. The North American Electric Reliability Corporation (NERC) in its 2007 Survey of Reliability Issues found that "the aging workforce and lack of skilled workers" is ranked first among all business issues, with the highest likelihood and highest impact on reliability. In a Florida survey, 75 percent of the state's electric companies cited the accelerated pace of retirements as a chief concern. Failing to maintain the skills of today's workforce by replacing retiring workers with competent substitutes, by training and re-training workers to keep pace with technological changes, and by capturing and transferring knowledge more effectively could affect the quality of service to consumers in Florida—and across the Nation—and impact the sustainability of economic development going forward. A 2006 U.S. Department of Energy study also found that "the loss of institutional knowledge is a critical concern, especially for a profession heavily dependent on mentoring and on-the-job training." Several of Florida's investor-owned utilities have formal knowledge-transfer initiatives in place for this very reason. One Florida company has surveyed its employees asking them to characterize their knowledge. Full certainty means they know how to do their job and why they do it. Partial certainty means they know how, but not why and conditional certainty indicates they don't know how or why, but are willing to try. On average, only half of the utility's operations and maintenance employees report "full certainty" of the required skill sets for their position. How problematic would it be to continue production with skilled talent exiting their workforce with only half reporting they have full knowledge of the required skill sets?

HIGH-DEMAND JOB OPPORTUNITIES

With an understanding of how such critical issues affect the workforce in power operations and energy delivery now and in the future, the consortium turned to identifying the jobs in which skilled employees are most needed by our utilities, which not surprisingly mirror critical occupations of other utilities in the Southeast. What are they? In energy delivery, they are line technicians and substation technicians. In power operations, they are electricians, instruments and controls technicians, welders and power plant operators. This list of in-demand occupations also is nearly identical to a nationwide list compiled by the Center for Energy Workforce

Development. The center also is beginning to focus more attention on the national need for engineers to support this sector. In fact, a 2007 Center for Energy Workforce Development survey found that among participating companies about 46 percent of employees in engineering jobs could retire beginning in 2012. I mentioned the center earlier and its support of our efforts in Florida. Ann Randazzo, the center's director, has been an active participant in our meetings. The national center is a nonprofit consortium of electric, natural gas and nuclear utilities and their associations. It was formed about the same time as our Florida Energy Workforce Consortium and the center's research and advocacy on behalf of the workforce needs of this sector have been invaluable to us.

I can't underscore enough how critical the partnership among industry, education, economic development and workforce is in creating and sustaining a pipeline for skilled energy workers. The Florida success story would be incomplete without examining the actions taken by the industry to not just await a government solution, but to create programs and partnerships to begin to address their own needs. Florida energy companies such as Gulf Power, Florida Power & Light, Progress Energy, Ocala Electric Utility and Sumter Electric Cooperative (SECO) have initiated partnerships and created pipeline programs with secondary and post-secondary schools.

A challenge for the industry in recruiting students to participate in programs such as these is raising awareness about rewarding career opportunities in the energy sector. To recruit the desired workforce, companies will have to change their public image from one which is static to one which is more dynamic, offering challenging careers in an exciting industry. Creating awareness of jobs is essential and we can't rely on high school guidance counselors to do it for us. If we are to build a pipeline of skilled talent, we need to convince young workers that the industry is a desirable one to work for. They must understand the industry produces a commodity that is essential to society and to our quality of living. They also must be taught that those who work in the industry are environmentally responsible and that the jobs are stimulating and pay well. The Center for Energy Workforce Development has developed a website, GetIntoEnergy.com, which acquaints young people with jobs in the industry. The website provides career assessment, determining what job suits you; it also offers a career quiz, salary comparisons, and allows you to view videos of the actual work and people doing it. It outlines the skills required for key occupations as well as education requirements and where you can go to get that education. One of the early projects of the Florida Energy Workforce Consortium was to identify all school-based energy training options in our state and to make that information available on this site. Industry job listings for Florida and other partner states also are posted on the site.

FOCUSING ON SECONDARY EDUCATION PIPELINE PROGRAMS

When we do engage young people who are interested in energy careers the connection is a powerful one. In North Florida, Gulf Power began its first academy in Pensacola at West Florida High School of Advanced Technology in the summer of 2001. It did so to develop a feeder pool for critical jobs such as entry-level power generation and power delivery positions as well as degreed positions such as engineers. The popular program now has expanded to two other high schools, Laurel Hill School in Laurel Hill and Locklin Tech in Milton. Gulf Power employees hold formal interviews for those students seeking entry into the academies. The curriculum is focused on industrial electricity and the electrical utility industry. Instructors use the National Center for Construction Education and Research (NCCER) electrical curriculum. In the Gulf Power program, every 11th grader is paired with a Gulf Power mentor who is in a career of interest to the student. Seniors who meet school criteria are placed in the Advanced Career Experience (ACE) program where they report to Gulf Power on alternating days during school hours for completion of their curriculum requirements and work opportunities. Graduates of this high school program earn 15 hours of college credit and a nationally recognized NCCER industry credential. Many of the graduates are now employed by Gulf Power. Also critical to the success of any program is public accountability and the outcomes. Gulf Power uses the Edison Electric Institute pre-employment tests as a condition of hiring. In the most recent graduating class from the power academy program, the exam passage rate was 100 percent, compared to an average passage rate of 40 percent for general test-takers. The West Florida High School program has produced 62 graduates. Of those, 20 have been hired by the company into entry-level positions, 10 went to work for other utilities or related companies, 26 enrolled in college, two went into the military and four are in the Gulf Power pre-employment process.

For a more personal peek at the effectiveness of the Gulf Power Academy program at providing opportunities for a brighter future for students as well as utility companies, consider the experience of Ron, though I've changed his name to shield his privacy. Ron was initially disqualified from participating in the ACE program during his senior year because of excessive tardiness to school. Program leaders later learned his tardiness was attributable to an unstable home life. Ron had a turbulent relationship with his parents and feared for his personal safety because his father struggled with alcoholism. Ron had often been late to school because he was homeless for a period alternately living in his truck, spending the night with friends or sleeping in parks. Despite this hardship, he continued to come to school and after opening up about his difficulties, Ron appealed his ineligibility to participate in the ACE program. Following his appeal, Ron was accepted into the ACE program and successfully passed Gulf Power's preemployment tests earning praise from the utility company's employees for his eagerness to learn, respectfulness and engaging personality. When Ron graduated from high school he was offered a job as an apprentice line technician and he began working for Gulf Power shortly after turning 18. Just over a year after completing the Gulf Power Academy and graduating from West Florida High School, Ron closed on a three-bedroom, two-bath home and is well on his way in his career at Gulf Power. From homeless to homeowner, Ron through his experience exemplifies how relevant training and support from professionals in an industry with great earning opportunities can change your life.

In Miami Dade, Florida Power & Light has joined with Miami-Dade County Public Schools to create a two-year, dual-enrollment high school apprentice program to train future line specialists. The first class of nine graduates completed the program earlier this year. In Central Florida, Progress Energy and other utilities are working with CLM Workforce Connection, the local workforce investment board in this region, as well as the school districts in Citrus, Marion and Levy counties, in a recently opened power industry academy modeled after the Gulf Power program in North Florida. Workforce Florida awarded two grants totaling about $157,400 to support launching the new program that will train high school students and provide a pathway for careers as utility electricians, electrical engineers and electrical contractors. The Central Florida academy is taking aim at preparing students for jobs in anticipated, new power-producing plants in the region. Eighty students have signed up for the program, which also is modeled after Florida's CHOICE career academies. Part of what makes all of these programs such tremendous successes is that they emphasize industry certifications. Participants graduate not only with high school diplomas, but also with industry-awarded credentials and often college credits, at no additional charge to students or their parents. These certifications demonstrate the students are work-ready and prepared to step into good paying jobs or to continue their education in a postsecondary setting.

In fact, these career academies—and others like them in our state that prepare students for careers in industries such as aviation, manufacturing, information technology, construction and health sciences—use rigorous and relevant industry-endorsed curriculum. They also represent a major transformation in career and technical education in Florida in part thanks to a new state law, the Career and Professional Education Act, which will lead to similar high school academies in every Florida school district to train students for careers in energy and other sectors that help drive regional economies. In our state, the work to create the CHOICE model of career and technical education and the new law that codifies this blueprint was led by state Senator Don Gaetz, a businessman and former superintendent of the Okaloosa County School District. Florida's workforce system was at the table from the beginning helping to shape the CHOICE programs led by Mary Lou Reed, executive director of the Workforce Development Board of Okaloosa and Walton Counties. Workforce Florida has awarded more than $5.1 million in grants statewide since 2005 for initiatives to replicate and support CHOICE-model career academies. Why is this important? Again, each CHOICE program is created through partnership with education, workforce, economic development and industry and provides excellent choices for future career paths whether it's a head start on college with credits already in hand or skills that allow students to enter the workforce qualified for higher wage jobs. Such preparation is critical in Florida where six out of 10 ninth graders either drop out of high school or don't go on to college even if they finish high school. The energy sector, as we know, is among the industries that have an abundance of well-paying job and career advancement opportunities that do not require college degrees. In Florida last year, the average annual wage for electrical power line installers and repairers was $52,956; for power plant workers, $59,217; and for first-line supervisors of mechanics, installers and repairers, $64,480. The state annual average wage for all industries was about $38,500. The national annual average wage for all industries was $42,535.

EXPANDING THE 'POOL' THROUGH POST-SECONDARY INITIATIVES

Beyond our efforts in growing talent at the secondary level, Florida energy companies also are taking action to forge stronger partnerships with post-secondary institutions to train and re-train energy workers. For example, Florida Power & Light, our state's largest utility company serving 4.4 million customer accounts, has strong partnerships with Miami Dade College and Indian River Community College for post-secondary training programs, particularly for nuclear technicians. Among Florida's newest workforce initiatives are Employ Florida Banner Centers. These centers, mostly based at Florida community colleges, are charged with developing new, cutting-edge training with industry input that is portable and can be delivered throughout the state by other community colleges, universities, vocational technical centers, private training providers and others. These centers also provide training to entry-level and advanced workers and serve as a clearinghouse for companies and job seekers in their targeted industry. Workforce Florida has awarded $8.8 million in grants to support this e^3 (employment, education and economic development) initiative. Two of the 12 new Banner Centers are designated in energy and alternative energy, based in part on the workforce needs identified by the Florida Energy Workforce Consortium. The Employ Florida Banner Center for Energy got under way this past spring at Lake-Sumter Community College. It builds on the college's existing six-week pre-apprentice boot camp program that orients those interested in becoming line technicians with the demanding work. It also provides skills upgrade training for incumbent workers. In fact, before the consortium got under way (and later the new Banner Center for Energy), many of our utilities were recruiting line technicians from North Dakota, South Georgia, and Puerto Rico, while unaware of the home-state resource available right there at Lake-Sumter Community College. The lead instructor for Lake-Sumter's program is Bill Tyler—a 42-year veteran of the line-worker trade. Under the Banner Center for Energy initiative, Lake-Sumter Community College also has partnered with Indian River Community College to increase training opportunities and develop new curricula for power plant workers, expanding the work of Indian River's existing Power Plant Technology Institute. The Banner Center for Energy's advisory council is made up of key organizations and companies represented in the Florida Energy Workforce Consortium including the Florida Electric Cooperative Association, Florida Municipal Electric Association, Florida Power & Light, Gulf Power, Progress Energy, Jacksonville Electric Authority, Orlando Utilities Commission, Lakeland Electric, SECO and TECO Energy. In its first four months of offering training, the Banner Center trained 118 incumbent and entry-level workers in line specialist skills, directly helping at least 16 of the 18 or so people who were being introduced to the profession find employment in the industry.

In Florida, we're also beginning to examine more closely the need to fill critical professional positions such as in engineering that require post-secondary degrees. We have learned through the consortium that demand for engineers varies among utility companies. We also know that with the number of new plants on the drawing board the need for professional staff will grow. One area that we have identified through the consortium that needs attention is strengthening articulation agreements between our secondary career academies and post-secondary institutions (both community colleges and universities). Workforce Florida also has worked with the Florida Energy Commission on its recommendations to the Florida Legislature on strategies to secure the state's energy future. Not surprising, one of the commission's recommendations is that Florida establish an Electric Power Institute within the state university system to concentrate on both undergraduate and graduate training in fuels, power technology and management. The workforce system has traditionally focused on short-term training, but it's critical that we fortify the link with our higher education partners to ensure the highly skilled engineers and other professionals required by the industry are produced in Florida and, more importantly, stay in Florida. Our higher education partners also play a critical role in the mounting focus on research and development as our state's energy policies increasingly expand beyond today's power production technologies.

The new Banner Center for Alternative Energy based at the University of Central Florida and the Florida Solar Energy Center, for example, will help ensure our state has a workforce that is equipped to seize upon opportunities created through renewable energy sources. This mission is consistent with the greener direction our state is headed led by Governor Crist, who during his first year in office has set Florida on a bold path to diversify our energy resources and reduce greenhouse gas emissions.

LINKING ENERGY COMPANIES WITH QUALIFIED CANDIDATES

Another way in which our workforce system helps to expand the talent pool for this sector is by bridging the divide between employers and qualified job candidates. Key to our comprehensive strategies for meeting the energy sector's demand for skilled talent is linking Florida companies with job seekers both through the job-matching services offered through Florida's nearly 100 one-stop centers and through our powerful online tool the Employ Florida Marketplace on the Web at EmployFlorida.com. The Marketplace website receives 3.85 million hits and has about 48,800 unique visitors daily. On it you will find registered 2.9 million job seekers and 159,000 employers seeking to connect with one another. On any given day, the site has about 285,000 job listings, including those from Florida utilities, posted on it. There are also 406,000 resumes currently available there.

We also have professional workforce experts in our one-stop centers, who are dedicated to helping sometimes untapped or under-tapped groups such as veterans. In fact, veterans represent a strong talent pool for the energy sector. We are all familiar with the many benefits of hiring veterans such as their leadership skills, ability to perform under pressure and penchant for working as a team. They also receive some of the best training while in the military and, if they weren't when they joined, they are tech savvy when they leave. To illustrate just how important the workforce system's role is in bringing companies and job candidates together allow me to briefly share the story of Gabriel Johnson.

Mr. Johnson was a nuclear-power-trained Machinist Mate Chief Petty Officer (E-7) who, as a single parent, decided to get out of the Navy to raise his two young children. He registered at the Fort Pierce One Stop Career Center for assistance with finding a job and had expressed an interest in working for Florida Power & Light at its nuclear energy plant in South Florida on Hutchinson Island. He applied online through Florida Power & Light's Web site as well as expressed interest in nuclear plant jobs in other states. He was mulling an offer in Nebraska when Larry Sowers, the regional veterans' program coordinator in the Fort Pierce one stop, reached out to a Florida Power & Light human resources manager, who had previously indicated her company's keen interest in recruiting veterans for employment openings. That intervention led to a job interview for Mr. Johnson, who was offered a maintenance supervisor position with a $75,000 annual salary. This experience also demonstrates our system's commitment through our workforce partners, such as the Fort Pierce One Stop Career Center under the Workforce Development Board of the Treasure Coast, to retaining our best talent in Florida to meet the employment needs of our key industries.

WHAT'S AHEAD: BUILDING A NATIONAL POLICY BLUEPRINT

From creating new partnerships such as the Florida Energy Workforce Consortium to developing pipeline programs like the career academies and Banner Centers to leading through policy-setting as Workforce Florida has done in recognizing the energy sector as vital to our economic future and investing resources accordingly, we've indeed made significant progress in our state toward ensuring we have the reliable power resources needed to sustain our quality of life as well as our economic prosperity. Yet, we also recognize that more work remains ahead. Where do we go from here? How do we build lasting solutions for what will be long-term challenges in meeting the demanding workforce needs for the energy sector? How do we move this workforce from a puddle to a pool? We'll continue to build on the strategies that I outlined today and seek new ones through our collaborative efforts. The momentum of our early success at building new bridges through our Florida Energy Workforce Consortium has led us to plans for our first statewide summit on the energy workforce in February 2008. We'll use this opportunity to assess our progress, set short-term and long-term goals and initiate plans to get us there. Additionally, we plan to invite some new partners to join our efforts by expanding membership in the consortium to include contractors, their associations, and labor organizations that provide contract labor that is essential to efforts at maintaining and increasing our energy infrastructure through both construction and operations. In Florida's experience are lessons and strategies that can be replicated to address the national scale of workforce challenges presented by our country's increasing energy demand—both traditional and alternative. That experience leads us to believe that any national solutions to ensuring we have a reliable workforce to provide reliable power resources should take into account the following three things:

1) Make the energy industry workforce development effort an economic development priority. This is paramount because reliable power is essential to both

our quality of life and business operations and it is the backbone for any growing economy.

2) Focus on talent pipeline development and raising awareness about career opportunities in the energy sector. A key point worth remembering is that many of the in-demand jobs for this sector such as line workers, power plant mechanics and electricians are positions that are never, ever off-shored. Programs aimed at producing more entry-level talent should emphasize skills attainment with documentable results. That is, industry-recognized certifications awarded as a result of training as productive outcomes.

3) Align investments in solutions through partnerships to reduce redundancy. Ensure that government, industry and labor are all involved in developing this critical workforce. To accomplish this, encourage collaboration among companies, educational institutions, agencies, and nonprofit organizations, which are empowered to craft solutions with the urgency to drive results. Also maximize limited public funding with leveraged private sector dollars.

Finally, in doing these three things, remember the three P's that are essential to effecting lasting solutions: partnership, pipeline and policy.

I would like to thank Ann Randazzo, Mary Lou Reed, Jennifer Grove, of Gulf Power, and Adriane Glenn Grant, of Workforce Florida, for their assistance in preparing these remarks.

Chairman Bingaman, this concludes my testimony on behalf of Workforce Florida. I want to thank you, this entire Senate Committee on Energy and Natural Resources and your outstanding staff again for our state's participation in this hearing on this critical issue. I welcome any questions that you may have.

The CHAIRMAN. Thank you very much, let me ask a couple of questions and then defer to my colleagues here.

You know, one thing that occurs to me in hearing the witnesses so far is that we have efforts going on at the Federal level to assist with this type of training, or training of people for this group of industries, out of several departments—Department of Labor, Department of Energy, Department of Education, maybe others, that I can't think of right now. To what extent is that coordinated? To what extent, in making a decision as to what you will support, in the Department of Labor, to what extent do you, are you aware, and do you take into account what is being done by other departments?

Secretary DeRocco, why don't you answer that?

MS. DEROCCO. Certainly, Mr. Chairman. I will tell you that coordination among Federal agencies engaged in education and job training in any sector, but particularly in energy, in the past has not been well-coordinated, we have known little of what each other has focused on. Our WIRED initiative has offered us the opportunity to build a partnership among 12 Federal agencies, engaged in supporting the development of talent in sectors of the economy that are creating jobs and assuring economic prosperity.

In that engagement, we have found that there is a duplication of effort, and it is critically important for us to institutionalize some ways in which the investments across the Department of Labor, the Department of Education, in the case of energy, the Department of Energy, the National Science Foundation, interestingly, the Department of Defense—all of us are engaged in some level of investment, and encouragement of stem education, workforce development and technology skills development across multiple sectors in our economy.

The CHAIRMAN. So, do I take it from your answer that there is a group now that actually tries to do this coordinating, or is that just something that's planned, or what?

Ms. DEROCCO. No, there currently is a group of 12 Federal agencies engaged through this specific initiative, the WIRED initiative, that is working in 39 regional economies across the country. But, from an institutional basis, there is no current institutionalized engagement across the agencies for, for example, the energy sector, when it's not specific to a regional economy. We need to do that.

There is an example underway in the aerospace industry which, by law, Congress called for an interagency taskforce on the future of the aerospace workforce, which has engaged agencies that are developing the talent to support the aerospace industry in a very formal way. Now, in the energy arena, we are partnering in an informal way.

The CHAIRMAN. Ms. Hoffman, did you have a comment on any of that?

Ms. HOFFMAN. Mr. Chairman, I would agree that we need to have better coordination among the Federal agencies.

Within the Department of Energy, our activities focus on research and university-level educational programs to continue to sustain long-term funding for faculty development, as well as student development. We do have efforts with DHS and DoD that are definitely an opportunity for dual-use technologies. We have interagency agreements with the National Science Foundation to conduct workshops, and in fact there is a workshop on November 28 and 29 to look at workforce issues. There is also a potential to work with USDA through the Rural Electric Service.

So, I do believe that there is an opportunity that we could do better coordination.

The CHAIRMAN. Ms. Cornelius, let me ask you, I know we've talked a lot about how you need to stay in close touch with industries to identify the needs and all——

Ms. CORNELIUS. Yes.

The CHAIRMAN [continuing]. How does what you're doing there in Florida relate to union apprenticeship programs?

Ms. CORNELIUS. IBEW sits on the Consortia, J.B. Clark, State-level IBEW representative is a very important part of our Consortia.

Again, sir, we need to have everyone at the table, whether it be through traditional apprenticeship models, or through new, creative, innovative training models—we need to do all of it because of the need, the need is so great in our State.

We had a study done by our Florida legislature back in June 2002 that took a hard look at our State apprenticeship models, and regrettably, we found that there was much more that needed to be done to align the critical occupations in our State, particularly in construction, with our traditional apprenticeship models.

We're intending, at our very next Consortium meeting to have an overview, again, of the apprenticeship models to find out where we can develop better linkages, and in addition to what my colleagues here have said, we must—we need to align resources, we need to build upon traditional training sources, and look to new ones as well, to meet the need.

The CHAIRMAN. All right, Senator Corker, go right ahead.

Senator CORKER. Mr. Chairman, I just, I do want to reiterate the point you made about coordination. I think that we have a tend-

ency in government, everybody gets excited about a particular issue, every department has to do it, every Senator has to be involved on the committees that they're on, and I hope that we can work together to really focus these efforts.

What is happening at the college level right now? I remember, a long time ago, that much of what students focused on was sort of what was the cool thing to do at the time, is there much focus on the university level right now on causing people to have the background, if you will, moving into industry that is focused on energy?

Ms. DEROCCO. I would be glad to comment on that, Senator.

We certainly have found, particularly the State universities and land grant colleges, becoming much more deeply engaged, returning to their mission, so to speak, of economic development within their regional economies, and thus becoming much more engaged with us at the Department of Labor in assuring a connection to the employers within those regional economies, the growth sectors of the economy, an understanding of where jobs are being created, and tailoring curriculum, more specifically, to meet the requirements of the job market, post-graduation.

I know through our partnerships with the Department of Energy and the National Science Foundation, we are also engaged, certainly, in the energy sector in assuring the highest level graduate degreed engineers, scientists, mathematicians that are needed to guide that first part of the innovation life cycle in energy, are seeking an engagement by the industry to both define their jobs, their career opportunities, and to make better connections with the industry.

Senator CORKER. Yes, ma'am?

Ms. HOFFMAN. Senator, I just would like to provide a couple of comments. First, I think we need to continue to stimulate the high school level so they engage into education in the engineering field. We need to get our high school students into science and mathematics and get their abilities in science and mathematics to the level that's required for engineering colleges and universities.

Second, I do believe that there is still a momentum to the popular-type college programs. One thing that we should do is to start promoting engineering and emphasizing the high-tech nature of the industry, whether it's the electrical industry with smart grids, or whether it's the oil and gas industry with wired oil fields, and build momentum in gaining some students back in those fields.

Senator CORKER. Which areas of the energy sector do you think we have the most critical shortages right now, that are going to affect us in the most immediate future?

Ms. CORNELIUS. I'd be happy to respond to that, Senator Corker.

Senator CORKER. OK.

Ms. CORNELIUS. Line technicians is an area that we've been very, very concerned about in Florida, with an estimated half of the line technician workforce to be retiring in a 5-year period.

We're also very concerned about power operators, electricians, welders that will be needed to maintain our power sources today, but then looking ahead to new sources of power generation.

But, if I were to identify the top three, clearly line technicians, welder, plumber/pipe fitters, and power plant operators.

MS. DEROCCO. I would like to add to that, if I may, according to the outreach we've made to all sectors of the energy industry now, it appears we also need a significant focus on the future of our nuclear industry, the industry is projecting that they're going to need 21,000 new workers to build new plants, and new plant capacity—this goes to the skilled crafts and trades that this Nation is seriously facing a shortage of—5,000 new workers to operate the potential nuclear energy plants currently in the application process, and 25,000 workers to replace retiring skilled workers today.

So, in addition to the utility occupations that my colleague has emphasized, we are focused very much on the nuclear sector.

Alternative energy—a growing opportunity in so many regional economies across our country is now defining new competencies and skills that their workforce is going to need, so that's an opportunity for workers, and also an opportunity for our economy to grow.

Senator CORKER. I think the answer to the next question is self-evident, but climate change legislation would affect the industry, how? From a standpoint of any comments about the meeting needs in the future if climate change legislation were to come to fruition?

Ms. DEROCCO. I'm not sure we've done a national assessment, I would defer to my colleague from the Department of Energy, but it is clearly the emphasis on climate change issue I think that is spurring a lot of interest in the alternative, or green energy sources, and the opportunities for biofuels development, and alternative energy plants and operations growing all across the country—ranging from wind to solar to other green energy alternatives as well.

A whole new set of competencies and skills, a whole new need for curriculum and education and training opportunities for America's workers.

Ms. HOFFMAN. I would agree with Assistant Secretary DeRocco, that with the growth in alternative energy there are solar, wind, and the technology opportunities there for that sector.

I would also comment that, in engaging the university and power plant operators, we need to get folks up to speed on the new technologies that are coming out with respect to climate change—carbon sequestration and advanced nuclear technologies—so that we can actually educate the workforce to be on top of where we're heading in the future with our technology advancements.

Senator CORKER. Thank you, Mr. Chairman.

If I could have one point of——

The CHAIRMAN. Sure.

Senator CORKER. What does a line technician make in Florida, just so you can advertise on C-Span?

Ms. CORNELIUS. Fifty-three thousand dollars a year. The average wage in Florida is about $35,800. With overtime—which is not unusual with line technicians, they can make up toward six-figure salaries.

The CHAIRMAN. Senator Corker, that's what you make, a six-figure salary.

[Laughter.]

The CHAIRMAN. That's what I make.

Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman, I thank all of our panelists.

My own sense is that the green energy field is going to be a huge magnet for economic development and for good- paying jobs for our country's future. My sense is that we're really lagging behind in terms of getting good numbers about what's going on in this area.

I've appreciated Chairman Bingaman's leadership in this area, and I know he's already tasked the Department of Energy to give us a sense of their assessment of the workforce needs, particularly in solar and biofuels and wind.

What can you tell us today, in terms of the workforce needs in these very promising green energy fields?

Let's make that for Ms. Hoffman to start with.

Ms. HOFFMAN. We don't have any statistics at the moment on the workforce needs, but we have expanded EPACT Sections 385 and 1830 to include the workforce requirements for renewable technologies as part of the potential future agreements with the Department of Labor. We know that there is growth in the industry, and that there is a huge potential for alternative energy and jobs across the United States in this area.

Senator WYDEN. When do you think you could give us a report on your assessment of the workforce needs in this area—and look, I'm not trying to give you a hard time on this—I think this is an area we feeling strongly about. My sense has been that because this is new, the government—and not as a result of blaming, you know, always flounders a little bit in terms of trying to figure out how to get all of the information. Can you, for purposes of this morning, give us a timeline on when you could get us a assessment of the workforce needs, at least in those three key areas—biofuels, solar and wind?

Ms. Hoffman.

Ms. HOFFMAN. Can I defer to——

Senator WYDEN. I'm sorry, for our two witnesses from the Government, Ms. Hoffman, Ms. DeRocco.

Ms. DEROCCO. As you can tell, Senator, we're partnering on the National Academy of Sciences study that is called for in the Energy Policy Act and with the expansion to alternative energy, we really have just begun the study work. We certainly will look at accelerating the work on the alternative energy field to see when we can get data to you from that study.

Also, we have gained some experience with industry itself, having projections, and we'd be more than glad to very quickly reach out to provide the industry projections.

I would also, just want to add that the National Renewable Energy Lab in Golden, Colorado has been an exceptional partner with nine of the WIRED regions that are focusing on alternative energy, to both determine the talent development requirements, the new competency and skill requirements, and to be of assistance in ensuring those employment centers around the country are beginning the skills development programs that will be necessary to support the growth of the industry.

From those three sources, we will try to get you some preliminary information as quickly as possible, and we will focus on this

National Academy of Sciences study which, I believe, is a year-long effort, so——

Senator WYDEN. So you could have this to us in 6 months?

Ms. DEROCCO. We'll try to get you some preliminary information within 6 months, National Academy of Sciences study will look to its conclusion within the year.

Senator WYDEN. Because I'm looking at the statute in terms of the National Academy and it talks about energy and mineral security requirements—all of which I strongly support, and I want to be clear on that. I just don't want renewables and green energy to get the short end of the stick, and I very much appreciate Chairman Bingaman's leadership on this, because I think both the Chairman and I think that there are a great many economic opportunities in this area, it's going to be an economic magnet for investors, and we're just going to need the government to be more proactive as it relates to the assessment of workforce needs in this area. I would like the recorder to note that there have been a lot of nods—affirmative nods—from our Government witnesses on this, and we appreciate that.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Senator Craig.

Senator CRAIG. Thank you, Mr. Chairman, for focusing on energy workforce.

Let me put it in a slightly different context—the Senator from Oregon talked about green and clean technologies, I am of the belief that all new technologies are clean or green, or we won't be building them. That's not only part of the climate change debate, it's about what we are now. EPACT says it, others say it—so in the context of all of this, a stainless steel welder on a nuclear reactor facility is going to be making twice as much money as the average wage of the State of Idaho.

How do we take these traditional skills, Madame Secretary, and do what Senator Corker so appropriately says, how do we make them cool today? Because all skills related to energy today are clean, and green, and that's where our country wants to go.

Now, that construction worker that erects a standard, put a wind turbine on, is making very good money with potential benefits. While that might be viewed as a sweat of the brow kind of labor force, compared to somebody sitting at a computer keyboard—that's green technology. That's cool. How do we make it cool? How do we communicate the new need in a way that catches the imagination of a necessary workforce?

Sputnik did it for us, NDEA—I grew up in that period of time, 1958 forward. Then we went—National Academy of Science rising above a gathering storm, produced legislation here, and I stuck a little nuclear education and training into that.

But, America gets captured by a feeling, and a mood, and a desire, and what becomes cool in someone's youth oftentimes drives them into a future employment or job training or education, how do we make it cool?

Ms. DEROCCO. Absolutely, well, we have a very strong industry education, government partnership looking at exactly that issue, Senator, you're absolutely right.

I would make several points that we know now, and we are really advancing our opportunities to make these jobs cool, and to provide career information.

The first point is, we have developed, the Department of Labor, in conjunction with the Department of Education, a Web site called "Career Voyages," which is for young people, teachers and their parents to take them on a road trip to the careers of the future, and to present young people very diverse video, online information about the careers in energy and the opportunities to make good salaries and to be cool in their work life and at the workplace.

We also published In-Demand magazine that illustrates the careers and put it in a million high schools around the country.

We have to do much more than this, though. As my colleague from Florida indicated, our statistics show that 30 percent of our young people that are in 9th grade today will not graduate from high school 4 years from now. In large measure, we believe we haven't made education relevant to their work opportunities, their career opportunities, which tells me age 14 or 9th grade is too late to begin talking to these young people about the exciting career pathways that they could explore if they maintain and gain their academic foundation and then go on to post-secondary education in multiple forms.

Our current Workforce Investment Act precludes our working with young people that are younger than 14. I think for career awareness purposes, and for exciting the young people, we probably have to look at that age.

Finally, I would say this education, industry and government partnership now gets it, that we have to meet these young people where they are. They're on the web, and they're on iPods, and they're on YouTube, and Facebook, and we need to find ways to communicate with them in their medium, and we're working very hard on creative solutions that industry will be driving to meet them there, and to encourage them to explore careers in the energy field.

Senator CRAIG. You mentioned in response, I think, to a question to Senator Bingaman that our land grant universities are kind of getting back to the idea of economic development. I know we've gone through this great period of university education as one of socialization and experience—maybe we can't get back to our roots. But, the only way land grant universities, oftentimes, are driven is by money. The private sector, in need of a workforce, is likely to invest at a university level if that university can see the green. In this case, we're not talking environment, we're talking bucks.

Those kind of partnerships need to re-establish themselves. If you go back and look at the old background of land grant universities, they were all about economic development.

MS. DEROCCO. Right.

Senator CRAIG. Out there on the frontier, if you will, of economic growth. How do we recreate—or is there an opportunity for us to assist in creating greater advantages for private sector investment in our colleges and universities that move in that path?

Ms. DEROCCO. Again, Senator, I keep referring to the WIRED initiative, because it has been such a phenomenal learning experience for all of us, including the universities that they can play such

a strong catalytic role in bringing together all of the strategic partners that are necessary to advance job creation and economic prosperity within a regional economy, and they serve so many roles, including being the site of lifelong learning for new skills and competencies, as well as the universities as researchers that begin the innovation lifecycle.

So, they are creating the new products and product features, and they are training our workforce throughout their careers for individuals who are going to have multiple jobs and multiple opportunities in their lifetime.

I'm not naïve, either, in knowing that we invest $15 billion a year—as I cited earlier—through this Public Workforce Investment System, which has rather traditionally looked to low-wage, low-skill occupations and the churn in the economy, and today recognizes that 90 percent of the fastest-growing jobs require some post-secondary education, so the investment from the Federal Government and from States and local governments in our post-secondary education system—be it community colleges or 4-year colleges and universities—is going to increase. Therefore, they are most interested in becoming partners with government at all levels, with industry that is driving job creation and serving a leadership role within their regional economies. I think our day has come for engaging our university system as the regional economic catalyst.

Senator CRAIG. Good, thank you.

The CHAIRMAN. Senator Murkowski.

Senator MURKOWSKI. Thanks, Mr. Chairman, and thank you to the panelists here this morning, I appreciate your comments.

To my distinguished colleagues, we're going to have to get with it. "Cool" is not the appropriate lingo when you're talking to teenagers——

[Laughter.]

Senator MURKOWSKI."Cool" has now been replaced with "sick."

[Laughter.]

Senator MURKOWSKI. So——

Senator CRAIG. The mother of teenagers.

Senator MURKOWSKI. [continuing]. I've got a 14 and a 16-year old, and every time they say something is "sick" I look at them, oddly, and they say, "Well, that's your version of 'cool'."

So, I don't know that we necessarily want to include that in our legislation or in the pamphlets that we've had——

[Laughter.]

Senator MURKOWSKI [continuing]. Out for publication.

But, it is important to be meeting the young people where they are and I appreciate what you said, Madame Secretary, about going to their venues. Whether it's YouTube or wherever it is.

We've been relatively successful in the State of Alaska in some programs to try to get kids more interested in the trades. We've realized that you don't start in high school. That fifth grade is about right. By first and second grades, kids are deselecting their careers. Once they've deselected, they're not going back to that as an area of interest. So, we need to get them very, very early on.

I think we missed an opportunity here yesterday, we had about 5,000 young people here on Capitol Hill, their purpose was to lobby us on climate change issues. But when you talk about bright young

minds that are passionate about the future of their country, and how we're going to make a difference, I told the 25 of them or so that were in my office, we need to be able to advance these technologies. There are huge opportunities for us out there, but you all are the ones that are going to make that happen. We need to tap into that source there.

I want to ask you, Ms. DeRocco, from the Department of Labor's perspective, they've been helpful to us in the State of Alaska with some training grant money—we've received energy employee training money back in 2004, this was to help us prepare for our gasline, which we recognize—great opportunity for us, but it causes us a fair amount of angst, in terms of where are we going to get the workers that we will need for this very, very massive project?

We have been working to build the energy workers for this project, but what we're finding is that, we'll train them, and they get kind of sucked into that energy infrastructure pipeline that is already needed. So, the gasline is still years down the road, we're trying to keep up with the need on the ground right now, and we're seeing a graying of our oil slope workers—about the same rate that you're experiencing here in the lower 48, but—what do we have available to us, in terms of training dollars across the country that is really going to make a difference? Do we have enough? Is it sufficient?

Ms. DEROCCO. Senator, yes, the needs in Alaska are huge, and we understand that. In addition to the project that you mentioned, which was a high-growth project for $7 million, we just this year provided $7.5 million specific, to creating the pipeline of workers for the pipeline. Putting the programs in place through your technical and vocational education programs and new apprenticeship programs. We've been working very closely with Commissioner Bishop in Alaska to make sure that we are supporting the efforts of the State, to use their Workforce Investment Act dollars which come as an annual appropriation, and to use them effectively as an investment for both your short- and long-term needs to build this energy pipeline. I mean that in both senses—the pipeline of workers, as well as the new pipeline that we're all working toward.

Are there enough dollars? I think first and foremost, we have been focusing on reforming this workforce investment system and the current investment of $15 billion a year, to ensure that the investment is demand-driven, that we are, in fact, using it to educate and train workers for the jobs that are being created today, and those that are going to be created in the years ahead. To become demand-driven and understand that it may take longer, and higher levels of education and training to ensure that our workers are equipped for the marketplace next year, and 5 years from now.

Once we get that—the use of those dollars that are currently invested and appropriated—right, I think we'll have a much better feel for whether additional resources are or are not needed. You've heard us say—and I know it's been frustrating to some Senators that—of, just the part of the Workforce Investment dollars that go through my Agency, which is about $9 billion out of that $15 billion a year, States and local workforce investment areas are carrying in over $1 billion each year, unspent.

That tells us there is still capacity to use the current appropriated dollars better, more effectively and more targeted to these sectors where jobs are being created, and new competencies and skills are needed by the workers. We need to get that right first. We need to assure we have reformed and well-invested those dollars, before we assess the need for more.

Then the second point is—it is staggering, the amount of resources across our Federal agencies that are devoted to educating and training workers. We need to align and leverage those resources, and without any institutional framework for doing that, just the force of an initiative like WIRED, and the personalities that are currently working together, it is really hard work. Because every agency is kind of siloed and working in its own venue, and even the sharing of information is extraordinarily hard. But, we're getting better at it, and I think anything that Congress can do to help us in aligning and leveraging the resources currently devoted, we'll be doing a better job for Alaska and for the Nation in ensuring an educated and prepared workforce.

Senator MURKOWSKI. I appreciate that, thank you.

The CHAIRMAN. Thank you very much.

There are two Senators who haven't had a chance to ask questions of this first panel, and I'd just remind everyone that we have a second panel of five witnesses, still waiting to testify.

Let me call on you, Senator Sessions, and then Senator Salazar.

Senator SESSIONS. Thank you, Mr. Chairman, I appreciate this discussion. It goes beyond energy, to me. When I travel to Alabama and talk to businesspeople, they continue to be concerned about the number of qualified applicants.

I will say to my business friends, however, that in many areas, the wages haven't gone up a lot, which makes me wonder how seriously driven they are.

But, I do think it is a national problem, so I would just say, Mr. Chairman, I'll wait till the next panel, but would note two problems that we should be able to address.

One is the question of young people finishing high school. Some have called it delayed adolescence. But they seem somewhat reluctant to move into a job that might be their permanent job the rest of their life, it's a commitment like marriage or something, they're just not willing to make, they don't want to make. They drift around with much lower-paying jobs, with less benefits, than they might otherwise take advantage of at some of these fabulous energy companies who pay well, who have good benefits and insurance.

So, I guess, are you concerned—any of you would want to comment on this question of this gap of lost productivity that occurs when perfectly capable young people are not taking advantage of, perhaps, the best job opportunities that there exist, and can we help them take advantage of that?

Ms. CORNELIUS. I'd like to respond to your question, Senator.

In Florida, we've passed aggressive legislation to modernize and make more market-relevant our career and technical education programs.

But, to your point—our statistics in Florida with our young people dropping out of school or not going on to college, 6 of 10—it's

criminal, that kind of statistic. These are not children that can not learn, rather, they've become disappointed with the traditional learning environment. What we've found through our modernized career and technical academies, like those we have in construction and in electricity, that they find some relevancy to the training that they're receiving—they're able to develop a mentoring relationship with a energy industry employee. They can see the future ahead of them and they understand why they are learning the way that they are.

So, I think if there was anything that I would respond to your question with, it's the whole market relevancy, and the better understanding of what they're learning, and the application to the real world.

Senator SESSIONS. Wonderful answer. Now, I know you're doing that in Florida, it sounds good. Let me ask you, honestly, I assume you're one of the leaders of the Nation in that, but with regard to the total number of kids graduated from high school in Florida, you're not yet at—reaching all of those, are you?

Ms. CORNELIUS. No, sir, we are not.

Senator SESSIONS. That's certainly not——

Ms. CORNELIUS. We're just at the beginning.

Senator SESSIONS. So, I think we're behind on that.

Other question I would ask is about this aging workforce. I notice that Southern company representatives said that 45 percent of the half million utility worker employees throughout the Nation are over 48. So, to me, what do you do at 60 or 65—is there a way to encourage those older workers to stay and work longerand maybe taking less stress and less hours, more free time—are we doing enough to make work appealing for older workers to keep at it?

Ms. CORNELIUS. Senator Sessions, if I may, again, respond to your question.

Through the Florida Energy Workforce Consortia, which is comprised of all of our major energy partners throughout the State, we in effect, learn from one another—their knowledge transferring skills that they employ in their own company to retain those skilled workers. The ways that they're utilizing those skilled workers to keep them, either one, in the labor force, or to use them in other capacities. Perhaps teaching the new entrants into the workforce. It's a situation that we must look at.

So, we're learning from one another, our power companies, learning what best in class for this knowledge transfer model, and applying it where we can.

Ms. DEROCCO. Senator, if I may add to that, just very quickly, we are about to present to the Senate, an interagency task force report on the aging of the American workforce called for by the Senate Select Committee on the Aging, where we are proposing many recommendations for continuing to engage, or reengage our older, mature workers in a variety of opportunities still in our workplace, and to bring down barriers that currently exist to their continued engagement, be it in employment, or as educators in these areas where we significantly need their assistance to ensure a strong, viable workforce. So, we'll look forward to sharing that report to you, as well.

Senator SESSIONS. Thank you.

The CHAIRMAN. Thank you very much.

Senator Salazar.

Senator SALAZAR. Thank you very much, Chairman Bingaman. I'll just make a quick comment, I know we have another panel waiting on the wings.

But, I would say first, that through your leadership and the work on this committee, the work on the Finance Committee, the work on the Agriculture Committee and the Farm Bill that's on the floor today, we really are opening up this whole new opportunity for clean energy economy for the 21 Century.

I think all of us who work on these issues are cognizant of the fact that we have technological barriers that we have to overcome, we have economic barriers that we have to overcome, but also, with that, we need to make sure that we are training the right kind of people to be able to take on the jobs for what is, I think, a huge imperative, as well as an opportunity for America.

The National Renewable Energy Lab who, which is stationed in Colorado, and we will be hearing in the next panel from Dr. Ray Stults in a 2006 study NREL provided, made a finding that one of the barriers that we are looking at in terms of moving forward with this clean energy economy, is the whole issue of the absence of trained workers to deal with the new opportunities that are coming on down the line. So, I just want to say to you, Mr. Chairman, thank you for putting the spotlight on this issue, and I look forward to working with you on this, and so many other matters.

Thank you.

The CHAIRMAN. Thank you very much.

Senator Menendez.

Senator MENENDEZ. Thank you, Mr. Chairman, I have a couple of questions that I'd like to ask.

Secretary DeRocco, as you know, renewable energy demand and production has been exploding in recent years. For instance, some have projected 50 percent annual growth in the solar industry—something my home State of New Jersey is very interested in—for many years to come.

Of course, creating those new green jobs is great for our economy, and for our environment, but I wonder what the Department of Labor has done to ensure that these new green job seekers actually get reached out in underemployed communities?

For example, does the Administration support Senator Sanders' and Clinton's Energy Efficiency and Renewable Energy Workforce Development amendment to the Energy bill that would provide $100 million to develop a green job training program? Or, do you have some of your own initiatives in that regard?

Ms. DEROCCO. Let me start, Senator, thank you for asking these important questions. No. 1, in New Jersey, I hope you are aware that we have three WIRED regions, New Jersey is a huge contributor to our learning through the WIRED initiative, one of which is very much focused on green energy, and among their strategies is to assure that untapped labor pools is a focus for the education and job training that will provide new employment opportunities and long-term careers for many that have been previously been marginalized in the workforce.

So, we are in your home State, looking very definitively at the opportunities for untapped labor pools. I would say—again, nationally, this is our time as a Nation to assure that targeted populations that previously have been marginalized. The demographics of today's workforce presents huge new opportunities for us to reach out to everyone and find a good job with good pay, and security and opportunity for economic prosperity for them and their families.

So, while we talk about the challenges of the demographics of our workforce, this is our opportunity to really engage those who have formerly been marginalized. I think in the alternative, or green energy area, this is going to be an exploding area.

The one issue—we did have several issues with the Green Jobs proposal. It is—it appears to us to be another siloed job training program. I've spoken often this morning about this public workforce investment system, where we are now managing 17 different siloed programs which, by the time the resources and the eligibility requirements and all of the rules and regulations of 17 different programs get down to the States, and then to local workforce investment areas, it's very difficult for them to actually engage in——

Senator MENENDEZ. But, if it's not siloed for—to take your argument—then ultimately, how do we ensure that we drive in what seems to be the potential for an ever-growing part of the labor force, to reach out to it?

Ms. DEROCCO. It doesn't mean that it couldn't be focused specifically on an industry sector or a growth part of our economy, but I don't believe in that particular provision now, there is any reference at all to this broad- based public workforce investment system, and assuring alignment and leveraging with the resources, the service delivery system, and the opportunities for workers to access those opportunities through their community-based one-stop career centers, and to assure the resources for education and training are among those that can be accessed in that particular——

Senator MENENDEZ. Let me, in line with that, let me ask Ms. Hoffman, or you for that matter, you both might be willing to respond—but part of the purpose of this hearing is to raise awareness, helping to fill jobs that will ensure that we all have heat and electricity in the years ahead, but the current workforce didn't age overnight. It is the product of a whole host of things, one is aging, of course, but the other one is layoffs. It wasn't too long ago we had layoffs, consolidation, deregulation, and result in negative perceptions as to whether this is a field I want to get into.

The question now becomes, how do we learn from those experiences as we talk about now moving to a growth level—how do we learn from those experiences, and what steps do we have to take to avoid this cycle in the future? So that we don't enter into the same cycle again? I'd invite anyone who wants to make an answer to that.

MS. DEROCCO. I think, perhaps, we both do.

One of those things we've learned, we've gotten a lot more sophisticated about understanding that across, for example, sectors within the energy industry, there are certain competencies and skills that are cross-cutting. In other words, these workers are no

longer on a career ladder in a single sector within the energy industry, they have a career lattice—an opportunity as business cycles change, as certain sectors within the industry grow, or others might decline, that their competencies and skills are transferable, to jobs across the industry.

One of those things this shortage of skilled workers has really done for all of us, is engage all of the sectors—oil and gas, nuclear, power generation, alternative energy together, in looking at how do we define the competencies and skills that are needed for our workers, how do we assure that those workers have portable skills, so that they have career opportunities within the energy industry broadly, not just in a narrow sector where they might experience a business cycle downturn, for example.

Ms. HOFFMAN. I would agree with Assistant Secretary DeRocco, that we must have some cross-cutting capabilities across the whole energy sector, to bring diversity to our new workforce. We also have to have flexibility within the workforce to be able to move them around in areas where we have the greatest need.

The other thing that we need to provide is certainty in the industry and certainty that the energy sector is an important part of our economy for the investment that is required.

Senator MENENDEZ. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Let me thank this panel for your excellent testimony, and why don't we move right to the second panel here?

The CHAIRMAN. OK, let me introduce people as you're taking your seat, your seats. We have five panelists on this panel.

Norm Szydlowski is with Colonial Pipeline in Alpharetta, Georgia. Ray Stults is with the National Renewable Energy Laboratory. I know Senator Salazar wanted to make an introduction of Ray Stults, and why don't you go ahead right now with that.

Senator SALAZAR. Thank you, Mr. Chairman.

I have the special pleasure today to introduce my friend Dr. Ray Stults, who is the Associate Laboratory Director of the—for Energy Science at the National Renewable Energy Laboratory in Golden, Colorado. He is the program manager for research at NREL, sponsored by DOE's Office of Science, and is leading NREL's expansion of basic research programs. These programs are the roots that underpin NREL's applied research in solar, biomass, wind, buildings, and transportation. Ray has long been a servant at NREL, with a distinguished career in leadership in our National Laboratories and he brings a wealth of experience, bridging government and industry in NREL.

I want to say this very quickly, just about NREL and some of the efforts we have underway in Colorado. It is our hope that, along with the rest of the Nation, that we see a burgeoning of renewable energy and new technologies to deal with the energy issues that we face in our Nation.

We have to face those issues because of the inescapable forces of national security, environmental security, and economic opportunity that we face.

NREL has been at the lead with the University of Colorado, Colorado School of Mines, and the University of Colorado, in developing a co-laboratory, which we actually discussed at some point

here on our Energy Committee, where that co-laboratory is in the process of working with the private sector community to deploy the research and technologies being developed at NREL out into the private sector. It's something that we are very proud of. I know that the workforce issues are very much a part of those concerns.

So, Dr. Stults, thank you for visiting us in Washington today. We're proud of NREL and I know that my colleagues here on this committee are very proud of the work you do.

Dr. STULTS. Thank you.

The CHAIRMAN. Let me also say that we taught Ray everything he knows about energy in New Mexico when he was at Los Alamos National Lab. But we're very glad to see him here representing NREL, too.

Jim Hunter is with the International Brotherhood of Electrical Workers here, and we appreciate you being here. Paul Bowers, Southern Company from Atlanta, Georgia. Thank you very much for being here. Carol Berrigan is here representing the Nuclear Energy Institute.

Why don't we just go across from left to right on the panel here, and if each of you will take 5 minutes to summarize the main points of your testimony. We'll include your full testimony in the record.

Mr. Szydlowski, go right ahead.

STATEMENT OF NORM SZYDLOWSKI, PRESIDENT AND CHIEF EXECUTIVE OFFICER, COLONIAL PIPELINE COMPANY, ALPHARETTA, GA

Mr. SZYDLOWSKI. Thank you, Senator. I appreciate the opportunity to address the committee today.

I think what we're talking about is a convergence of workforce demographics and energy infrastructure keeping up with the GDP growth that you mentioned earlier on in your opening comments, Senator. Probably the solution lies somewhere in this idea of cooperative, coordinated cooperation.

At Colonial Pipeline, that's the company that I'm from, we've seen that a lot of good comes when the Government and energy industry works together to ensure that the infrastructure is in place, it's strong, it's responsive to the needs of the Americans. Nowhere was this more evident than the aftermath of hurricanes Katrina and Rita.

I don't think, for the cooperation between government and energy industry, that the suffering, I suspect, would have been far worse and the recovery would not have begun within 48 hours after those terrible storms had come ashore if that cooperation was not in place.

There's a number of members on this committee, including you, Senator Bingaman, that took a special interest, along with State officials, in seeing that the energy industry had what it needed to serve the public. That's essentially what we're talking about, I think, today. Does the energy industry have the right workers to make sure that Americans will have the energy they need today, tomorrow, and in the future?

First, let me give you a quick description of our company. Colonial Pipeline carries about 20 percent of all the liquid petroleum

products that moves on U.S. pipelines. In many markets we supply the vast majority of fuels that the communities rely on. Our headquarters in is suburban Atlanta. There we have a control center that operates this pipeline 24 hours a day, 7 days a week.

We're a company based on some pretty fundamental values. First of this is safety of the operations, so that we protect the workers, the citizens whose communities we operate in, the environment that we all share. Another fundamental value we share is reliability. Our customers and the public they serve depend on Colonial Pipeline, the Nation's most efficient, safest method of delivering fuels, and Colonial strives to be the best in our industry.

Industry-wide, the petroleum sector estimates, not unlike the figures we've heard so far from Secretary DeRocco, that 27 percent of the workforce is within 5 years of retirement. That figure is, certainly the same for us in our company, and the problem is a little worse for us, in the people that actually do the operating of the pipeline, where near one in five of the employees are eligible to retire in 2 years.

Labor statistics put the average U.S. worker at 39 years. We heard some earlier commentary about a much larger age in the electrical business. For Colonial Pipeline, our company-wide average is just short of 44 years. About half of our workers are over the age of 40.

We currently have a project that we're developing that would add a third pipeline for our company. Trying to keep up with demand—this would be another pipeline in a corridor that exists between Baton Rouge, Louisiana and Atlanta—the project still faces some regulatory and engineering hurdles, but it would add about 33 million gallons of fuel delivery capacity a day. Also, if you look at the U.S. refining capacity, there's about a million barrels of new capacity scheduled to be available by 2012.

When we initially proposed the project a few years ago, we thought it was going to cost a billion dollars. Today, we think by the time it gets together, it will probably be $2 billion, given cost increases, which include commodities and as well as labor.

Colonial today, with industry and government partners also has been researching some transportation of ethanol and biofuels in the pipeline. While the initial results are very encouraging, we still have a lot of work to do, some questions to answer. Hopefully we'll be in a position to make some test shipments of those biofuels in 2008.

It's unlikely that these efforts will add a lot to our workforce demands in the long-term, as we view this biofuels effort, but there may be some system modifications that, again, could put some pressure on the construction expertise.

I'd like to suggest some actions that you might consider, one of which I think, encouraging policies that match the technical school with the skill-trade training, with workforce needs, working on the stigma of vocational technical careers, in the sense of professional careers. I think this would have the most immediate impact on workforce needs.

It's an area where companies like ours would be willing to participate, either in design of curriculums or providing some other support. Also, there's some IRS relief, I think, that would be a big

help to us. This has to do with phased retirement initiatives that would allow companies to make some in-service distribution of retirement benefits.

This challenge of workers that are older, between, say, the ages of 62 and 55, is one—is a group where we need the experience for training, we need the manpower to do what we need to do in these areas, and it's becoming very, very difficult under the current situation to hold on to those workers and keep them in place.

We can't ask them to jeopardize their pension benefits or the non-qualified status of our pension plan when we ask them to help us out and stay on longer and do training and participate in the company's activity.

So again, thank you for the opportunity to testify. Colonial Pipeline welcomes your continued interest and support. It's been invaluable to our company, in particular to—and make a contribution to the industry and the Nation. Speaking for the 630 employees in Colonial and for the pipeline industry as a whole, we're ready to help in any way we can to help develop some solutions for the workforce shortage facing the Nation's energy suppliers.

[The prepared statement of Mr. Szydlowski follows:]

PREPARED STATEMENT OF NORM SZYDLOWSKI, PRESIDENT AND CHIEF EXECUTIVE OFFICER, COLONIAL PIPELINE COMPANY, ALPHARETTA, GA

I appreciate the opportunity to address the Committee today. I want to commend you for focusing attention on whether the domestic energy industry has the necessary workforce and skill sets to ensure our Nation has the vital energy we need.

Too often the U.S. energy industry is portrayed as uninterested in the future, as passive and as part of the problem, not the solution. The truth is our industry exists to serve the American people by providing an essential commodity. I was fortunate enough to represent our country as an advisor to the Iraqi Oil Ministry, so I have seen firsthand what happens when a Nation's energy industry is unable to meet the people's needs. First at Chevron and now as CEO of Colonial Pipeline, I also have seen the good that comes when a government and the energy industry work together to ensure infrastructure is in place, is strong and is responsive to the needs of Americans.

Nowhere was this more evident than in the aftermath of Hurricanes Katrina and Rita. If not for the cooperation between the government and the energy industry, the suffering would have been far worse and recovery would not have begun within 48 hours of those terrible storms coming ashore. Three members of this committee—Senators Bingaman, Domenici and Akaka—were among the U.S. and state officials who took a personal stake in seeing that the U.S. energy industry had what it needed to serve the American public. That is essentially what we are talking about today: does the energy industry have the right workers to ensure Americans will have the energy they need today, tomorrow and into the future.

My remarks will share Colonial Pipeline's experience. As the largest pipeline of its kind, I believe it provides examples that represent the entire pipeline segment of the U.S. energy industry. I believe my remarks also represent experiences of the broader energy sector, including nuclear, refining, natural gas and electric utilities. I will conclude with my thoughts on what leadership this Committee can provide on this issue.

First, let me give you a quick description of Colonial Pipeline. Created in 1962, Colonial today consists of 5,519 miles of underground pipeline connecting refineries primarily in the Gulf Coast with markets across the Southern and Eastern United States. We begin in Houston and end at the New York harbor. The main lines are 40-and 36-inches in diameter, with one primarily devoted to gasoline and the other carrying distillate products such as jet fuel, diesel fuel, home heating oil and fuels for the U.S. military.

We connect directly to major airports along our system. Visually, Colonial looks like a long expanse of right-of-way with 15 tank farms along the way. These tank farms store more than 1.2 billion gallons of fuel and help provide communities with a 4–5 day supply before they need to be replenished.

Overall, Colonial carries 20 percent of all liquid petroleum products that move on U.S. pipelines. In many markets we supply the vast majority of fuel those communities rely on. In others, such as the Northeast, we face competition from overseas shipments of fuel. There our gasoline shipments are less significant than our distillate shipments (home heating oil, jet fuel, etc.) Our headquarters is in suburban Atlanta from where our Control Center operates the pipeline 24 hours a day, seven days a week. We are a company based on some fundamental values. The first of these is the safety of our operations so that we protect our workers, the citizens in whose communities we operate, and the environment we share. Another fundamental value we share is reliability. Our customers—and the public they serve—depend on Colonial. Pipelines are the Nation's most efficient and safest method of delivering fuel, and Colonial strives to be the best in our industry.

When construction began in 1962, it was a different world. There wasn't the global economy we have today. The pipeline was mostly in rural areas. Growth and development have brought us much closer to cities and towns. Suburbs now overlap our right-of-way. There have been corresponding changes to the workforce as the Nation has grown. The information highway has shown many young men and women in search of career opportunities a more glamorous world 2 than pipelines and refineries. Fewer are following their parents' line of work, instead pursuing their own career paths and direction.

Across our industry, consolidation has caused a sharp decline in employment since the early 1980s. Over half a million petroleum jobs were lost between 1982 and 2000. These layoffs gave an entire generation the impression that our industry was an unreliable employer. While Colonial's employment remained relatively stable during these years, we have had to deal with the same shrinking pool of candidates applying for careers within the overall industry. We are competing hard for candidates who may have fewer skills than candidates 10 years ago.

To address the situation, we have increased our compensation packages in an effort to attract entry-level workers. Colonial offers candidates with no more than a high school degree a starting salary of approximately $42,000 with the ability to progress their career to $70,000 a year. That is only an average. Those who follow this path can—and do—become Lead Operators earning $84,000 per year. Again, these are base salaries. On top of the base are shift differentials and overtime pay. To attract entry-level workers and to retain our current workforce we have included a full benefits package and annual bonuses. In critical labor markets such as Houston and the Northeast, we also pay geographic differentials. I stress that these opportunities are for non-skilled positions. The competition for engineers and more highly skilled positions is even more intense and the pay packages accordingly climb dramatically.

This challenge of recruiting new workers is not unique to our industry. But what makes it more serious for Colonial is the rate at which our current workforce is departing. Part of this is due to realities of the workplace. Fewer workers are spending their entire career at one company. The consequent trend is for an employee to spend 2-3 years mastering their skills and then to re-enter the job market in search of opportunities beyond their current employer.

But an even larger contributor is the graying of our workforce.

Industry-wide, the petroleum sector estimates 27 percent of its workforce is within five years of retirement. That figure is the same for Colonial's workforce. The problem is worse among the people who operate the pipeline, where nearly one in five employees is eligible to retire within two years. Of the four most critical positions, 35 percent of our Senior Operators/Lead Operators and 29 percent of our Inspectors are within two years of retiring. Among Controllers (who control and monitor pipeline operations) and Technicians (who maintain pumps, valves and other pipeline equipment), each group has 15 percent of their complement within two years of retiring.)

The U.S. Bureau of Labor Statistics puts the average age of the U.S. worker at 39 years. Colonial's company-wide average age is just short of 44 years. As the chart* below shows, more than half of our workers are over the age of 40.

Unfortunately, these workforce issues are striking just as the business demands on and opportunities for pipelines are accelerating. This is especially true for Colonial Pipeline. As you are aware, expansions are under way for several refineries in the Gulf Coast region we serve. As a large-volume pipeline capable or transporting this product to the major population centers of the South and Eastern seaboard, Colonial is in a great position to help with the industry's growth and with increasing the supply of available fuels.

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*All charts and graphs have been retained in committee files.

We are currently developing a project that would add a third pipeline of 36 inches in diameter along our existing pipeline corridor between Baton Rouge and Atlanta. This project, which still faces several regulatory and engineering hurdles as well as the final approval of our owners, could add 800,000 barrels of additional capacity every day. That equates to an additional 33 million gallons of fuel every day. (By comparison, announced refinery expansions will produce an additional 1 million barrels per day of product by 2012.)

When we initially proposed the project, we estimated the cost would be $1 billion for 465 miles of new pipeline. However, we now estimate the project will top $2 billion. Part of that may be our conservative estimates in the beginning, and part of it is the rising price of steel. But a significant part of the higher estimate is due to the competition for qualified workers to build our project. The very expansions within the refining sector of our industry are soaking up the available skilled labor pool we are seeking for our own project. Although construction on our proposed project would not begin before 2011, our forecast is that the labor market will be as tight if not tighter by that time.

While this expansion will likely have minimal impact on our long term needs for operations manpower, it will require approximately 2,000 construction jobs during the building period.

Colonial has also been researching the transportation of ethanol and other biofuels on our pipeline. As you may or may not be aware, we are working with others to determine whether ethanol can be transported in a steel pipeline without inducing stress-cracking. While initial results are encouraging and there is much work to be done and questions to be answered, we hope to make test shipments in 2008. It's unlikely that the these efforts will add significantly to our workforce demands long term, but the system modifications to handle these fuels may require could add yet another need for scarce design and construction expertise.

We hope projects like our expansion and our research into carrying fuels that will boost America's energy security are steps toward making our pipeline industry more attractive to young workers looking for a company to start and/or develop their career.

The work of this Committee has the potential to have far more substantial benefits for the workforce needs we face. Speaking for Colonial, here are some steps I think would benefit the industry as a whole and therefore the Nation's consumers:

—Encourage policies that improve technical school and skilled trade training. This would have the most immediate impact on our workforce needs, and this is an area where companies like Colonial would be willing to participate either in the design of curriculums or by providing other support, such as grants targeting the development of skills and trades needed in our industry.

—Provide IRS relief on phased retirement initiatives that will allow companies to make in-service distribution of retirement benefits. We need to tap into the knowledge and experience of those employees who retired solely to have access their lump-sum benefits. We need their help preparing the new workers, and we can't ask them to jeopardize their pension benefits—nor the tax-qualified status of our pension plan—when they answer our call.

—As Congress works on solutions to the Immigration question, please keep in mind that foreign workers represent a potential pool of skilled workers that would address our workforce shortages and provide stable, well-paying jobs that would not only benefit the individual but the community as well.

Thank you for the opportunity to testify before the Committee. Colonial Pipeline welcomes your continued interest and support. It has been invaluable to our company in particular and a contribution to the industry and the Nation. Speaking for the 630 employees of Colonial Pipeline, and for the pipeline industry as a whole, we stand ready to help in any way we can as you develop solutions to the workforce shortage facing the Nation's energy suppliers.

The CHAIRMAN. Thank you very much.

Mr. Bowers.

STATEMENT OF W. PAUL BOWERS, PRESIDENT, SOUTHERN COMPANY GENERATION, ATLANTA, GA

Mr. BOWERS. Thank you, Mr. Chairman, and distinguished members of the committee. I am honored to appear before you today, and offer the perspective from the energy industry on its workforce needs and concerns.

As we look forward over the next 5 to 10 years, we are confronted with a significant and increasing shortfall of skilled craft workers, upon whom we depend on for operation, maintenance, and development of our energy infrastructure. How this shortfall is addressed will directly impact the ability of the industry to satisfy the growing energy needs of our Nation, while ensuring a thriving secured domestic economy.

To put matters in context, please let me offer you a few statistical frameworks. The National Electric and Gas Utility Sector employs approximately 550,000 individuals. More than half of these individuals work in specific areas, such as generation, transmission, and distribution, which require skilled craft personnel in such roles as technicians, mechanics, power plant operators, and line workers.

In the Southeast, the supply of skilled of craft industrial labor, in recent years, was measured at approximately 120,000 individuals. That number fell short of the demand by approximately 20,000 individuals. By 2011 the deficit is expected to more than double, as demand for labor increases to more than 170,000 persons.

In short, the supply of skilled craft labor lags well behind demand. One key reason for this problem is our aging workforce, which has been mentioned here already. Within 5 years, the utility industry could see losses of between 40 and 50 percent of its generation, transmission, and distribution employees. Currently, more than 45 percent of the half million utility employees are at the age of 48. More than 25 percent are over the age of 53, while only 13 percent are below the age of 33.

At Southern Company, our numbers are no different. Approximately 8,000 retirements are expected in the next 10 years, or 31 percent of our company's entire workforce could retire. The drop in available skill-craft workers is also attributable to a shift in cultural norms associated with such careers. As compared to when you and I were in high school, educators, counselors, and parents today have deemphasized or eliminated altogether the avenue of vocational or technical programs. Participation in industry related vocational and technical courses has decreased by 35 percent over the past decade.

The consequence of such deficit and skill-craft worker shortage can not be understated. The North American Electric Reliability Council found in its 2007 survey of reliability issues, that the utility user, owners, and operators ranked aging workforce and the lack of skilled workers as the foremost cause of reliability risk.

Demand for energy continues to increase. To satisfy this demand, a national investment of approximately $900 billion is expected in energy infrastructure projects over the next 15 years, with $400 billion of that committed to the Southeast. Current forecast assumes approximately 26 new nuclear plants, 77 new generation stations, all could be constructed in the Southeast, along with 3,500 miles of transmission.

Southern Company has taken a number of steps to address these issues as best it can. In 2001, which has already been mentioned, our subsidiary, Gulf Power, opened a academy in Pensacola, Florida, designed to foster and a feeder pool for important positions

such as entry-level power generation, power delivery jobs. Southern Company, through Alabama Power and Georgia Power, provides a number of education leadership forums for students and educators and has partnered with technical schools to develop heightened standards of education in an effort to increase the passage rate of individuals taking industry pre-employment tests. These efforts can only take Southern Company and the industry so far, and will inevitably fall short.

An effort to assist the committee in development of such plans, Southern Company offers some suggestions and ideas for consideration and discussion.

One, an increased awareness is needed of the critical workforce issues we face. In an effort to support continued economic development across the Nation, our educators and the students in their care must become better aware of the existing and future skill-craft labor careers and opportunities. Current academic mandates do not award credit to students who participate in career technical educational programs. Their credit systems must be modified, so that credit toward graduation is awarded as part of participation in technical curriculum.

The national curricula and related standards for middle and high schools are needed to complement and improve the perception and selection of careers in energy and construction industries by qualified students. A perfect example is the model in Florida with the Career and Professional Education Act.

Finally, let me summarize and say thank you for allowing me to appear before you. Southern Company and its employees greatly appreciate your commitment to this issue. On their behalf, I hope you will carefully consider the points I've raised in my written testimony and hopefully I'm available for you to answer the questions you might have.

Thank you.

[The prepared statement of Mr. Bowers follows:]

PREPARED STATEMENT OF W. PAUL BOWERS, PRESIDENT, SOUTHERN COMPANY GENERATION, ATLANTA, GA

Thank you, Mr. Chairman, Ranking Member Domenici and other distinguished members of the committee. My name is Paul Bowers, and I am president of Southern Company Generation, a business unit of Southern Company, the largest electric utility in the United States. Headquartered in Atlanta, Southern Company owns and operates more than 42,000 megawatts of generation capacity and more than 27,000 miles of electric transmission lines. To operate, maintain and manage this vast electric energy infrastructure and to reliably supply electricity to our customers, Southern Company employs more than 26,000 women and men across four states.

I am honored to have this opportunity to appear before you today on behalf of Southern Company and offer the perspective of the electric utility industry on the workforce requirements of our Nation's domestic energy industry. These needs are an integral part of any discussion regarding the electric utility industry in the United States—both present and future—and it is my hope through this testimony to address the intent of this hearing by outlining several fundamental workforce issues that our industry faces as it continues to grow into this new century. First, I will describe the current state of the energy workforce and the demands facing the industry. Then I will discuss the future growth requirements expected in the region as well as short-term actions that have been taken to alleviate problems associated with current and anticipated industry workforce needs in the face of growing demand. Finally, I will offer suggestions for this committee to consider as it ad-

dresses these critical issues and recommends policy actions that will ensure the United States has a secure and abundant supply of energy.

I. THE STATE OF THE DOMESTIC ENERGY INDUSTRY WORKFORCE

Recent data collected by the United States Census Bureau indicates that the national electric and natural gas utility sectors employ approximately 555,000 individuals. Half a million people, dedicated to keeping the lights of our country on, its homes warm, and its economy thriving. More than a quarter of this group, or approximately 120,000 workers, serve the Generation (including nuclear) function of the sectors—namely producing the energy our Nation needs. Another 260,000 people serve the Transmission and Distribution functions, and see that the generated energy safely and reliably reaches the people and businesses that require it. Both functions require a host of skilled craft personnel, who fulfill the critically important roles of technicians, power plant operators, lineworkers, and pipefitters/pipelayers.

The energy demand served by the infrastructure to which these individuals tend has increased by an average of 2 percent annually over the last five years. In the Southeast, that demand growth has averaged 3 percent over the same period. In any event, according to the Energy Information Administration, the demand for energy in the United States is expected to increase 31 percent between 2005 and 2030. As this committee has recognized, such growth in demand necessarily requires a workforce to satisfy it. As this committee also appears to have recognized that, a shortage exists in the number of workers available to meet this demand.

Internal Southern Company research indicates that the available supply of skilled craft industrial labor in the Southeast for 2006 was approximately 120,000 individuals.* [1] This figure comprises such service categories as operation and maintenance, environmental, and industrial, and includes both union and non-union workers trained as pipefitters/combo welders, boilermakers/tube welders, electricians, millwrights and iron workers.[2] The 120,000 person number fell short of the demand in the Southeast for skilled craft labor in 2007 by approximately 20,000 workers. Moreover, that deficit is expected to more than double through 2011, as demand for skilled craft laborers in the Southeast grows to more than 170,000 persons.

This demand growth reflects not only the expanding energy needs of the Southeast (along with the rest of the Nation), but calls attention to an equally significant workforce issue the electricity industry must face: an aging workforce. According to a recent Center for Energy and Workforce Development (CEWD) survey, the electric and natural gas industries could lose between 40 to 50 percent of their Generation, and Transmission and Distribution employees within the next five years.[3] In fact, more than 45 percent of the half million utility employees serving our country's energy needs are above the age of 48. More than 25 percent are over the age of 53. Only 13 percent of employees are below the age of 33. According to a fall 2006 Washington Post report, more than half of the entire electric utility workforce will be eligible for retirement within 10 years. Not surprisingly, an accounting for this demographic distribution of personnel results in projected losses in some skilled craft positions well in excess of 50 percent.

For example, more than 52 percent of Generation technicians may be eligible to retire by 2012. When that number is considered with the normal 8.4 percent attrition rate, the potential need for replacement Generation technicians exceeds 60 percent. Lineworkers likewise present a similarly significant workforce issue. In 2005, the Department of Energy concluded that the electric utility industry could suffer a shortage of 12,000 lineworkers by 2015 (assuming a modest 1.5 percent growth rate), or nearly 20 percent of the current workforce. For some organizations, lineworker retirements could approach 50 percent of total personnel. Vacancies of upwards to 50 percent (and beyond) also are anticipated for power plant operators and engineering jobs generally as retirement eligibility grows over the next five years.

The numbers at Southern Company vary little from national figures. Our 26,000 employees include 6,300 persons serving the Generation function, 2,500 serving the Transmission function, while the remaining 17,200 serve roles in Distribution, Customer Service and Support functions. Approximately 15 percent of Southern Company's employees are below the age of 33; however, more than 45 percent are above

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* All exhibits referred to in Mr. Bowers's testimony have been retained in committee files.

[1] See Exhibit 1, Southeast Industrial Craft Labor Demand Chart, Southern Company Generation.

[2] See Exhibit 2, Southeast workforce White Paper.

[3] See Exhibit 3, Gaps in the Energy Workforce Pipeline: A 2007 Workforce Survey Report from the Center for Energy and Workforce Development, Executive Summary and Summary of Findings.

the age of 48. Over the next 10 years, Southern Company projects approximately 8,000 retirements, or 31 percent of its workforce, with approximately one quarter of those being skilled craft personnel such as plant operators and lineworkers. Retirement eligibility, however, will grow to 64 percent of the workforce, with approximately 46 percent of the Southern Company Generation workforce between age 58 and 61.

Compounding these problems is a marked lacked of proficiency of personnel entering the workplace. Over the past two years, more than 2,000 potential employees could not pass entrance tests required for employment with Southern Company Generation. Although Southern Company has seen a slight increase in qualifying applicants between 2006 and 2007, only 37 percent of applicants qualified for employment in Alabama in 2007 (up from 30 percent in 2006), while 41 percent of applicants qualified for employment in Georgia in 2007 (up from 39 percent in 2006). A number of sources can be blamed for the shrinking skilled craft labor pool. Most notable is a shift in cultural norms associated with skilled craft labor careers.

Presently, parents, school counselors and students' peers emphasize the importance of completing secondary education with the goal of gaining acceptance to and attending a four-year college. To this end, some state government policies (whether organic or interpreting federal policy) have led to the elimination of many high school vocational and technical programs that previously served as introductory training for future skilled craft laborers. Over the past decade, the number of students in high school who are taking trade or industry-related vocational and technical courses has declined by 35 percent. Moreover, many would-be candidates hold misperceptions about such positions. Once considered excellent career options, the high-paying skilled craft work is now seen as second class. Individuals also associate such work as seasonal and without adequate benefits, neither of which may be (and often is not) true.

II. FUTURE GROWTH AFFECTING THE WORKFACE AND SHORT-TERM ACTIONS TAKEN

The consequences of a skilled craft worker shortage cannot be understated. The North American Electric Reliability Corporation (NERC) found in its 2007 Survey of Reliability Issues that utility users, owners and operators ranked "aging workforce and lack of skilled workers" as the foremost cause of reliability risk. Moreover, a deficit of 50,000 skilled craft workers by 2011 cannot adequately sustain the industry growth that the Nation expects in order to satisfy the corresponding increase in demand. The growing number of industry retirements that will invariably overlap with the increase for labor will only exacerbate the problems created by such a shortfall.

Specifically, Cambridge Energy Research Associates (CERA) expects supply levels in the Southeast to fall over the next five years to levels that will require investment in new capacity.[4] According to CERA estimates, the energy industry nationally will invest approximately $900 billion in infrastructure projects over the next 15 years, with the South's share of such investment expected to exceed $400 billion. The Nuclear Energy Institute estimates that the Southeast could host 26 new nuclear plants for which license applications are being developed. Moreover, NERC estimates the construction of 77 new generating stations in the Southeastern Electric Reliability Council (SERC) region through 2013, along with 3,500 miles of transmission lines as part of 183 different projects. Through 2025, Southern Company will require 17,000 MWs of new capacity to satisfy demand within its four-state control area, an amount that is more than 40 percent of our current capacity. In addition, Southern Company will be installing environmental controls over the next three years, for which we expect to expend $4.6 billion and require 8.5 million skilled craft labor hours, as well as other projects that we expect to consume more than 2 million skilled craft labor hours.

Southern Company is not atypical in this regard. Across the Southeast, 55 new scrubbers to reduce sulfur dioxide emissions are planned over the next several years that will, in total, require an estimated 35,000 workers. The skilled craft labor required to serve these needs does not, however, exist for the utility industry alone. By way of example, Southern Company understands the new ThyssenKrupp steel plant in Mobile, Alabama will need skilled craft workers to satisfy approximately half of its 2,700 total workface, while the new Kia automobile plant in western Georgia will require a substantially similar amount of craft labor as part of its approximately 2,800 workers. Additionally, reconstruction along the Mississippi and Louisiana Gulf Coast in the wake of Hurricane Katrina still consumes the time and availability of thousands of skilled craftspeople.

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[4] See Exhibit 2, Southeast workforce White Paper.

It should thus come as no surprise that the spiking demand and plummeting supply make for an impressive increase in wage expectations for the skilled craft laborers. While perhaps obvious, it bears remembering that the work performed by these skilled craftspeople cannot be outsourced. Rather, it must be performed on site. Accordingly, in the coming years, union wages are expected to increase 4 to 6 percent annually. Additional compensation, such as subsistence (per diems, stipends) and other incentives, may become required to attract union labor to specific projects. Non-union compensation is not expected to be any different, as wages and benefits packages for open shop employees currently coincide with that received by union workers. Although the skilled craft workers certainly benefit from higher wages, the increased costs ultimately result in higher electricity rates for customers.

Furthermore, the reduction in qualified skilled craft personnel increases the potential for quality and safety issues, and a corresponding lack of productivity. For example, one of Southern Company's Alabama plants has approximately 1,400 skilled craft employees on site. Over the past year, the turnover rate at the plant has increased to 28 percent. Additionally, the plant has seen an increase in the failure rate of certain quality control metrics. Such failures cause delays in repairs and ongoing maintenance, which necessarily impact productivity and result in an increase in plant costs. In this time, Southern Company also has witnessed an increase in the percentage of skilled craft workers who are either less familiar, or unfamiliar, with working on industrial sites. Here too, quality and safety concerns are implicated.

Southern Company is taking steps to address the issues that it has recognized. In 2001, Gulf Power (one of the Southern Company operating companies) began its first academy at West Florida High School of Advanced Technology in Pensacola, Florida. Through this academy, Gulf Power was able to develop a feeder pool for important positions such as entry-level power generation and power delivery, as well as degreed positions such as engineers. Each incoming junior is paired with a Gulf Power mentor who holds a career of interest to the student. Incoming seniors who meet certain criteria are placed in a program where they report to Gulf Power during certain school hours for completion of their curriculum and work obligations. Since its introduction, the program has expanded to two other Florida high schools, and has produced 62 graduates, 30 of whom have been hired by Gulf Power or other utility or related companies (with another 26 enrolled in college).

Southern Company also provides a Summer Energy Career and Leadership Academy for incoming freshmen in Burke County, Georgia; facilitates a Summer Educators Forum at its nuclear plants Vogtle and Hatch for area high school and technical school educators; provides a leadership conference for junior students in the Mobile County, Alabama School District to raise awareness of careers in the energy industry; and partnered with technical schools in Georgia to develop a Technical Certificate of Credit, the goal of which is to increase the passage rate of individuals taking the Edison Electric Institute pre-employment test (and thereby increase our qualified pool of candidates). Southern Company also is partnering with Georgia technical schools to develop an electrical lineworker program from which our Georgia Power operating company can hire new personnel. An additional, but by no means final, effort undertaken by Southern Company involves collaboration with technical schools to develop a power-plant operator course that introduces students to the responsibilities of a plant mechanic at our Southern Nuclear facilities.

Southern Company also has taken operational steps to address workforce shortage. One short-term method we have adopted in an effort to manage the labor demand issues is scheduling. For example, when possible, Southern Company plans its plant outages to coincide with environmental-controls construction projects in an effort to optimize the skilled craft labor on our plant sites. In other situations, Southern Company has changed the timing of its installation of environmental controls. In this way, we avoid having too many skilled craft workers at a particular location at any one time (which often creates high turnover, as well as quality and safety issues).

Through partnerships with other industries, workforce investment boards, and state governments across our service territory, as well as active membership in community, state and national organizations, Southern Company also is endeavoring to increase the supply of skilled craft professionals. For instance, in 2004, Southern Company began evaluating the workforce needs in our region through the CEWD. A partnership among utilities and industry associations such as the Edison Electric Institute, the American Gas Association, the Nuclear Energy Institute and the National Rural Electric Cooperative Association, as well as contractors and unions, CEWD seeks to expedite the creation of educational programs, improve the skill levels of graduates, improve their awareness of opportunities in the utility industry,

and increase the number of diverse qualified applicants who want to work for utilities.

III. SUGGESTIONS FOR THE COMMITTEE IN DEVELOPMENT OF POLICY ACTION

Despite these and other efforts by Southern Company and others in industry, there remains much to be done to address the critical shortfall of skilled craft workers the domestic energy industry faces in the coming years. Resolving this challenge will not be accomplished without attention and support from Congress and distinguished leaders such as yourself. In an effort to assist the committee in this regard, Southern Company offers the following suggestions.

- Increased awareness is needed on issues related to skilled craft labor and workforce initiatives in order to support economic development. As I have discussed, the domestic energy industry is approaching a significant demographic cliff in its skilled craft workforce. Addressing the problem posed by this reduction in available labor should be a priority for Congress, as the growth of the Nation's electric infrastructure generally, and Southern Company's region of the country specifically, depends upon the development of a workable solution to this problem. By increasing awareness of these issues, the confidence of all business sectors in the South will improve, as will the quality of life of those working in it, and dependent upon it.
- National curricula and related standards for middle and high schools are needed that raise awareness of careers in the energy and construction industries and enhance the ability of qualified students to enter skilled craft positions immediately from high school. A possible model would be Florida's Career and Professional Education Act. Developed through a partnership with the state workforce and led by Andra Cornelius, vice president for business relations at Workforce Florida, the act requires all school districts to have at least one career academy that prepares students for high-wage, high-skill jobs within the local economy. The act also requires industry certification to receive enhanced full-time equivalent weighted-funding, and it requires the rigor of articulated coursework with post-secondary institutions. In this way, a functioning pipeline of skilled workers can be established that industry can rely upon to serve its growing workforce needs.
- Flexible teacher-qualification standards are needed that would permit domestic energy industry personnel to teach in the public education system. Additionally, career and technical education courses should be developed so that they meet specific quality standards—such as completion rates and industry and instructor certifications—in order to receive enhanced funding.
- Industry-certification programs are needed in secondary and post-secondary schools. Current academic mandates do not award credit to students who participate in career technical education programs, nor do they provide the time necessary for students to participate realistically in such programs. The credit systems must be modified so that technical credit is awarded as part of a curriculum, thus allowing students who participate in such classes to accrue sufficient credits toward graduation. Technical education programs help students become immediately employable with high starting salaries that often exceed state averages. Such programs also instill technical skills in such students, and the certification would be portable and nationally recognized. Industry certification should be a component of all career technical education programs of study.
- Lastly, school systems need counseling programs to encourage students and their parents to consider these career academy programs. The image of the domestic energy industry as a career should be one of excitement and opportunity, and not anything negative or second class. To facilitate this change in perception, school systems must educate students and their parents about the potential inherent in the energy industry, and how they can pursue a career in which they could earn a good wage.

In summary, Chairman Bingaman, Ranking Member Domenici and other distinguished committee members, your support and action is needed. Southern Company and its employees greatly appreciate your commitment to this issue. On their behalf, I hope that you will carefully consider the matters I have raised and the requests that I have outlined.[5] In the meantime, thank you again for the opportunity to speak with you today, and I welcome any questions that you may have.

[5] A copy of my biography is attached for your convenience at Exhibit 4.

The CHAIRMAN. Thank you very much.
Dr. Ray Stults, please go right ahead.

STATEMENT OF RAY STULTS, ASSOCIATE DIRECTOR, ENERGY SCIENCES, NATIONAL RENEWABLE ENERGY LABORATORY, GOLDEN, CO

Mr. STULTS. Thank you, Senator Bingaman. It's a pleasure to be here to provide some information regarding the development of renewable energies as we meet the current projected energy demands of the U.S. and the world with tremendous growth, as projected, and particularly as we start to relate to considering the energy security and the climate change issues that we believe that renewable energy will play a strong role in the future.

Ideas of the investment that's going to be required have been provided by such agencies as Inter-Governmental Panel on Climate Change, which has estimated a $30 billion—$30 trillion investment between now and 2030, of which over $5 trillion of that will be in the U.S. in energy infrastructure. So, the projections of growth are certainly there, and we're already seeing growth in the renewable energy.

For example, wind power in the last 5 years has enjoyed an annual growth rate of 22 percent, 27 percent last year, and we're seeing a tremendous growth this year. Although, what's really interesting, is on this growth and investment of over $4 billion in the wind industry, is that if we look at the Energy Information Agency's projections, that by 2030, the contribution from renewable energies is almost stagnant. Today it's about 6 percent and they're projecting only a 7 percent growth. Now, we're seeing growth in selective sectors of this because the overall energy portfolio—overall energy demand is growing, but yet the amount of energy renewables is not projected to grow.

However, I think that's going to change and it's going to change by one, the awareness of the need for green energy and renewable energies. It's always going to change by initiatives, such as the American Competitiveness Act, the Advanced Energy Initiative, and so forth. That's a major part of what's currently going on at our laboratory right now.

As you know, we're a National Laboratory and the primary focus of what we work on is developing new energy technology options for the future. So on wind, solar, biomass, geothermal, we're heavily involved in developing, you know, new energy options for the future. Only recently have we started to address the workforce issues, as we develop these new technologies and we start to build plants.

So, what I would like to do now is to talk a little bit about one example, and that's the example in the biofuels area where there's been tremendous amount of interest in the last several years. Energy renewable—Office of Energy Efficiency and Renewable Energy is investing in pilot-scale facilities. The Office of Science has invested in advanced bioenergy centers in the United States. We've recently done an analysis—and this is a preliminary analysis of what it would take to replace 20 percent of our transportation fuels by ethanol by 2017—so we've done an analysis of this, and basically what it talks about, is how do we produce 20 billion gallons

of cellulosic ethanol, put it into the marketplace, and then have the mechanisms to use that energy.

Let me just give you a few numbers. Now, these numbers are not in my written testimony, I actually received these last night when I arrived in Washington, DC and there's some information. But I thought I should try to share these. If we're going to produce 20 billion gallons of ethanol by 2017, we're going to require developing on the order 400 new refineries. The stainless steel requirements will equal 8 percent of the annual U.S. production of stainless steel to build those refineries. In some years, the peak will be more like 30 percent of the development. We will need 600,000 tons per year of concrete to build those plants. Once they're operational, the demands on water is significant, 80 billion gallons of water per year to do the processing, OK?

Construction labor—this is averaged out over that 10-year growth period, will be 10,000 personal labor-years per year. Then once the plants are operating, we'll need 12,000 person-years of labor each year to operate the plants. So, I think those numbers are quite staggering and sort of goes along with everything we've been hearing this morning about the demand on trained skilled workforce.

In addition, we're going to need dispensing units in the form of new gasoline pumps to dispense this. So this analysis, in order to use this, says that by 2015, we need to have E–10 available nationally, and we need to have E–85 pumps available in many regions of the country. That's on the order of 30,000 stations, investing somewhere between $300 and $600 million just to put in the pumps to provide this. Flex-fuel vehicles will need to be available. It's projected that by 2017, we'll need to have nearly 93 million flex-fuel vehicle on the road in order to take advantage of this.

So, I think the numbers are staggering and it sort of accents the problem, and certainly contributes to the demand for skilled workforce to build the plants, to operate the plants, and so forth.

The last thing I would like to comment on is something that we're seeing at our laboratory, and that is the projected shortage of scientists and engineers in this field. We're already seeing a workforce demand. We need additional scientists and engineers in our National Bioenergy Center, for example. We have numerous positions we're working to fill. It's going a lot slower than we would like. So, there is a work labor issue in the science and engineering.

So, I think these are all issues that we need to address in the future and this is, by a lot of the comments today, I'm summarizing this, so, anyway, I applaud the committee. I think this is the first of several hearings, meetings, workshops that's going to be necessary as we start to address these issues, and I certainly look forward to answering any questions.

Thank you.

[The prepared statement of Mr. Stults follows:]

PREPARED STATEMENT OF RAY STULTS, ASSOCIATE DIRECTOR, ENERGY SCIENCES, NATIONAL RENEWABLE ENERGY LABORATORY, GOLDEN, CO

Mr. Chairman, thank you for this opportunity to discuss workforce issues related to our Nation's growing energy needs. I am Ray Stults, Associate Laboratory Director for Energy Sciences at the National Renewable Energy Laboratory (NREL) in Golden, Colo. NREL is the U.S. Department of Energy's primary National Labora-

tory for research and development of renewable energy and energy efficiency technologies.

The challenges we face today in the energy sector are unprecedented in our Nation's history. While we clearly must produce tremendous amounts of new energy to serve our citizens and keep our economy growing, we at the same must strive to reduce our dependence on imported oil and take new measures to protect our environment.

As we look to the future, the demand for new energy technologies, and especially clean energy technologies, is expected to grow exponentially. A study conducted this year by the Intergovernmental Panel on Climate Change estimated that from 2007 until 2030, the global need for new energy infrastructure will total some $20 trillion dollars. New energy infrastructure needs in the U.S. were projected to be $5 trillion.

RENEWABLE ENERGY—A LOOK TO THE FUTURE

The Nation is increasingly looking for solutions from renewable energy technologies, and wind, biomass and solar energy industries are growing at rapid rates. Although the renewable energy sector is a long way from realizing its ultimate potential, these varied industries already are having significant impact. Wind power, for instance, over the past five years has enjoyed an annual growth rate of 22 percent. In 2006, U.S. wind power generating capacity rose by some 27 percent. The wind power industry this year anticipates U.S. investment of $4 billion, with 2,454 megawatts of new generating capacity installed. Wind power will be the second largest source of new generation in the Nation—second only to natural gas—for the second year in a row.

While it is difficult to predict long-term growth of any particular technology in the marketplace, several studies are providing insight into the future. Perhaps the most inclusive review of workforce demands from renewable energy development was conducted in 2004 by the Energy and Resources Group of the Goldman School of Public Policy, University of California, Berkeley. Incorporating the work of some 13 existing studies, that examination found that even least-case scenarios of renewable energy development will create a major new employment sector in the future.

The University of California study analyzed the employment needs of renewable energy industries if they were to achieve a 20 percent market penetration by 2020—a goal of various policy initiatives at the state level. With biomass contributing 85 percent, wind 14 percent and solar 1 percent of total renewable energy production, the study indicated that 52,530 jobs would be created in construction and manufacturing, and 188,317 jobs created for facility operations and maintenance.

The study also found job creation to be generally greater for renewable energy expansion, as compared to fossil fuels development, per unit of energy delivered. (A study by NREL's Energy Analysis Office likewise found economic benefits from encouraging renewable energy development. In a comparison of renewable energy development verses fossil energy development, it was found that for every equivalent of one megawatt produced, fossil energy development generates 25.4 job years per additional megawatt capacity; renewable energy 41.7 job years.)

Another valuable assessment of renewable energy growth is DOE's 20 Percent Wind Scenario, which looks at wind power's potential to meet 20 percent of the Nation's electricity needs. The 20 Percent Wind Scenario found direct employment would be created for nearly 150,000 people, in manufacturing, construction and operation of wind power systems—jobs that largely would extend over a period of 20 years or more. (The total U.S. electric power sector currently employs about 395,000 people.) The indirect and induced economic activity that would result from that level of investment in wind power would create an additional 300,000 jobs. The overall economic activity that would be created from wind development, if it were to reach 20 percent of total generation, was estimated to approach, and could potentially exceed, $1 trillion.

In addition to the workforce needs of manufacturing and operations, the equally crucial need for new related infrastructure must also be considered. No definitive research has been completed in this area. However, a look into one aspect of biofuels development begins to reveal the complexities and workforce demands ahead. The Department of Energy's "20 in 10" goal of displacing 20 percent of the Nation's gasoline use by 2017 would require that 30 billion gallons of E85 be sold annually. That would require an estimated 28,500 service stations to be equipped to dispense ethanol. The cost of labor for installing new tanks averages $20,894 per station; the labor cost for retrofitting existing tanks averages $7,771. Overall estimates of labor costs associated with providing enough ethanol pumps at the Nation's gas stations range from $220 million to $600 million, according to NREL's Center for Transportation Technologies and Systems.

SKILLED LABOR REQUIREMENTS

As the renewable energy sector grows to meet more of the Nation's energy requirements, there will be new demands for skilled labor. While few detailed studies exist of future skilled labor requirements, several assessments have been initiated. One demonstrated area of concern is the gap between existing workforce skill sets and those needed for emerging energy industries. The wind power industry, for example, will require substantial growth of both skilled labor and technical labor, and create new demands for engineering and scientific professionals.

Research by the Renewable Energy Policy Project (REPP) analyzed the likely distribution of benefits throughout the U.S. manufacturing sector that will result from wind power development. Because manufacturing of wind turbine components is a labor-intensive process, some significant manufacturing has gone to foreign facilities. At the same time, U.S. firms are attempting to increase productivity at domestic production facilities—to outweigh the advantageous labor costs of foreign competitors. One wind blade manufacturer with significant international manufacturing experience estimates that the labor hours per blade would need to be reduced by a third for a U.S. factory to remain competitive. To ensure that manufacturing jobs remain in this country, development of advanced manufacturing technologies is essential.

To address the projected shortage of skilled workers for the biomass fuels industry, a number of educational programs have been initiated at the state and local level. For example, Indian Hills Community College constructed the Iowa Bioprocess Training Center in 2002, and began offering a two-year bioprocess technician program, working with two local ethanol producers. Another school, Minnesota West Community and Technical College, worked with local ethanol producers and the Minnesota Coalition for Ethanol to create a two-year Renewable Energy Technology program. A third of program's initial students moved on to a related four-year program, two-thirds were immediately hired in the ethanol industry.

On the national level, DOE has created a program to improve and expand solar installer training and certification in cooperation with the North American Board of Certified Energy Practitioners (NABCEP). Similarly, NREL is working through the U.S. Department of Labor's Workforce Innovation in Regional Economic Development, or WIRED Initiative, to ensure that skills of the emerging renewable energy industries will be addressed. The WIRED Initiative supports innovative approaches to education and workforce development that serve the needs of employee and employers alike.

We recommend a detailed analysis be conducted of skilled labor requirements for the renewable energy industry, now and into the future. A comprehensive, multi-industry assessment of the need for new craft and skilled workers is essential to inform national policy in this critical area.

ENGINEERS AND SCIENTISTS FOR THE FUTURE

The steady decline of engineering program enrollment comprises a major concern for therenewable energy industry. A report published by the National Science and Technology Counsel in 2000 found that the percentage of 22-year-olds earning degrees in science and engineering will continue to fall over the next four decades. Currently, U.S. graduate power engineering programs produce about 500 engineers per year. During the 1980s, this number approached 2,000 annually.

This issue poses risks to U.S. competitiveness. The number of wind engineering programs at European schools is significantly greater than that offered in the U.S. Although our Nation has historically been a world leader in providing broad access to higher education, and in attracting foreign students, other countries are closing the gap, by providing comparable educational access to their own population and attracting large numbers of foreign students.

The nascent biofuels industry in the U.S. already is encountering a shortage of qualified engineers and scientists with the appropriate education and training to make the contributions that are needed in the field. A looming shortfall of potential biofuels researchers in the undergraduate system today will only be compounded as industry ramps up its hiring demands in the future. At our own National Laboratory, we have experienced a severe shortage of qualified candidates for technical and scientific positions within the National Bioenergy Center, and competition for qualified candidates is only expected to intensify in the years to come. Just as Petroleum Engineering served this Nation for decades as an important discipline, so too must a new "Biofuels Science and Engineering" discipline become an attractive and fulfilling educational and career path for our emerging workforce.

NREL is currently working with the research and consulting firm Independent Project Analysis, Inc. (IPA), to help DOE better understand the challenges associ-

ated with commercialization of new biofuels technologies. IPA focuses on the quantitative analysis of capital projects worldwide, including energy projects, and conducts extensive research on the factors that influence project success. Through this work, we are finding that shortages of technically qualified workers are currently having significant impacts on the costs and schedules of capital projects, such as power plants, chemical plants and refinery upgrades. In one striking example, data suggests the cost of engineering labor on the U.S. Gulf Coast more than doubled between January 2004 and June 2007, due to a shortage of qualified design engineers. Such labor issues are likely to be compounded as the biofuels industry expands.

We recommend a detailed national study be initiated to identify potential shortages of crucial engineering and scientific professionals. Study results would provide policy makers with the information they will need to ensure an adequate workforce is available to meet the Nation's future energy needs.

The CHAIRMAN. Thank you very much.

Ms. Berrigan, go right ahead, please.

STATEMENT OF CAROL L. BERRIGAN, Director, Industry Infrastructure, NUCLEAR ENERGY INSTITUTE

Ms. BERRIGAN. Chairman Bingaman, Ranking Member Domenici, and members of the committee, I am Carol Berrigan, Director of Industry Infrastructure at the Nuclear Energy Institute. I appreciate this opportunity to express the nuclear industry's views on the availability of the workforce necessary to meet our Nation's growing energy needs.

Let me begin by thanking members of this committee for their long-standing vision and leadership, which has shaped our national energy policy, most recently embodied in EPACT 2005. We commend the enactment of the America Competes Act, which establishes a solid policy framework for addressing the challenges in stem workforce, and we look forward to this Act's implementation.

In addition, this committee has long supported nuclear engineering education in university programs and we encourage you to continue to reinforce the importance of these programs with the Department of Energy.

The 104 reactors operating in the United States today are among our Nations safest and most secure industrial facilities. In addition, they are the Nation's lowest cost producer of base-load electricity. Nuclear power produces one-fifth of America's electricity and U.S. utilities are preparing to build advanced design nuclear power plants to meet our Nation's growing energy needs.

According to EIA estimates, U.S. electricity demand is expected to grow by at least 40 percent by 2030. Meeting new demands for electricity will require energy providers to make major investments in new power plants, as well as transmission and distribution systems. Nuclear energy holds great potential for meeting our Nation's climate- related goals. Today, nuclear energy represents over 70 percent of the Nation's emission-free generation.

Given concerns about climate change and the need for affordable and reliable base-load electricity production, policymakers and energy industry leaders are evaluating an expanded role for nuclear energy. Both NRG and TVA have taken concrete steps toward this expanding role, with the submission of combined operating license applications for new nuclear reactors to be built in Texas and Alabama. There are currently 15 other companies or consortia who

have announce plans to submit COLOs for up to 27 additional nuclear power plants across the country.

Since the interest of this committee is in the availability of workforce necessary to meet our Nation's growing energy needs, please note that while the nuclear industry faces several challenges in meeting its nuclear workforce demands, along with these challenges come significant opportunities for American workers.

Each nuclear unit in operation today, directly employs 400 to 700 people. In addition to direct employment, the nuclear industry relies on numerous vendors and specialty contractors for additional expertise. For maintenance and outages, nuclear power plants also require a skilled labor to complement onboard utility staff, in some cases as many as 1,000 additional workers.

NEI's 2007 nuclear workforce survey indicated that 35 percent or 19,600 current nuclear utility employees may be eligible to retire by 2012. Within the vendor community that supports the industry, that number is 25 percent.

The resurgence of nuclear energy will also lead to increasing demand for skilled labor at all levels. NEI anticipates that each new nuclear unit will require 1,400 to 1,800 workers for construction, with peak employment of up to 2,300 workers.

If the industry were to construct the 31 units that are currently being discussed, it would require roughly 43,000 to 56,000 workers during construction with peak employment over 71,000. Once built, these plants would require roughly 12,000 to 22,000 permanent workers.

One area that's often overlooked in considering the nuclear workforce, is the manufacturing jobs that new nuclear construction would generate. According to a DOE survey in 2004, deploying 33 to 41 new nuclear units through 2024 could generate as many as 37,000 to 38,000 nuclear manufacturing jobs.

Jobs in the industry also have many desirable attributes. They are well compensated and commonly include family medical benefits, pensions, and generous incentive compensation plans.

Across the energy sector, there is growing demand for technical workers. The nuclear industry, like the rest of American industry, faces increasing competition for engineering talent, but we do see some good news.

In nuclear engineering programs, we see a fourfold increase in enrollment at the B.S. level, and a fivefold increase in enrollment at the graduate level.

Within the skilled crafts, however, there are challenges remaining. At the same time that demographics-driven attrition of skilled crafts is rising, numerous reports—as you've heard in various testimony—indicate a growing demand for skilled labor. Recruitment into skilled crafts has several challenges, the first is a lack of awareness and prestige for these important occupations.

The shift in national attention toward skilled craft employment, compounded by some State government policies, and various interpretations of Federal policies has led to the elimination of many high school career and technical programs, further reducing the qualified pool of skilled craft applicants.

The industry also faces hurdles due to our need for high-quality rigorous technical and personal standards.

I'd like to—in the interest of time—skip down to talk a little bit about what the industry is doing. The industry is——

The CHAIRMAN. Why don't you give us a short version of that, we're over the 5 minutes, go right ahead.

Ms. BERRIGAN. I certainly will.

The industry has taken aggressive actions in addressing the future workforce, pursuing initiatives in career awareness, developing training programs, providing financial support and scholarships, and developing regional and State-based workforce initiatives. We also actively work with the Center for Workforce Development, that you've heard mentioned elsewhere, and we're an active participant in the Southeast Skilled Trade Summit.

Mr. Chairman, in conclusion, I encourage you in this committee to continue your legacy of leadership on this issue, through greater national attention, and coordinated efforts of Federal and State government, industry, organized labor, and the educational community, we can and will build our future energy workforce.

Thank you.

[The prepared statement of Ms. Berrigan follows:]

PREPARED STATEMENT OF CAROL L. BERRIGAN, DIRECTOR, INDUSTRY INFRASTRUCTURE, NUCLEAR ENERGY INSTITUTE

Chairman Bingaman, Ranking Member Domenici and members of the Committee, I am Carol Berrigan, Director of Industry Infrastructure at the Nuclear Energy Institute. I appreciate this opportunity to express the nuclear industry's views on the availability of the workforce necessary to meet our Nation's growing energy needs.

Let me begin by thanking the Members of this Committee for their long-standing vision and leadership which has shaped our national energy policy most recently embodied in the Energy Policy Act of 2005. Key provisions in this legislation have accelerated the nuclear renaissance, including Title XVII loan guarantees, the production tax credit and regulatory risk insurance.

We commend the enactment of the America Competes Act, which establishes a solid policy framework for addressing the challenges in the science, technology, engineering and math (STEM) workforce and we look forward to this Act's implementation. In addition, this Committee has long supported nuclear engineering education and university programs, and we encourage you to continue to reinforce the importance of these programs with the Department of Energy.

The 104 reactors operating in the United States today are among our Nation's safest and most secure industrial facilities. In addition, they are the Nation's lowest cost producer of base-load electricity, averaging just 1.72 cents per kilowatt-hour. Those 104 nuclear power plants produce one-fifth of America's electricity, and U.S. utilities are preparing to build advanced-design nuclear power plants to meet our Nation's growing electricity demand.

According to EIA estimates, U.S. electricity demand is expected to grow by at least 40 percent by 2030. Meeting new demands for electricity will require energy providers to make major investments in new power plants, as well as in the transmission and distribution systems used to deliver electricity where it is needed. Cambridge Energy Research Associates estimates that, nationwide, the electric power industry will invest approximately $750 billion in infrastructure projects through 2020, with $250 to $300 billion in expenditure for new generation.

Nuclear energy holds great potential for meeting our Nation's future climate related goals. Today, nuclear energy represents over 70 percent of the Nation's emission-free generation portfolio, avoiding 3.12 million short tons of Sulfur Dioxide, .99 million short tons of Nitrogen Oxide and 681 million metric tons of Carbon Dioxide compared to the fossil fuels that would have been burned in the absence of nuclear energy.

Climate change is increasingly important as federal, state and local policymakers consider energy supply and greenhouse gas mitigation. Given those concerns and the need for affordable and reliable base-load electricity production, policymakers and energy industry leaders are evaluating an expanded role for nuclear power.

Both NRG and the Tennessee Valley Authority have announced that they have taken concrete steps toward this expanding role with the submission of Combined

Operating License Applications for new nuclear reactors to be built in Texas and Alabama. There are currently 15 other companies or consortia who have announced plans to submit Combined Operating License Applications for up to 27 additional new nuclear power plants across the country.

Since the interest of this Committee is the availability of the workforce necessary to meet our Nation's growing energy needs, I will begin by describing the size of the workforce needed to support the current nuclear industry and new nuclear construction. While the nuclear industry faces several challenges in meeting its future workforce demands, along with these challenges are significant opportunities for American workers.

Current Nuclear Power Plants:—Each nuclear unit in operation today directly employs 400 to 700 people.[1] In addition to direct employment, the nuclear industry relies on numerous vendors and specialty contractors for additional expertise and services. For maintenance and outages, nuclear plants also require skilled labor to compliment onboard utility staff, in some cases as many as 1,000 additional workers over a 4 to 8 week period, depending on the scope of the outage work. Based on an extrapolation of data supplied from the Associated Maintenance Contractors, over 30 million man-hours are worked by supplemental craft labor each year at the Nation's 104 nuclear reactors.

NEI's 2007 nuclear workforce survey indicated that 35 percent or 19,600 current nuclear utility employees will be eligible to retire within five years (2007 to 2012). In addition, the industry continues to experience non-retirement attrition, which over the same five-year period may require replacement of an additional 11 percent of the nuclear utility workforce or 6,300 workers. Within the vendor community, the NEI survey indicated that roughly 25 percent of the workforce would be eligible for retirement by 2012.

New Nuclear Power Plants:—The resurgence of nuclear energy will lead to increasing demand for skilled labor at all levels. Depending on the build technique selected, NEI anticipates that each new unit will require between 1,400 and 1,800 workers for construction with peak employment of up to 2,300 workers. Some estimates with a shortened timeline and little use of modularized construction techniques have peak construction estimates at 4,000 workers per project. These jobs include skilled crafts such as welders, pipefitters, masons, carpenters, millwrights, sheet metal workers, electricians, ironworkers, heavy equipment operators, and insulators, as well as engineers, project managers, and construction supervisors.

If the industry were to construct the 31 units that are currently being discussed for COL applications, this would require 43,400 to 55,800 workers during construction with peak employment of up to 71,300. Once built, these 31 plants would require 12,400 to 21,700 permanent fulltime workers to operate the plants and additional supplemental labor for maintenance and outages.

Manufacturing:—One of the areas that is often overlooked in considering the workforce impact of new nuclear construction are the manufacturing jobs associated with the nuclear industry. These jobs include the manufacture of components including pumps, valves, piping, tubing, insulation, reactor pressure vessels, pressurizes, heat exchangers, and moisture separators to name a few, and commodities like cement, structural steel, steel reinforcing bar, stainless steel, cable tray and cabling. According to a 2004 report from Idaho National Lab and Bechtel Power Corporation, if the industry were to deploy 33 to 41 new Generation III units through 2024, this could create 37,000 to 38,000 nuclear manufacturing jobs in the U.S.

About the Jobs:—Jobs in the nuclear industry have many desirable attributes; they are well compensated and commonly include family medical benefits, pensions and generous incentive compensation plans. Today, the median salary for an electrical technician at a nuclear power plant is $67,517, for a mechanical technician, it is $66,581 and for a reactor operator, it is $77,782. A senior reactor operator's median income is $85,426. Jobs in the nuclear industry are safe with fewer reported accidents than numerous other industries, including banking and other white-collar occupations.

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[1] For some single unit sites, the number of workers may exceed 1000. In addition to direct employment, each plant creates economic activity that generates roughly an equivalent number of additional jobs within the local community and produces approximately $430 million annually in expenditures for goods, services and labor, and through subsequent spending because of the presence of the plant and its employees. The average nuclear plants also contributes more than $20 million annually to state and local tax revenue, benefiting schools, roads and other state and local infrastructure and provides annual federal tax payments of $75 million.

Challenges and opportunities:—Across the energy sector, there is a growing demand for skilled technical workers.[2] Many of the challenges facing the development the future STEM workforce are identified in the National Science Foundation's "Gathering Storm" report. The nuclear industry, like the rest of American industry, faces increasing competition for engineering talent, while the supply of this talent remains static.

Despite the challenges noted in the NSF report, there is good news. We are seeing the resurgence of interest in nuclear careers at the college and graduate engineering level, most notably evidenced by the rapidly increasing enrollments in nuclear engineering programs. According to a recent study by the U.S. Department of Energy, enrollments in undergraduate nuclear engineering programs have grown from just 470 in the 1998 to 1999 academic year to 1,933 in the 2006 to 2007 academic year. Graduate enrollments have also climbed from 220 in the 1998 to 1999 academic year to 1,153 in the 2006 to 2007 academic year. The Bureau of Labor Statistics Occupational Outlook Handbook indicates median earnings for nuclear engineers are amongst the highest for all engineering disciplines at $84,880 per year.

Within the skilled crafts,[3] challenges remain. Demand for skilled craft labor centers on three activities: construction, operation and maintenance. These activities are common to all energy infrastructure types, including fossil power, transmission, distribution, pipelines, petrochemical refining and nuclear power. Skilled craft labor, particularly for construction and plant outage maintenance (or turnarounds), is able to work on all types of energy infrastructure.

According to NEI's 2007 nuclear workforce survey, up to 39 percent of nuclear utility maintenance workers, 34 percent of radiation protection workers and 27 percent of operations staff may reach retirement eligibility within five years.

Non-utility skilled craft labor will likely be impacted by demographics-driven attrition as well. A report from the Construction Labor Research Council estimates that up to 185,000 new construction craft workers will be required nationally to replace the 95,000 retiring workers and deliver the necessary 1 percent to 2 percent workforce growth between 2005 and 2015.[4]

At the same time that demographics-driven attrition of non-utility skilled crafts is rising, numerous reports indicate a growing demand for skilled craft labor on a regional or national basis. Figure 1 illustrates anticipated demand for various types of industrial construction and maintenance workers in the Southeast. Although project demand after 2011 is difficult to forecast, many strong indications point to growing demand. When adding the expected rate of worker attrition to the estimates, the supply-demand imbalance is even more pronounced.

The nuclear industry draws its supplemental skilled craft labor and will draw its construction labor for new nuclear plants from the same labor pool that supports the rest of the energy sector. The demographics-driven attrition and growing demand that affects the skilled craft labor pool will have an impact on the nuclear industry.

Recruitment:—Recruitment into skilled crafts has several challenges. The first is a lack of awareness and prestige for these important occupations. A shift in cultural norms associated with skilled labor careers has contributed to the shrinking craft labor pool. Parents, guidance counselors and society in general push high school students to complete their secondary education with the intention of then attending a four-year college program. High-paying skilled labor jobs, once considered excellent career options, are now perceived as second class.[5] This shift in focus, compounded by some state government policies and varying interpretations of federal policy, has led to the elimination of many high school career and technical programs. That, in turn, further reduces the number of qualified applicants for skilled craft positions.

The nuclear industry faces additional hurdles. Specifically, there are few workforce training programs focused on the skills needed for successful employment in the nuclear energy industry due to the industry's rigorous technical and personnel standards.[6]

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[2] Skilled technical workers include both degreed and non-degreed personnel.

[3] Examples of skilled craft labor include Boilermakers, Carpenters, Chemistry Technicians, Electrical Maintenance Technicians, Electricians, Heavy Equipment Operators, Instrumentation and Control Technicians, Insulators, Ironworkers, Lineworkers, Masons, Mechanical Maintenance Technicians, Millwrights, Non-Destructive Examination Technicians, Pipefitters, Power Plant Operators, Process Technicians, Quality Assurance Technicians, Quality Control Technicians, Radiation Protection Technicians, Sheet Metal Workers and Welders.

[4] "Craft Labor Supply Outlook 2005-2015," Construction Labor Research Council, 2005.

[5] "Where Have all the Welders Gone," Wall Street Journal Online, Aug. 15, 2006.

[6] The nuclear industry is required to meet rigorous training and qualification standards for personnel. These standards are set by the Nuclear Regulatory Commission and the National

As the entire energy industry works to replace its aging workforce and plans for new facilities and infrastructure, the overall decline in high quality career and technical education and a general perception that skilled crafts represent less valuable career choices have combined to restrict the pool of applicants for skilled crafts jobs.

Individuals often incorrectly perceive skilled labor jobs in the energy sector to require little or no post-secondary training. In fact, these jobs require certifications, offer high pay with benefits and provide opportunities to earn college credits. In an era of rapidly escalating college costs, the advantages of energy sector skilled craft jobs are poorly communicated to potential entrants, particularly as high school students are directed almost exclusively toward four-year degree programs. Improving awareness of skilled craft jobs in the energy sector and changing this misperception will undoubtedly lead to more students electing to enter skilled craft careers and enjoying long-term, high-wage employment.

Industry Response:—The commercial nuclear industry is taking aggressive action to develop its future workforce. The industry has been pursuing a variety of initiatives to increase career awareness through direct outreach efforts with professional societies, in high schools, and through the internet and other media. The industry has developed training programs and partnerships through high schools, union apprenticeship programs, skills centers, community colleges and universities. The nuclear industry also provides financial support and scholarships to students and is actively developing and engaging regional and state-based workforce development partnerships.

In March 2006, the Center for Energy Workforce Development (CEWD) was established. It is a partnership between the Nuclear Energy Institute, the Edison Electric Institute, the American Gas Association and the National Rural Electric Cooperative Association. CEWD is a non-profit organization that teams with secondary and post-secondary educational institutions, organized labor and the workforce system to create effective solutions to address the need for a qualified, diverse workforce. CEWD programs include: career awareness, identification and replication of model programs and processes, and support for regional and state workforce development partnerships. CEWD also endeavors to identify and address gaps in national workforce data and promotes policies that support energy workforce development.

In August 2007, the Nuclear Energy Institute, the Edison Electric Institute and the American Petroleum Institute co-sponsored the Southeast Energy Skilled Trades Summit in Biloxi, MS. This Summit, hosted by the U.S. Department of Labor and the State of Mississippi, brought together nearly 300 key stakeholders from industry, organized labor, government, and the educational community to raise awareness about opportunities in the energy skilled crafts and develop concrete solutions to the energy skilled craft workforce challenges in the region. This Summit was the first step in an ongoing process that has lead to the establishment or enhancement of numerous state-based consortia that are working to implement innovative workforce development solutions locally. The industry, in partnership with the Department of Labor, is also investigating replication of this summit in other regions of the country.

Recommendations:—Taken together, these programs represent an enormous investment of time and money in the future workforce of the industry, but more is needed to develop the technical and skilled crafts workforce that our Nation will need to deploy additional generating capacity, including nuclear. Specifically, we must:

- raise awareness of the impending skilled craft labor shortage and its impact on the energy sector
- elevate the image, status and prestige of skilled craft careers in the energy sector
- attract, recruit and train workers, particularly from untapped and under-represented labor pools
- align investments and workforce development initiatives to ensure collaboration and coordination of government, industry and labor efforts in the develop the energy skilled trades workforce
- build partnerships between industry, government, organized labor and the education community that promote talent and economic development
- implement performance-based education and training programs for skilled craft workers through vocational and technical education programs in secondary and post-secondary educational environments (including high schools, pre-apprentice, apprentiship, and community college programs).

Academy of Nuclear Training. In addition, some personnel must meet qualification requirements established by international standards organizations such as ASME and ANSI.

Some have argued that wages for skilled crafts have had a negative effect on attracting new workers into the industry. The Nuclear Energy Institute and the American nuclear industry have a long, mutually beneficial relationship with our workers and with the unions associated with the nuclear industry sector. Our members believe that prevailing wages have a stabilizing effect in the nuclear construction industry by promoting good labor relations, encouraging workforce training and supporting skilled worker retention. On behalf of our members, the Nuclear Energy Institute supports prevailing wages for this skilled workforce and agrees with the inclusion of the prevailing wage provision for new nuclear projects covered by Title XVII loan guarantees.

Mr. Chairman, in conclusion, I encourage you and this Committee to continue your legacy of leadership on workforce and competitiveness issues. Through greater national attention and the coordinated efforts of federal and state government, industry, organized labor and the educational community, we can and will build our future energy workforce. Successfully addressing this challenge will enhance our national competitiveness and train tens of thousands of workers for the kinds of high-skill, high-wage jobs that built this Nation.

The CHAIRMAN. Thank you very much.

Mr. Hunter, you're the clean-up hitter here, so go right ahead.

PREPARED STATEMENT OF JAMES L. HUNTER, DIRECTOR, INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS

Mr. HUNTER. All right. Thank you very much.

Good morning, Mr. Chairman and members of the committee. My name is James Hunter, I'm the Director of the International Brotherhood of Electrical Workers utility department. I've been asked by our President, Ed Hill, to speak today on behalf of the IBEW, and I want to thank you for holding this hearing, it's very, very important.

The IBEW represents 720,000, more than 220,000 of them in the utility industry. The IBEW provides a view of the utilities from inside, that we think is unique.

We see the workforce shortages from a very different perspective. The 1990s move toward deregulation caused the utilities to slow down hiring, offer early retirements to reduce staff, and a radical curtailment in new infrastructure.

The IBEW believes we are facing a critical manpower shortage in the utility industry today, and it is getting worse day by day.

Our information shows that average age of a lineman in the industry is over 51 years old. A line worker must be highly skilled and trained to perform their physically and mentally challenging job. It's a job that requires extensive safety training and on-the-job training.

It takes over 10 years of experience to become a lead lineman. A study from Carnegie Mellon which charts up there, shows employment levels in the industry peaked about 1990 at 550,000. It's declined steadily to today's numbers of about 400,000.

The interesting point here is that the total generation increased during that same time by about 30 percent, while employment levels dropped by 23.7. On face value, it would sound like we're doing more with less. But, the truth is, the companies have achieved these levels by working enormous amounts of overtime, and reducing maintenance and construction. The next generation of utility workers must be hired and trained today.

The situation is also dire in the generation sector. We've heard NEI has done a couple of studies showing that over 35 percent of the plant workers will be eligible to retire within 5 years.

The IBEW knows it takes 4 to 5 years to train just to the journeyman level. Proof again that we need to hire today, to replace the workers that are leaving in 5 years.

NEI's data also shows that 76 percent of all of the craft workers in the nuclear plants are over 43 years old.

Jeff Sterba, the Chairman and President and CEO of Albuquerque-based PNM Resources, recently spoke to a group of IBEW leaders and said that his company faces the grim reality that within 5 years, 50 percent of his workforce will be eligible to retire. He said, though, that that really doesn't both him. What bothered him was that within 10 years, 85 percent of his workforce will be eligible for retirement.

You can see from the other chart, our industry is different. We have a huge bubble of retirees coming up. The IBEW has been working with employers to attract people into the industry, and train then. We've started some regional training centers, a concept, it looks to partner with the utilities to help train the new generation of workers.

We see community colleges and resources as a good resource but not training centers in the practical sense. Many of our job require hands-on training that can not be taught in the classroom. IBEW President Hill has said many times that kids need to be taught how to work.

We understand that being taught by experienced craftsman is by far the best way to convey skills. The utilities must start to do some workforce assessments, and implement plans to hire and retain the future workers in our industry. The IBEW is working with the Center for Workforce Development, CWD, which is a partnership of all facets of the utility industry. CWD has just released a comprehensive study of the energy workforce, that I think is very revealing.

The IBEW is also at the forefront of anticipating staffing needs on construction projects. The key to working with employers long before projects start. We need to have a—we have a program that forecasts construction projects over the next few years, to determine how many construction workers will be needed, in any given area of the country. We then work with employers to ensure that we have enough trained and qualified workers available.

The committee has also questioned the use of foreign workers. The IBEW believes that the worker shortage we're seeing in the United States is an issue that can be addressed by retraining, and including unemployed workers displaced by outsourcing, and shipping jobs overseas. Therefore, training workers domestically now to meet the coming demand, is where the industry and Congress should e focusing.

If America is serious about reducing carbon emissions, we will need to build thousands of wind turbines and solar rays, along with new nuclear plants. A transition to carbon-free generation will require different skill sets and training. While the IBEW is working with companies such as Sharp and others, to develop training classes, we know that the need for new skills are enormous.

Funding assistance is needed to implement and operate the necessary training programs, and it's important for Congress to work

closely with labor and industry to attract, train and retain the workers in the energy industry.

Thank you very much.

[The prepared statement of Mr. Hunter follows:]

PREPARED STATEMENT OF JAMES L. HUNTER, DIRECTOR, INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS

CRITICAL ENERGY WORKFORCE SHORTAGE

Good morning Mr. Chairman and Members of the Committee: My name is James Hunter and I am the Director of the International Brotherhood of Electrical Workers (IBEW) Utility Department. I have been asked by our President, Ed Hill to speak to you today on behalf of the IBEW. Thank you for inviting us to comment this morning.

Of the 95 percent of investor-owned electric utilities that employ union members, the IBEW represents 98 percent of those workers. We also represent the largest number of unionized employees working for municipal and rural cooperative employers; the IBEW also represents workers at federal electricity facilities, such as the Tennessee Valley Authority (TVA) and Bonneville Power Administration (BPA). Of the 720,000 members of the IBEW, more than 220,000 of them are utility workers, who are covered by some 1,400 collective bargaining agreements in the United States and Canada.

SITUATION

The IBEW provides a view of the utilities from the inside that we feel is unique. We see the workforce shortages from a very different perspective the demand for trained skilled workers is rapidly expanding in the utility sector. The 1990s move toward deregulation caused the utilities to slow down hiring, offer early retirements to reduce staff, and a radical curtailment in new infrastructure. The IBEW believes we are facing a critical manpower shortage in the utility industry today, and that it is getting worse day by day. Our information shows that the average age of a lineman in the industry is over 51 years old. A Line worker must be highly skilled and trained to perform their physically and mentally challenging job. It is a job that requires extensive safety and on the job training. It takes over 10 years of experience to become a lead lineman. A study from Carnegie Mellon in 2005 showed that employment levels in the industry peaked in 1990 at about 550,000 employees, and has declined steadily to today's numbers of about 400,000. The interesting point here is that total generation increased 30 percent while at the same time employment levels dropped by 23.7 percent. On face value it sounds like we are doing more with less. But, the truth is the companies have achieved these levels by working enormous amounts of overtime and reducing maintenance and construction. The next generation of utility workers must be hired and trained soon. Workers will be needed to replace those who will be leaving the workforce and to bolster the additional numbers needed to repair, maintain, and build the new energy infrastructure needed for our future.

The situation is also dire in the generation sector. The Nuclear Energy Institute (NEI) completed a study showing over 35 percent of their plant workers will be eligible to retire within five years. The IBEW knows that it takes four to five years to train to the journeyman level in most utility jobs. Proof again that we need to hire today to replace the workers leaving in five years. NEI's data shows that 76 percent of craft workers are 43 years old or older.

Jeff E. Sterba, chairman, president and CEO of Albuquerque-based PNM Resources recently spoke to a group of IBEW leaders and said that his company faces the grim reality that within five years 50 percent of his workforce would be eligible to retire, and that 85 percent will be eligible within 10 years.

SUGGESTED SOLUTIONS

The IBEW has been at the forefront of the employment issue for years. We are working with employers to attract people into our industry, and to train them. We have started a regional training center concept that looks to partner with the utilities to train a new generation of workers. We see community colleges and universities as a good resource, but not training centers in the practical sense. Many of our jobs require hands on training that cannot be taught in the classroom. IBEW President Hill has said many times that kids need to be taught how to work. We

understand that being taught by experienced craftsmen is by far the best way to convey skills.

The utilities must start to do workforce assessments and implement plans to hire and retain the future workers in our industry. The IBEW is working with the Center for Workforce Development (CEWD). CEWD is a partnership between all facets of the utility industry; electric, gas, investor owned, co-ops, public power and labor. CEWD has just released a comprehensive study of the energy workforce that you can obtain from their web site www.cewd.org We believe that working together with our employers and the federal government we can be successful.

The IBEW is also at the forefront of anticipating staffing needs on construction projects. The key is working with employers long before the projects start. We have a new program that forecasts construction projects over the next few years to determine how many construction workers will be needed in any given area of the country. We then work with employers to assure we have enough trained and qualified workers available.

The committee has questioned the use of foreign workers. The IBEW believes that the worker shortage we are seeing in the United States is an issue that can be addressed by retraining and including unemployed or underemployed workers displaced by outsourcing and shipping jobs overseas. Therefore, training workers domestically, now, to meet the coming demand is where the industry and Congress should be focusing.

The IBEW is diligently and actively recruiting new workers with job fairs, DVDs, websites like ElectrifyingCareers.com, and even the sponsorship of a race car in its attempt to get a few moments in front of America's youth. Recruitment sites like ElectrifyingCareers.com give broad descriptions of dozens of positions available within the industry and provide easy steps to get more information. The site even tailors its information to the specific needs of students, parents, counselors, and people interested in making a mid-life career change to the skilled trades. Additionally, a website founded and supported by the Building and Construction Trades Department of the AFL-CIO called HelmetsToHardhats.com is specifically designed to recruit people leaving the military, a group that is known for their responsible work ethic and a "team" mentality that leads to success in the construction industry. These online outreach programs are often the first step toward attracting employees to the electrical industry, because they provide information necessary to make smart decisions about their future.

If America is serious about reducing carbon emissions we will need to build thousands of wind turbines, and solar arrays along with new nuclear plants. A transition to carbon-free generation will require different skill sets and training. While the IBEW is working with companies such as Sharp and others to develop training classes, we know that the need for new skills will be enormous. Funding assistance is needed to implement and operate the necessary training programs. It is important for Congress to work closely with labor and industry to attract, train, and retain workers in the energy industry.

The CHAIRMAN. Thank you very much for your testimony.

Let me ask a question of Mr. Szydlowski, first. You have a suggestion here in your testimony that we provide IRS relief on phased retirement initiatives. You say we need the help of these older workers in preparing the new workers—we can't ask them, the older workers, to jeopardize their pension benefits, nor their tax-qualified status or pension plan.

Could you be a little more specific about what you're recommending we do? Do you have people who are approaching retirement age, and who want to start drawing retirement while they're still on the company payroll, is that the idea?

Mr. SZYDLOWSKI. Yes, Senator, it's an opportunity to—I think you may have mentioned this earlier in some of your comments for older workers to not work full-time, but at the same time, have some access to their retirement benefits.

Today there's a change with the Pension Protection Act, which comes into force on January 1, 2008, and I think the final regulations, I think will be out this week, but I understand that the retirement age is set at 62. If the retirement age, for example, was

set at 55, that would allow an opportunity for workers in that range—55 to 62—to work at some amount of time in these roles where they may not want to work full-time, but at the same time, they could help an organization like ours—Colonial Pipeline—do training, keep up with ongoing work, but not risk their pension, lump sum.

To try and explain that just a bit more, the challenge and a lot of anxiety in companies like ours where 55 is a special age, because people are allowed to retire, there's concern about the value of their lump sum benefit. The new Pension Protection Act changes the discount rate—changed it from Treasury's to investment rate bonds. That will be an overall, somewhat a reduction, it looks, in terms of what the lump sum will be worth, and there's anxiety.

There's anxiety that I'm not quite sure what my benefit will be in the future, so it's an incentive to me to retire now, take my benefit, and most of these people, Senator, go back to work. They can't come back to work, in our case, for Colonial, they may go work for a competitor, they may go work for a contractor. They're still eager to contribute, they're not ready to retire. But there's an odd—I would call it a disincentive in our retirement system today, which is encouraging them to leave early.

The CHAIRMAN. Thank you for explaining that, and I'll try to look into that and understand it better. If you have anything written up on that issue, I'd be anxious to get it.

Mr. SZYDLOWSKI. Yes, I do, I'd be glad to send it.

The CHAIRMAN. OK, thank you very much.

Senator Domenici.

Senator DOMENICI. I just wanted to follow-up, because you said a couple of things that I was surprised at. To whom does the 55 year retirement apply? All of the workers in the company you're talking about?

Mr. SZYDLOWSKI. In our company, Senator Domenici. We have—as many companies in our industry have—55 has been set as the eligibility date for a person to retire, the soonest date that they can draw on their retirement benefits. So, it's our—that 55 is our date. It's frequently used, at least in our industry.

Senator DOMENICI. Now, what industry is yours, which part of it?

Mr. SZYDLOWSKI. This would be petroleum and oil and gas.

Senator DOMENICI. Don't you think that is kind of early?

[Laughter.]

Senator DOMENICI. Considering the problems we're having? I mean, it seems to me we ought to be thinking about some way to let them work longer, and not jeopardize their pension, is that what you're talking about?

Mr. SZYDLOWSKI. Absolutely, I couldn't agree more. I think that's the purpose for bringing this subject up. Because, these are folks that are at a time when I think they're very, very productive, we see them as a wonderful asset and resource, and we don't want them to leave. We'd rather have them—their highest and best use is to stay with the company they're with.

Senator DOMENICI. Senator Bingaman's on the committee that looks at that, so I assume he will look at that, you raise a very good issue.

Could I ask you, Mr. Hunter, I'm very concerned about, well, I'm old enough to have lived through Lyndon Johnson's programs—what did he call his ideas? The Great Society? One of the efforts was to establish training centers all over the country, because it was thought that the schools, the regular schools, weren't properly training people for jobs—you go through high school, you weren't trained for a job, you go through community college, you weren't—and then we went overboard, we had three or four different agencies setting up job training centers. So, when I was mayor of Albuquerque, there were at least four that were funded and were out there trying to train people, and they didn't know what the hell they were training them for.

So, one time they reported in, they were training women to be hairdressers? I said, "That's fine, how many are you training?" I know the little town they were training them for couldn't use more than 6, 7. They said, "We've got at least 50 that we're training for Espanola," and I said, "You expect them to work for hire? Fifty of these hairdressers?" They said, "We don't know, but the ladies like it."

Do you envision or see something that we ought to be doing, by way of the Federal Government getting involved in the establishment of training centers, or paying for half of the cost or in some way being involved. I've been dreaming about this, and I'm befuddled but yet as to what the Federal role might be. Know the labor unions are involved, and should be involved, because most workers at a nuclear power plant are unionized, and we ought to see what the union has to do about training them.

Are you the lead union, in terms of training in these fields? Or would we need to get more information as to what programs you all have, and the unions have?

Mr. HUNTER. Traditionally the IBEW, we're obviously, by far the largest in the electrical sector, and we have always trained electricians, we've had our own apprenticeship programs and trained internally.

We've never really been involved in the utility side, because utilities always hired the employees and they trained them themselves.

Senator DOMENICI. I see.

Mr. HUNTER. Now, we're starting to see more and more of a trend to try to use community colleges, Southern Company, for instance, because of the grants in the State, are, you know, kids can come right out of high school, get a grant, go into a community college, and they've partnered up with the community college, along with, you know, the IBEW folks that, you know, we've got poles in the community colleges that the kids can actually climb, they've got bucket trucks, they can see and feel what is the job, even at that level.

That type of concept is what we're looking at to be able to take, especially a six week class, a boot camp, and get the kids out, show them what the industry is all about, what the jobs are about. Because we've got a tremendous drop-out rate. The kids go into the schools after the first couple days, it's like, you know, "No, this isn't what I want to do." So, we're trying to look at how do we orient them to the job, see that they are interested in the job, get them through drug tests and entrance-level tests and all of those

things with an experienced person that can actually convey to them, what does, what's it like working in a nuclear plant?

Senator DOMENICI. OK.

I don't want to take too much time, but I assume that we have had testimony on, by previous witnesses looking at the list, that talk about job training, and how that's done out there? What did the Secretary of Labor say about the Federal Government having—did she talk about programs that we already have for training workers?

The CHAIRMAN. Dr.——

Senator DOMENICI. Secretary——

The CHAIRMAN. [continuing]. DeRocco. She spoke about a variety of programs the Department of Labor has to train people in skills that are relevant to the energy sector, and I think the representative from the Department of Energy did, as well.

Mr. SZYDLOWSKI. Senator, I might add that they have focused on the energy sector, and really have that they have focused on the energy sector and really have directed funds and assistance, if you will, on heightening the awareness of the opportunities within the sector, plus creating a dialog within the Southeast, particularly, with the Southern Governor's Association, to heighten their interest in funding opportunities for different programs. So, they've done a good job of heightening the interest.

Senator DOMENICI. I've been thinking about whether there was a role for the United States to establish something like an Energy Worker Training Act, and then figure out what it would do to help the States and the junior colleges, community colleges, and the like, get involved in the kind of training we need. I still think maybe there is a role, but we have to look at that and see what we could do. We'll talk to the unions, obviously.

Let me ask Dr. Stults, you know, I was really caught by surprise recently when I asked about the wind turbines and wind energy in the United States. You state about how much it was growing, but the truth of the matter is, that there's a backup there in orders where you have to wait a long time to get turbines, right? Two years, I understand? So, even a simple thing like buying the parts for a windmill, you have to wait and most of it comes from other countries, right?

Mr. STULTS. Correct.

Senator DOMENICI. It's imported.

Mr. STULTS. Yes.

Senator DOMENICI. The thing that drives it all, and puts these companies in business is this tax credit, right? That's the principal thing that's driving wind energy. I would assume, therefore, that you would recommend an extension of the credit, would you not?

Mr. STULTS. Certainly. Anything that we can do to stimulate and for the——

Senator DOMENICI. Because, it runs out and you probably need it for more than just 6 or 8 or 10 months, you need it for a couple of more years, and maybe beyond that, right?

Mr. STULTS. We'll need it for extensive time in order to also establish the manufacturing capability and enhance that, and so that we have advanced manufacturing capabilities to overcome the labor cost difference between offshore and in the United States.

Senator DOMENICI. Would a company like Southern, Mr. Bowers, join with a local unit of government that was trying to train people, and put Southern in it, so that they could train for what you need?

Mr. BOWERS. Yes, sir.

Senator DOMENICI. Is that kind of thing being done?

Mr. BOWERS. Yes, sir, they are. We're joining in the State of Alabama and Georgia with the local communities and high schools, creating academies and training initiatives to try to get people in this sector.

Senator DOMENICI. Now where does the money come from to do the training? Is that grants that they get from the Federal Government, or do you know?

Mr. BOWERS. There is grants available for them from the Federal Government, as well as State funds as well. We fund some of that activity.

Senator DOMENICI. You fund some?

Mr. BOWERS. Yes, sir.

Senator DOMENICI. How about you, Ms. Berrigan? You must be out there checking to see what's available for nuclear and be very worried that we don't have enough trained people. Is that a fair statement?

Ms. BERRIGAN. I think that we're paying attention to what the numbers look like and tracking the issue closely. We're also working to share best practices directly with our members, as well as through the Center for Energy Workforce Development on effective means to develop the workforce programs that are necessary to train the workers. So it's definitely an issue that we're paying very close attention to and we're expending a lot of resources on.

Senator DOMENICI. If you're looking out there—this is my last question, Mr. Chairman—if you're looking at all this, could you tell us what is the principal way that business is now training for these skilled jobs. What's taking place out in the marketplace? Do you all know?

Ms. BERRIGAN. There are a number of different approaches that people are taking toward developing a workforce for these skilled jobs. They include programs like—the program that's run through the Central Virginia Community College system, that starts in the high school, continues with the Community College program. Then it's something that we like to call a two-plus-two effort, where after they get an associates degree, it's articulated so they can go on for a bachelors degree and beyond. That's one model of a regional-based initiative. Others are focused on more coordination on a—on a wider scale, using both union apprenticeship, training centers, as well as community colleges and their local university systems.

Senator DOMENICI. One last question of anybody that knows enough about it to tell me. What is the Center for Workforce Development and who pays for it and what does it do?

Mr. BOWERS. The Center for Energy Workforce Development is a consortium of groups. The EEI, the Edison Electrical Institute, AGA, the NRAECA, the National Rural Electric Cooperatives, IBEW, other unions are joint together to heighten the issue and awareness around workforce shortage and workforce training. That group was formed approximately 2 years ago and I was the initial chairman of that group.

Senator DOMENICI. Great.

Ms. BERRIGAN. If I can add. That group is—NEI is also a partner in that group. I serve as the Vice President of the Center and it's funded by utility contributions as well as contribution from the participating associations.

Senator DOMENICI. Does it work?

Ms. BERRIGAN. Seems to be working pretty well so far.

Senator DOMENICI. What do you think, Mr. Bowers?

Mr. BOWERS. It's created a momentum and awareness within the industry as a whole. I think it has gained a lot of status within the sectors to create an opportunity for us to go forward.

Senator DOMENICI. So are you telling young people what you've got? Is that what it is? What kind of jobs they might expect and——

Mr. BOWERS. There are Web sites where it highlights the opportunities for careers in the energy sector, absolutely.

Ms. BERRIGAN. There's also a branding campaign that CEWD has launched just, I guess it was about 2 weeks ago at their annual summit, to educate young people about career opportunities in many of the key areas important to the utility sector.

Senator DOMENICI. Positively my last question. What's the pay scale? If you're telling some teenagers or young adults that they don't have good jobs, and you're saying, "You ought to get trained for the utility industry somewhere out there because they're better jobs." What are they? How much does an ironworker job on a nuclear power plant make if it's unionized and they're hired to do the principal work on a plant?

Mr. HUNTER. I can tell you from the utilities sector, which I came from PEPCO here in the Washington area. I would say that our average lineman across the country is making well over $100,000. Power plant operators—and again, now that's with a lot, a substantial amount of overtime. So, spending a lot of hours on the job.

Senator DOMENICI. Experience.

Mr. HUNTER. Yes. But $100,000 plus is very reasonable.

Mr. BOWERS. Senator Domenici, the wage rates are, for electricians, $25 to $30 an hour, pipe fitters are in the $35 to $38 an hour range. You get per diems, that could push that up to almost $45 to $50.

Senator DOMENICI. So, that's the kind of information you can throw out there to people that are looking at it, if you have a way of getting it to them.

Mr. BOWERS. Absolutely.

Senator DOMENICI. If you're working at a job paying minimum wage plus $2, think of us. We pay four times as much or whatever it is. Right?

Mr. HUNTER. I think the CEWD Web site, if you get into it, it's really neat. It sends the kids—and it's, we're in cooperation with Google, and the kids are, if they're looking for a job, just playing on the Web site. They'll get into the Web site. It's takes them in, it asks them a bunch of questions. Do you enjoy working outdoors, working with your hands, computers, whatever. Then after that, it will steer them and start telling then about different jobs in the utility industry. It will have streaming video where you'll have an overhead lineman standing there telling what his job is and that.

It does have pays, you know, approximate pay scales and that. Then it will also, if you want to continue on down the road, it will actually send you to locations of the country where you can Google earth and I'm, you know, living in Atlanta, Georgia. I'm interested in a job here. Here's all the companies in that area that are hiring, both electric and gas.

Senator DOMENICI. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Senator Murkowski, you're our final questioner.

Let me just indicate that any Senator who has additional questions would be asked to submit those by the close of business tomorrow.

I'm going to have to duck out and make a phone call, so why don't you conclude the hearing, Senator Murkowski.

Senator Murkowski [presiding]: Thank you, Mr. Chairman.

The CHAIRMAN. I thank all witnesses.

Senator MURKOWSKI. My questions will be brief. You have been very patient with all of us, but your information has been very helpful. I think as Senator Domenici has pointed out, there's great stuff out there that just needs to get to the right place.

Mr. Bowers, you mentioned the term stigma. We've got to change the attitude. In so many of the trades, the attitude is "you can do better than me." We've got to be working with the folks that are working at Colonial and Southern Electric and within IBEW, those folks that have young children or teenagers or those that are preparing to go into the marketplace. We don't need them saying "you can do better than me."

You know, this has been the American Dream, you want to do better than your parents. But by saying that, in a way you're denigrating the fact that you've been a linesman and you had a good and a honorable respectable profession, and did well by your family. We need to make sure that in our actions, our statements, our cartoons, plumbers aren't looked at very favorably in many of the cartoons. How did that ever come about? I don't know why. But gosh, what is a plumber making nowadays?

I digress, but I think this is an issue that we've got to focus on. In the State of Alaska, our estimates are that about 70 percent of the kids that are graduating from Alaskan high schools are choosing not to go on to college. Recognizing that as a reality, are we preparing them to take on the career opportunities that really are available through the technical and the skilled occupation. We need to be doing a better job with them.

I serve on the HELP Committee, as does Senator Bingaman. This panel would be great to have in front of the Health, Education, Labor Pensions Committee, as we talk about reauthorization of No Child Left Behind. A focus from the Administration on some very core academic areas, so that we can get you all moving toward college.

That's great, but what happens if you're a kid that isn't destined for college, for whatever reason? We've got to have the guys that are keeping the lights on and keeping the temperatures cool and comfortable so that all these brainiacs can do what they need to do from the policy perspective.

I'm really singing to the choir here, but I wanted to ask generally, to any of you who may wish to respond. From an education policy perspective in this Nation, with our focus towards standards, are we doing enough to prepare young people to go into the fields that you need them in? Or when they come to you, whether it's for training through the IBEW, do you have to prep them for the training that they will then encounter? Mr. Hunter, you're nodding.

Mr. HUNTER. Absolutely. You know, we have probably about 40 percent of the people, there's a caste test that EEI has as an entrance level, which is really basic math, basic reading, fundamental skills. We have over 40 percent of the kids that take it fail. So that becomes a part of what we have to do early on, is——

Senator MURKOWSKI. So you do remedial within your training programs, then?

Mr. HUNTER. Yes, we have to, or you can't get them passed through the caste test.

Senator MURKOWSKI. What about you, Mr. Bowers, in the academy that you all have put together there through Southern?

Mr. BOWERS. That is a vehicle from a voc-tech skills training platform where most of the schools have really stopped providing that as a curriculum. Focused on getting the credits for graduation that leads to higher education, i.e. college. I think we've got to get back to the basic fundamentals, that it's OK to have vocational training and you get credit for graduation and we also supplement, with our workforce, going into those classrooms and trying to train our young folks about the opportunities and get them upgraded in their skills.

Because fundamentally, like Mr. Hunter said, they are failing the simple math and reading and just mechanical concepts. They don't have a clue about what it takes to be productive in this United States, especially in the energy sector.

Senator MURKOWSKI. Yet, if you could get a curriculum that has some relevance to them, they see where the math skills could be taking them to a good, high-paying job, whether it's in the nuclear industry or working pipelines. That gives them the incentive to not only stay in, but to focus on the academic curriculum that they need.

I'm a little concerned that with this needs assessment of the workforce shortage that we're not really projecting out adequately, because we don't really know what we're going to anticipate, whether it's in nuclear or wind or solar or geothermal. That what we are hearing today about the very dismal forecast is going to play out and be even worse than we think it might be. Do you think I'm right or am I being pessimistic this morning?

Mr. SZYDLOWSKI. If I might take a try at this, Senator. No, I think you're quite right, although I have to say this is a good problem to have. This idea of growth and trying to find our way to expand and do more and provide more, I think is a good problem. As opposed to trying to contract and other. But I think we have a—I think we have a pretty good idea of the kinds of needs, the kinds of skilled craft, the kinds of welders and so on, those skill trades that are necessary.

I want to comment on your thought on the stigma. Because I think there's something that everybody can do and it doesn't take

a Federal program, necessarily, to do it. But if you look around this room, I would say everybody here is probably guilty of sort of a stigma of a college-educated person versus someone that's in a voc-tech. I am. I have a son who's 21-years old. The last four or 5 years, I'm sure he convinced he's been a lot wiser than I am.

But Andy was smart about one thing. He got accepted in good schools, he went, he did it, one semester he did terribly, didn't like it. Today, he works two jobs. He goes to Cincinnati State, which is a community college, to be an automotive mechanic. He's never made less than an A in any of his courses and I couldn't be more proud of him.

Senator MURKOWSKI. That's great. That's great.

Senator DOMENICI. He's got a good job.

Senator MURKOWSKI. Yes.

Mr. SZYDLOWSKI. He will have a good job.

Senator MURKOWSKI. Yes.

I thank you all. You're right, it could be worse. We could be faced with a different situation where we didn't have the great resource that we have with our young people, and just need to help focus them in the right direction.

Thank you all.

Senator DOMENICI. One final observation. It's not like all these things I've seen and heard about lead me to what we ought to do. I think it's a very complicated subject because I think it's even a high school issue and it's very hard to get high schools to conceive of the idea that they ought to go forward with some vocational education. That's perceived to be backward, right? That's not forward. But it's forward right now for 30 or 40 percent of the kids, because if they get this, they might work in their life. If they don't get it, they might not, you know. That's 30 or 40 percent.

I was in an elevator in Albuquerque at a big Intel plant. In walked four people, all dressed in the suit that they wear to go into the clean room, C-L-E-A-N, clean room. They all looked about 35, about 34, something like that. I introduced myself and I turned around and started talking to each one and they were training to go to work for Intel at, a program that they each would start at $42,000, $38,000 or $42,000. I said, "That's interesting"—to this one—"what did you do before you applied for this job?" He said, "I got a Bachelor of Arts from Michigan." "University of Michigan?" "Yes." "Oh. You're doing this?" "Yes, best job I can find and much better than anything I can find with the degree that I got." Everyone was degreed and none could find a better job than training for a high-level job with Intel and work in clean rooms and the like.

You know, very interesting, they aren't mad at anybody, but someone like me does wonder, are we misleading those people, especially when the next 10 years we don't have to mislead them about what they could do because we know. They could get terrific jobs. You just told us what they get paid. Especially if they start young and by the time they're 30 they're already very experienced, that they make very good money if they work on a nuclear power plant, right?

Mr. BOWERS. Absolutely.

Senator DOMENICI. They're in the union, they get all the benefits, and they go to the next job. I think we're going to have to realize

that we either talk our kids into it with programs that are meaningful or we're going to have to find somebody else to do the jobs. I know we don't want to do that. I know you don't. But, you know, it might be that that's what immigration does for this country, if we get that off, you know, far enough down in the direction of not having anybody that wants these kind of jobs.

I thank you for yielding.

Senator MURKOWSKI. Thank you.

With that, we're adjourned.

[Whereupon, at 12:10 p.m., the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSES OF W. PAUL BOWERS TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. You note on page 3 of your testimony that the demand for skilled workers in the Southeast was 120,000—20,000 short for 2007 and that the demand is expected to grow to 170,000 by 2011. How serious are weather and other disruptive events like Katrina on the availability of skilled workers and how long does the disruption typically last?

Answer. Southern Company must continually monitor weather and weather-related events in order to prepare for and respond to any disruption caused to the planned operation of the electrical system. Be it through high temperatures and their impact on load; continuing drought and its impact on hydroelectric and other generating resources; or severe storms and tornados and their impact on generation and transmission facilities, weather impacts can require the redirection of resources and skilled craft personnel to address and resolve sudden problems caused by the weather.

Catastrophic events such as Hurricane Katrina only magnify the disruption caused to the electrical system, and as might be expected, deplete the available skilled craft workforce required for generation activities such as maintenance, new generation resource construction or environmental retrofit construction. Initially, such workers are called upon for emergency restoration and clean-up efforts. Over time, those efforts are replaced by the need for the restoration of infrastructure, as well as the reconstruction of commercial and residential facilities. Although Southern Company's labor market analyses do not track the demand for skilled craft labor associated with Katrina recovery and restoration, Southern Company expects the labor market to experience increased competition from Katrina-related projects for years to come. However, it should be emphasized that the shortfalls described in my testimony are baseline figures (regional generation construction projects and other major industrial plant activities) that do not factor in projected workforce commitments that would be required in the aftermath of another catastrophe like Katrina.

Question 2. You note on page 5 of your testimony that only around 40% of applicants could pass entrance for employment at Southern—are these for skilled labor positions? Can you please explain what these tests typically consist of?

Answer. Southern Company utilizes two different employment tests as part of its consideration of potential new skilled labor hires: the CAST (Construction and Skilled Trades Selection System) aptitude test for Transmission and Distribution candidates; and the POSS-C/MASS (Plant Operator Selection System/Power Plant Maintenance Selection System) test, which includes an aptitude test as well as a background and experience questionnaire for Generation candidates. These tests were developed specifically for the electric utility industry by investor-owned electrical utilities (including Southern Company) in conjunction with the Edison Electric Institute, and have been utilized effectively throughout the industry for the past 20 years.

CAST is a cognitive ability test that measures specific candidate faculties that are predictive of job performance for Distribution and Transmission positions in the electric utility industry, including graphic arithmetic, mathematical usage, mechanical concepts and reading for comprehension. The CAST test contains a total of 110 questions and takes approximately 2.5 hours to administer.

POSS-C/MASS is a combined test battery that measures both cognitive faculties as well as background and experience that are predictive of job performance for

Plant Operations and Maintenance positions in the electric utility industry, including math usage (short and long), assembly, mechanical concepts, tables & graphs, reading comprehension, and background and opinion questionnaire (total of 402 questions). The POSS-C/MASS test contains a total of 402 questions and takes approximately 3.5 hours to administer.

Candidates are not expected to complete each question in each test, and candidates are not penalized for unanswered questions. Each test component is weighted in such a way as to maximize the prediction of job performance. The scores on each component are combined to achieve a raw score. This means that strong performance in one test component can compensate for weaker performance on another test component. Candidate scores are compared to the cutoff score established by Southern Company to determine those who are recommended for further consideration.

It is worth adding that applicants who have completed specialized training programs, such as the academies in Florida affiliated with Gulf Power Company, have a significantly higher passage rate of the entrance tests than applicants without such instruction. In the case of Southern Company's Gulf Power Academy graduates, passage rates approach 100 percent.

Question 3. On page 6 of your testimony you note that high paying skilled craft work is seen as undesirable as a profession—what would recommend to alter that image?

Answer. Altering the image of skilled craft work as undesirable will require concerted efforts of industry, educators and governmental leaders toward changing that perception as it exists among those entering the general workforce. One way to change that perception is to increase awareness and understanding of what skilled craft work entails and what levels of compensation are commensurate with the work. Specifically, and as I noted in my testimony, many individuals do not recognize the fact that skilled craft work can be high paying, often in excess of state averages, with competitive benefit packages. A national advertising campaign may be one way to tackle this issue. Ideas circulating about the industry for which federal assistance would of significant value include a "Get Into Energy" campaign, as well as an umbrella campaign titled "We Build America" that encompasses a number of industries into a larger group of potential skilled labor careers.

Another approach is to ensure that such career options are integrated into the career awareness processes employed at the middle and secondary school levels and presented as a viable career option to students. Students often choose a course of study as early as the eighth grade that can determine whether or not they will have the academic and technical skills required by our careers. Unless students and their parents are fully informed about the avenues available within the energy industry, candidates who might consider learning the technical skills that would be useful for such a career could be missed. To accomplish this objective, funding assistance for the placement of career counselors at middle and secondary schools, as well as community colleges, would be of great assistance.

Southern Company also has sought to alter the negative opinion of utility industry careers through its creation of, and involvement in, technical programs for secondary students. With the support of educators, the success of efforts can only grow. However, as I explained in my testimony, many schools have begun to phase out, or already have phased out, technical programs, in order to comply with certain federal and state educational standards that do not accommodate a technical education curriculum. Thus, federal and state policymakers need to work with educators and with those in industry to develop and implement workable solutions that allow students to pursue technical studies and reward those students who do so and excel. The Career and Professional Education Act in Florida is one such example.

There is also concern that society as a whole has devalued the importance of a strong work ethic, particularly associated with the labor requirements expected from skilled craft positions. Changing perceptions in this respect is a more difficult task, given the complexity and magnitude of the issue. Nonetheless, Southern Company is involved in several organizations, such as the Center for Energy Workforce Development (CEWD) and Construction Users Roundtable (CURT), which are exploring ideas associated with a national marketing campaign to promote energy industry careers. As with efforts in the educational arena like those discussed above and in my testimony, assistance and support from state and federal policymakers is an important component to the future success of these and like efforts.

Question 4. There are skilled manufacturing jobs elsewhere in the United States which are loosing employment, whether it is outsourced or through declining sales, is it possible to retrain these skilled workers for the utility industry?

Answer. As a general matter, individuals skilled in certain manufacturing jobs can be very capable of transitioning into the skilled craft positions needed to support

the utility industry. In the case of Southern Company, its internal staffing recruiters, service providers, as well as organized labor supporting its plants make efforts to reach out to individuals facing layoffs with manufacturing facilities and alert them to the availability of skilled craft work in the utility industry. Other industries are doing the same, however, as evidenced by the relatively low unemployment statistics in the Southeast. On this point, it is notable that employment statistics for the month of October showed Alabama with an unemployment rate of 3.1 percent (compared to the national rate of 4.7 percent).

The extent to which these efforts can be expanded or improved in part depends on the extent to which there are other individuals who possess skills and experience that are directly transferable or who can be retrained and the costs associated with such retraining. On that front, assistance from federal and state authorities would greatly facilitate the ability of those in industry to commit the time and resources that would be needed to investigate the potential of transitioning skilled manufacturing labor to the utility industry, and then implementing any required retraining programs in order to bolster the actual skilled craft workforce.

Question 5. On page 12 of your testimony you recommend flexible teacher training programs where skilled energy crafts can teach in schools—has anyone discussed this with the Department of Education?

Answer. Although Southern Company is currently working with individual state education systems to address this issue, Southern Company itself has not had any such discussions with representatives of the Department of Education, and is not aware of the extent to which discussions have been had with the Department by others in industry. Southern Company welcomes the opportunity to do so, and would appreciate any direction from this Committee as to whom we should direct our inquiries.

RESPONSES OF W. PAUL BOWERS TO QUESTIONS FROM SENATOR DOMENICI

Question 1. In your testimony, you provide an example of how Southern Company optimizes its skilled labor through scheduling. Are there other examples of how to optimize available labor?

Answer. In addition to scheduling, Southern Company endeavors to optimize its skilled craft labor force through the meticulous planning of maintenance and project development tasks. Southern Company also has implemented leading industry practices in connection with its construction and maintenance management processes. Another way Southern Company has optimized its contracted skilled craft workforce is through progressive labor agreements for its projects utilizing organized labor, as well as the maintenance of a balanced labor posture, using both union and non-union labor, for the plants it constructs, operates and maintains.

Question 2. Are you aware of any regional disparities in future energy workforce demand? More specifically, will these issues have a more profound affect on the Southeast than in other areas of the Nation?

Answer. As discussed in my testimony, the workforce shortages that Southern Company foresees are being exacerbated by the confluence of an aging workforce and increases in energy demand. These factors generally are common across the Nation. However, energy production from electric, gas and oil and alternative fuels in the Southeast region is expected to increase at higher rates than many other areas. In addition, damage from hurricanes striking the Southeast in 2004 and 2005 is estimated at over $150 billion. Thus, a regional disparity with respect to competition for skilled labor likely is being experienced in the Southeast and is expected to continue for the foreseeable future. With this increased competition, there also is some expectation that the demand for skilled labor will impact the availability of such labor in other areas of the country. For instance, regions of the country that have relied in the past on skilled workers based in the Southeast to serve their projects when need arises will encounter a limited pool of workers who may tend to serve the existing (and increasing) projects at home, rather than travel in order to obtain work.

RESPONSES OF ANDRA CORNELIUS TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Your testimony on page 17 notes the creation of a "Banner Center" in renewable energy center at the University of Central Florida—would you be able to explain this in a little more detail?

Answer. Employ Florida Banner Centers, an initiative of Workforce Florida, target industries that are critical to growing Florida's diverse economy. They serve as clearinghouses for companies needing training and create relevant and rigorous new curricula for training entry-level workers as well as those who need to upgrade their

skills. Each Employ Florida Banner Center, most of which are based at Florida community colleges or universities, has an advisory council made up of industry leaders along with state and regional education, economic development and workforce stakeholders. Banner Centers have the design and aspiration to become go-to centers that serve as statewide resources for just-in-time workforce training in key sectors. They offer an innovative and strong foundation for building the pipeline for better-skilled workers in Florida's high-value industries. The initiative already is drawing national attention for its innovative approach to leveraging partnerships to expand training opportunities. The 10 existing centers and the two new programs that are about to get under way (one of which is the Banner Center for Alternative Energy) all engage educational institutions, businesses, and workforce and economic development partners, among others, to provide a focal point for industry-specific skills training.

The Banner Center for Alternative Energy was awarded competitively in September 2007 to the University of Central Florida, Florida Solar Energy Center, based in part on its mission—to research and develop renewable energy, energy efficiency and alternative energy technologies that enhance Florida's and the Nation's economy and environment. Sunlight is a compelling solution to our need for clean, abundant sources of energy in the future. Among this center's deliverables in year one will be to focus on solar thermal (solar water heating) and photovoltaic device installation and service technician training, in partnership with other educational institutions statewide. The technicians will be able to receive industry-recognized certification from the North American Board of Certified Energy Practitioners. Given that Florida will soon be the third largest state in the Nation, and that about 53% of energy consumed in Florida is by its residents, solar thermal and photovoltaic technologies offer two viable solutions provided that more technicians are developed through targeted training. Additionally, to spur solar energy uses, particularly among residents, the Florida Legislature is becoming more active in the support of solar related projects. In the 2006 session, the Legislature appropriated $2.5 million for solar hot water and photovoltaic rebates. The 2007 Legislature continued the rebate program with funding set at $3.5 million. (To find out more about Employ Florida Banner Centers, go to EmployFlorida.com.)

Question 2. How do you track the success of your program, do you have established metrics?

Answer. The Florida Energy Workforce Consortium, just 18 months old, is in process of articulating its benchmarks to track progress on goals. We will focus on results rather than process in such areas as:

- Increasing the number of rigorous new career academies at the secondary level in construction and/or electrical technology
- Increasing the number of graduates from training programs in critical occupations
- Comparing the graduates scores on pre-employment tests (e.g., Edison Electric Institute) to those of other applicants and their retention rates
- Increasing the number of industry-recognized certifications awarded
- Employer satisfaction of the graduates from the Employ Florida Banner Center for Energy
- Leveraging and tracking private and public sector funding from energy companies targeted toward workforce development
- Increasing the number of training graduates placed in energy jobs

Question 3. Do your graduates tend to stay in Florida or do they migrate to regions where there is greater demand?

Answer. Given the growth rates in Florida, our graduates tend to stay in our state and very often stay in their region of training. One of the early precepts of the Florida Energy Workforce Consortium is that given the steady demand for talent in this industry sector, it makes good business sense and offers a more lasting solution to grow your own workers rather than to poach from each other from a limited pool of workers. The "growing your own" workforce strategy often enables a company to attract people with ties to the area who are likely interested in maintaining their roots.

Question 4. The unions like IBEW have strong apprenticeship programs, how does your program work with these union programs—are they feeders for the skilled workforce such a utility lineman?

Answer. The IBEW is an important member of the Florida Energy Workforce Consortium due to their historical role in developing talent for critical occupations like line technicians. We are learning how to further expand the apprenticeship model in Florida, in partnership with our energy companies and educational institutions along side other innovative talent development models. For example, in June 2002,

the Florida Legislature, through its Office of Program Policy Analysis and Government Accountability, did an analysis of apprenticeship programs in the state—both union and non-union—and found that the programs were indeed beneficial, but were limited in meeting state demands. The Florida Energy Workforce Consortium will be receiving an update from the Office of Apprenticeship, Florida Department of Education, at its December 2007 meeting, to learn about improvements in the program since 2002, funding levels and what we can do together to meet the state's needs. The demand for workers in critical occupations is such that we will need to do all we can, building on traditional models and embracing new models, to generate sufficient worker supply.

RESPONSES OF ANDRA CORNELIUS TO QUESTIONS FROM SENATOR DOMENICI

Question 1. It seems that workforce issues are best addressed at the State and local level. What role do you envision for the Federal government when addressing energy workforce issues beyond federal funding to state programs?

Answer. Other than federal funding to state workforce training initiatives for this industry sector, we offer the following suggestions to increase improved performance and accountability:

1. Encouraging cross-agency workforce solutions (e.g., Departments of Labor and Energy) and co-mingling of funding opportunities.
2. Streamlining requirements that allow and encourage industry professionals to teach in career and technical education settings.
3. Allowing the opportunity for academic credits to be given for career and technical education to enable more students to have time on their schedules to accommodate this track.
4. Mandating that career and technical education result in industry-recognized credentials for graduates (similar to the Florida Career and Professional Education Act) and for participating educational institutions to receive increased funding based on Career and Technical Education (CTE) student hours.
5. Incentivizing performance accountability that focuses on outcomes rather than process improvements.
6. Aligning and coordinating investments in energy workforce training and education to reduce duplication and support best practices
7. Funding and support for utility technology and energy awareness in K-12 to include coal, nuclear and natural gas
8. Funding and support for energy career awareness in K-12
9. Funding support for pre-apprentice career and technical education

Question 2. Are you aware of other programs in other states similar to the Gulf Power Academy?

Answer. I am aware of no other programs in other states similar to the Gulf Power Academy in structure, nor performance (outcomes). However, one of the first career academy's in the United States was in energy so there may be best practices elsewhere from which to learn.

Question 3. Is there any best-practice data available for state programs such as Workforce Florida, Inc.? If not, would it be useful?

Answer. As the nonprofit, public-private organization charged with setting policy and overseeing the state's workforce system, Workforce Florida continues to lead through its commitment to accountability, responsiveness and innovation. It does so by linking workforce, economic development and education strategies through business-driven initiatives and programs to ensure Florida's workforce has the skills needed to support the state's enterprises and thus the economy. Workforce Florida also promotes an environment in which Floridians have the opportunity to upgrade their education and skills to obtain jobs that lead to greater economic prosperity. This work is supported by key workforce system partners—the Agency for Workforce Innovation (state agency responsible for administrative and fiscal affairs), the 24 regional workforce boards (primarily responsible for service delivery) and the nearly 100 one-stop centers (bricks-and-mortar gateway to services and resources for most businesses and job seekers).

Here are some of the accomplishments in 2006–07:

- More than 766,000 people were served through a one-stop center, which offers a range of employment and training services to individuals as well as businesses.
- About 75,000 veterans, including 9,300 who had recently left the military, and 1,500 family members of Florida veterans received workforce services.
- Workforce Florida's popular training grant programs available to Florida businesses, Quick Response Training (QRT) and Incumbent Worker Training (IWT),

awarded $17.2 million in grants to train nearly 30,000 workers. Businesses responded with cash and in-kind matches projected at $263 million in investments for improving their workers' skills.
- Ten new Employ Florida Banner Centers were launched, mostly at community colleges and universities, to increase the availability and quality of cutting-edge training for new and experienced workers in high-skills, high-wage sectors such as biotechnology, energy, health sciences and aviation and aerospace that help diversify the state economy—a top economic development priority in Florida.
- At the end of June 2007, Florida's unemployment rate of 3.5 percent was one percentage point lower than the national rate of 4.5 percent, continuing the below-the-national-average trend that started in mid-2002. Florida also had recorded 58 consecutive months of job growth, gaining about 113,700 more jobs than a year ago. Industries gaining the most new jobs were education and health services, leisure and hospitality and professional and business services. Job losses were in construction, manufacturing and information.

Workforce Florida's continued success at responding to the training and employment needs of businesses and citizens is rooted in its continuing efforts to foster collaboration not just throughout the workforce system, but among partners in education, economic development, industry and elsewhere. The responsiveness and flexibility of this organization allows us to act and react quickly to workforce needs, such as those expressed by the energy industry sector.

Question 4. In your testimony, you state that to build our energy workforce, we "need to convince young workers that the industry is a desirable one to work for, [that] they must understand the industry produces a commodity that is essential to society and to our quality of living [and that they] must also be taught that those who work in the industry are environmentally responsible and that the jobs are stimulating and pay well." Are these factors identified because they are current inhibitors to a stronger energy workforce?

Answer. The image of the energy industry is in need of improvement, as stated by many company representatives in the Florida Energy Workforce Consortium. For the first time, the energy industry has had to promote itself in the job marketplace, due to a number of factors including tight labor markets, an increasing number of retirees with fewer workers to take their place, and a diminished focus on career and technical education. The current image of jobs in the energy industry is less than desirable—hot, dirty, repetitive and risky. This is further exacerbated because many teachers and guidance counselors, who are the existing source of career information, have limited, if any, knowledge about the energy industry, the kind of jobs within it, the career paths and earning potential, or how one enters a job and advances in this sector. Students and guidance counselors are unaware of the cutting edge technology and safety practices that are utilized by utility employees to fulfill the critical role they play in providing energy to their communities. For this reason, building career awareness of the well-paying jobs in the sector is cited as one of the top priorities of both the Florida Energy Workforce Consortium and the Center for Energy Workforce Development. Additionally, the Consortium and the Center are affirming the importance of career and technical education in secondary education, particularly those educational programs that convey industry-recognized credentials to program graduates.

RESPONSES OF EMILY STOVER DEROCCO TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. As you know the U.S. energy industry is large and diverse. Does the Department of Labor have a good data base on the extent of the workforce problem facing our Nation from which to develop training programs at both the skilled labor and professional levels?

Answer. I am pleased to report that the Department's Employment and Training Administration (ETA) is fully engaged with multiple sectors within the energy industry in order to ensure that the workforce investment system has aligned its strategies with the needs of the industry. Our information on workforce issues facing the energy industry is not maintained in a single database, but relies on a variety of sources. One source is a 2007 report that discusses workforce shortages in three major energy sectors—utilities, mining, and oil and gas. It is in this industry report where we note that the average age of workers in the energy industry is now over 50, and that the industry estimates that up to half of its current workforce—more than 500,000 workers—will retire within 5 to 10 years. This report also notes that the utilities sector expects it will need to replace approximately 25,000 workers by 2015, that the mining sector expects to replace half of its workforce over the next

seven years, and that the total number of workers in the oil and gas sectors will decline 28 percent by 2012.

ETA considered it a critical step to find mechanisms to better understand the future direction of the energy industry. To that end, as part of the President's High Growth Job Training Initiative (HGJTI), we have done extensive research with industry leaders about the workforce challenges facing the sectors of the energy industry. In 2004, after conducting a scan of the energy industry to gain a better understanding of the opportunities and challenges it faces, ETA met with chief executive officers (CEOs) from across the energy industry to learn about the growth potential of their industry and to understand workforce challenges critical to continued growth. We then conducted a series of workforce solutions forums with industry human resources executives and representatives from the education and the public workforce investment system. These solutions forums were designed to compile industry-driven strategies that would address the workforce challenges of the industry. The results of these sessions, along with the statistics referenced earlier, are summarized in an Industry Report which is available online at http://www.doleta.gov/BRG/pdf/Energy%20Report—final.pdf.

As a result of our continued engagement with industry partners, in August of 2007, ETA convened an Energy Skilled Trades Summit where we met with leaders from the energy industry, education and the workforce system and heard first-hand about their workforce challenges. Among the over 300 attendees were four governors and 20 CEOs of major energy and construction firms. We hosted this event in partnership with industry associations, such as the Nuclear Energy Institute, the American Petroleum Institute, Edison Electric Institute and the Center for Energy Workforce Development, to call attention to the workforce needs of the industry in the Southeast States and to help facilitate a collaborative public-private approach to addressing these needs. Research conducted by these organizations provided background for discussion about the industry's critical workforce shortages at the Summit.

ETA also maintains a database of its own strategic investments in the energy industry that have been made through the HGJTI, the Community-Based Job Training Grants (CBJTG) and the Workforce Innovation in Regional Economic Development (WIRED) Initiative. To date, ETA has invested over $150 million in 37 projects across these three major initiatives. The HGJTI and CBJTG have trained over 86,000 participants, many of them in the energy sector.

Finally, we are working closely with the Department of Energy (DOE) to obtain labor market information on workforce issues facing the energy industry. ETA, in conjunction with our colleagues at DOE and the Department of the Interior, are commissioning the National Academy of Sciences to conduct a study on the availability of skilled workers in the energy, mining, nuclear, and alternative energy industries. By bringing together the workforce data collected by ETA and the Bureau of Labor Statistics, connecting with business leaders in the energy industry, and working with our federal colleagues at DOE, we are developing a comprehensive, data-driven, demand-driven picture of the workforce challenges facing the industry. It is this synergy that allows us to make informed policy decisions with federal and non-federal resources when developing training programs at both the skilled labor and professional levels.

Question 2. How early in their educational career are potential workers being targeted by the Workforce Investment System? Is it possible to push this into working with workers when they are even younger?

Answer. Currently, through both formula and discretionary grant programs, the workforce investment system engages youth as young as age 14 who face barriers to school completion and employment, to prepare them for the 21st century workforce. Over the past two years, ETA has worked steadily on implementing its Shared Youth Vision Initiative which asks employers to define the skill needs for the emerging youth workforce and to pair those skill needs with workforce investment system resources. Multiple education pathways are used to reconnect the neediest youth with education and career options, especially dropouts. These pathways are developed by mapping a variety of alternative learning strategies and environments that provide academic instruction that is rigorous and challenging, as well as relevant to emerging occupations and careers through applied learning strategies. Alternative learning environments such as career academies allow students to apply their academic course work to the world of work through internships and business involvement in curriculum design and instruction, with the goal of increased student achievement, preparedness for post-secondary education, and a greater ability to transition into in-demand careers.

Many industries, including energy, have identified significant challenges related to the capacity of high school graduates to enter higher education for careers that

require strong foundational Science, Technology, Engineering, and Math (STEM) skills. ETA is currently working collaboratively with our colleagues at the Department of Education and the National Academy of Sciences to focus on new education models at all levels, with a strong emphasis on applied learning in order to also expose students to careers in industries like energy. In addition, STEM education is a key focus in ETA's 39 funded WIRED regions, which are incubating many new models that will be shared nationwide.

Another area of focus for ETA has been to develop partnerships and tools that support strong career awareness and guidance. In partnership with industry and the Department of Education, ETA hosts the Career Voyages Web site (www.careervoyages.gov). Targeted to young people and career changers, this Web site highlights career information in a wide array of high growth, high demand industry sectors, including the energy sector. The Web site, containing a wealth of user-friendly labor market and economic development information, is designed to be used by students, as well as their parents, teachers and guidance counselors. By having a presence on the Internet, we are hoping to reach a younger generation of future workers and make them aware early on in their career decision-making process as to the opportunities that exist in the energy industry.

As a complement to Career Voyages, ETA has published print copies of InDemand magazines, which focus on high growth industry careers. ETA has sent over a million copies of these magazines to high schools across America. This information can be read or downloaded from the Career Voyages Web site, and ETA is particularly proud of the magazine developed for the energy sector, which can be found at http://www.careervoyages.gov/indemandmagazine-energy.cfm.

In an effort to help parents support their children's education and career decisions, ETA has also partnered with the National Parent Teacher Association to provide school personnel, students, and families with information that will better enable high school aged youth to utilize available resources to assist with career planning and to help them make the right academic decisions that will support successful transitions from school to work. We are currently working on tools for specific industry sectors, such as energy, as the next step in that partnership.

Question 3. How is the Department of Labor ensuring that workers are being prepared for energy related careers that will be permanent and lasting? Is DOL targeting career training that will translate into other positions as the energy model expands and adapts to innovation and new technology?

Answer. All of ETA's efforts are designed to help both students and adults gain access to postsecondary education and education pathways that will provide access to careers. During this administration, ETA has been working to guide the workforce investment system to become more demand driven, ensuring that individuals served by the system understand the jobs available within the industry sectors that drive their economies. ETA has used the HGJTI as a key vehicle to drive this approach in the energy sector and other high growth industries.

As a result of the HGJTI, today governors and State Workforce Investment Boards are routinely identifying targeted industry sectors as part of their strategic plans under WIA, and this leads to training resources being targeted to help skill individuals for employment in the energy industry.

As your question implies, in the current economy, there is a need to ensure that we have a workforce with highly transferable skills. To support the workforce investment system and its education partners in understanding how competencies may cut across industry sectors, ETA is currently working with the Center for Energy Workforce Development (CEWD) through the HGJTI. CEWD and its partners have created a Web site, Get Into Energy (http://www.getintoenergy.com), that provides information on the industry, career opportunities, competency and skill requirements, and information on where to access training. Through the site, educators (and parents) have access to lesson plans and tools for communicating opportunities in the energy industry to students. The key components of the Get Into Energy site are a career assessment tool, a competencies and skills tool, a salary comparison tool, a training and job locator using Google Earth technology, and a utilities lineman career profile video that serves as a model for videos on additional occupations.

Question 4. How successful have these programs been—do you have tracking metrics? Your testimony points to the amount of investment but what is the success rate of the Workforce Investment System? How successful has DOL been in meeting the training needs of employers and employees?

Answer. The performance measures for the workforce investment system are entered employment, retention, and earnings. These measures allow ETA to evaluate its progress in meeting the core purposes of our programs, namely, how many of our program participants got a job, how many stayed employed, and what were their

earnings. To date, the workforce investment system has demonstrated the ability to be responsive to the needs of both high growth industries and program participants. For the WIA Adult program, nearly 80 percent of those who received training obtained immediate employment and of these individuals, more than 86 percent maintained their employment. The WIA Dislocated Worker program also performs at a very high level, with 86 percent of those who received training entered employment and 91 percent retained employment. Both programs have consistently sought to increase the earnings of their trainees by placing them in high growth, high wage occupations with career ladders. Overall, we believe these measures and results accurately describe our effectiveness in focusing our education and training investments to meet the needs of high growth industries, such as energy, and to facilitate local, regional, and state talent development for occupations in demand.

In addition to our WIA investments, ETA has three major job training programs currently underway—the President's High Growth Job Training Initiative (HGJTI), the Community-Based Job Training Grants (CBJTG), and our newest initiative, Workforce Innovation in Regional Economic Development (WIRED). Each provides training tailored to the skill and occupational needs of the energy industry in regional economies. To date, the HGJTI grants have trained 73,430 participants and the CBJTG have trained 13,466 participants, many of them in the energy sector. For example, the College of Eastern Utah was awarded a $2.7 million High Growth grant to consolidate training curricula that are applicable to multiple sectors of the energy industry and will ultimately aid employees looking to enhance their skills for promotion or career changes. This project creates a conduit among local, state and federal workforce agencies and the energy industry to more effectively leverage workforce system resources and meet industry needs. To date, the project has trained 3,600 workers and built the capacity to train up to 2,100 people annually. Another example is the $2.4 million High Growth grant to the Wyoming Department of Workforce Services to establish the Rocky Mountain Oil and Gas Training Program. This program is designed to provide safety training for heavy equipment operators, truck drivers, crane operators, and safety coordinators through a simulated work environment on a 76 acre simulated oil and gas field. As of Spring 2007, the program had trained and certified 425 workers, with 411 getting jobs.

Further, ETA has focused on creating a demand driven public workforce investment system that is dedicated to serving the needs of business. The workforce system understands that serving employers and workers is critical and many states have highlighted energy, both traditional and alternative, as a key industry in their WIA plans. This industry focus is driving the allocation of resources at all levels of the workforce system to the benefit of employers, workers, and the Nation's economic competitiveness.

RESPONSES OF EMILY STOVER DEROCCO TO QUESTIONS FROM SENATOR DOMENICI

Question 5. You note in your testimony that employers of all sectors of industry will need workers who are more proficient in math, science and technology. Senator Bingaman and I worked very hard on the America COMPETES Act, which was enacted earlier this year. This new law will go a long way to strengthening the brainpower of our young people who will be the next generation of scientists and engineers. How can we build on the provisions of the America COMPETES Act to make sure it is serving the needs of the energy sector?

Answer. As mentioned in my testimony, one of the workforce challenges in the energy industry is the misconception that energy jobs are low-skilled, require little education or training, and provide inadequate compensation. From alternative energy and nuclear energy to utilities and natural resource refinement, the U.S. will need workers at all levels in the energy industry in the foreseeable future. From the skilled trades (such as welders, electricians, and pipe fitters) who will build and maintain our Nation's power plants, to the scientists, engineers, and operators who will run them, the energy sector needs a talented, well-educated, well-trained workforce.

The America COMPETES Act will help erase the traditional stigma against energy careers by promoting education in Science, Technology, Engineering and Mathematics (STEM) and raising awareness about career options where we need it most—in our schools. We need to be reaching our Nation's young people long before they transition out of high school.

Further, by promoting STEM awareness and mentorship in STEM careers to elementary and middle school students the America COMPETES Act helps to alleviate the stereotype about energy careers. Grades one through eight are critical in a child's life when career choices and perceptions of the workplace are beginning to be formed. Once interested in STEM, students can begin to explore career options,

including those in the energy industry. Summer internship programs for middle school and secondary school students in STEM, the establishment of statewide specialty schools that provide comprehensive STEM education, and the creation of regional Centers of Excellence in STEM in secondary schools will each provide opportunities to promote careers in the energy industry. Future generations of young Americans will associate the energy industry with lucrative, fulfilling careers as scientists, engineers, mechanics, as well as the skilled trades, and provide the power we need to not only keep the lights on, but to keep our competitive edge in the global economy.

While ETA is working to support activities to inform students about career pathways and opportunities specific to STEM careers, we have more of an impact through the public workforce investment system on individuals who are typically disconnected from the traditional education system. The workforce system assists workers who may not be equipped with STEMS skills, but who can utilize the resources of the system to gain these skills. By providing meaningful career guidance and access to training resources, such as apprenticeships and technical education, the workforce system plays an important role in transitioning workers into high-skill and high-wage job opportunities in the energy industry and others reliant on STEM skills.

In addition to reaching out to our Nation's youth and adult workers, we must improve America's competitiveness in the areas of technological innovation and STEM by leveraging and aligning Federal funds in education, research and development, facility construction, and public-private partnerships. Any additional Federal investment in these areas will contribute to a collaborative effort that must bring together many resources—government, private industry, and education, financial and human capital, and brick-and-mortar assets such as laboratories.

This type of integrated approach to solving our Nation's workforce challenges is what the Department has been undertaking since 2006 through our WIRED initiative. As mentioned in my testimony, 13 of the 39 WIRED regions are focusing on workforce challenges in the energy industry. Within these 13 regions, the breadth of activities spans the energy industry spectrum, from biofuels research in the Arkansas Delta, STEM education and skill development in Colorado and Michigan, alternative energy in Indiana, to renewable energy in Minnesota and New Mexico. The Department's WIRED investments complement the mission and objectives of the America COMPETES Act, while at the same time addressing the workforce needs within the energy industry.

Question 6. I was interested to learn that the Department of Labor has 13 regional initiatives focused on the energy industry, including one in Central New Mexico. I was also interested that other regional partnerships are working with Oak Ridge National Lab in Tennessee, and with the National Renewable Energy Laboratory in Colorado. Do Sandia and Los Alamos participate in the regional partnership efforts in New Mexico? If not, do you see a way that the New Mexico labs could add value to the regional effort?

Answer. I am pleased to report that both Sandia National Laboratories and Los Alamos National Laboratory are full partners in our WIRED investment. Both facilities have committed to making their resources available to support technology maturation projects being developed onsite. Additionally, Sandia National Laboratories will be making internships available for students in support of its ongoing programs and as part of the National Institute for Nano-Engineering, which is a new educational outreach program being established at Sandia Labs. More information on this investment is available in my written testimony.

Question 7. You note in your written testimony that few portable credentials have been developed in the energy industry. (A) Is there a role for the Department of Labor in helping industry develop standardized credentials for its workforce?

Answer. Yes, there is a role for the Department of Labor in helping the energy industry develop standardized credentials for its workforce.

The development of credentials is usually a multi-phase process: 1) assemble an industry agreed-upon body of knowledge, competency model, and/or skill standards; 2) develop a curriculum to teach the required competencies (knowledge, skills, and abilities); 3) develop an assessment of the competencies; and 4) establish an industry-recognized certification based upon successful completion of the assessment and other requirements.

Developing and administering actual assessments and certifications require specific subject matter expertise and intensive industry involvement. Within our resources, and given the wide scope of different industries that we work with, ETA has made the strategic decision to focus on the development of industry competency models and related curriculum as the foundational pieces in assisting industry in developing credentials.

The President's High Growth Job Training Initiative identified industry 14 sectors, one of which is energy. These sectors are projected to add substantial numbers of new jobs to the economy, affect the growth of other industries, or are existing or emerging industry sectors being transformed by technology and innovation requiring new skills sets for workers. Through the initiative, ETA has worked with business leaders to create comprehensive and readily accessible documentation of the skills and competencies required in a variety of high growth, high demand industries.

These industry competency model frameworks assist businesses, educators, and workforce professionals in developing education and training programs that effectively address core competencies, such as having basic familiarity with computer applications and selecting the right tools to solve problems. The goal is to advance understanding of the skill sets and competencies that are essential to educate and train a globally competitive workforce.

In partnership with the Center for Energy Workforce Development and representatives of member companies of the Edison Electric Institute, work is underway to develop an energy competency model. ETA has also funded projects to develop curriculum in the energy sector through the HGJTI and the CBJTG. These initial steps by ETA, the development of an energy competency model and an energy curriculum, are leading to standardized, portable credentials across the energy industry.

Question 7B. Should the Departments of Labor and Energy work in partnership to address this issue?

Answer. ETA is committed to working in close partnership with the DOE to develop standardized credentials in the energy industry. Although DOE's involvement is key to addressing this issue, they are not and should not be our sole partner in this effort. A critical step in the credentialing process is the collaboration and engagement of energy stakeholders all levels, public and private, Federal, state, and local, to collect an industry agreed-upon body of knowledge that leads to the discussion of cross-cutting skill standards. An example of this partnership is that ETA and DOE, along with the Southern Governors Association, were able to jointly participate in an Energy Skilled Trades Summit in August where we were able to articulate our vision for how Federal agencies and the energy industry would work collaboratively to build a skilled energy workforce, with a particular focus on skilled trades.

Perhaps most importantly, ETA and DOE have worked closely through our WIRED regions to align and leverage Federal resources to support regional economic development which is central to workforce development. Focusing our efforts on regional economies, our effort is to create portable, transferable credentials across the energy industry and across the country. WIRED allows our Nation's workforce to be both flexible and adaptive to change by creating "career lattices." A veteran electrical lineman in Dallas who wants to update his skills should be allowed to take his knowledge and experience to be trained to lay fiber optic cable in Fort Worth. The following is a full list of partnership opportunities currently in progress under the WIRED Initiative:

- Thirteen WIRED regions attended an Alternative Energy Institute at the National Renewable Energy Laboratory (NREL). ETA has been working with the Technology Transfer Office at NREL to continue to provide WIRED regions with information on NREL's biomass research program and technology transfer and commercialization programs and to discuss mutually beneficial follow up activities.
- In addition to NREL, ETA is partnering with other DOE National Laboratories across the country to increase WIRED region access to Federally-funded technologies at federal laboratories (e.g., automation, prototyping, materials science, information technologies, energy and environmental innovations). The partnership will lead toward the establishment of portable, standardized industry credentials and increase the regions' industrial competitiveness. This will stimulate wealth creation and employment opportunities as well as foster public-private collaboration in technology development, innovation and commercialization.
- ETA has negotiated a partnership opportunity with the DOE's Office of Science to give preferential placement for WIRED regions in its Summer Training for Science and Math Teachers. Currently, it offers a three consecutive summers of training and mentoring experience for cohorts of teachers at its federal labs across the country.
- he North Central Indiana WIRED region has developed an energy efficiency certification with the input of our Federal partners: U.S. Department of Commerce's National Institute of Standards and Technology, the Manufacturing Ex-

tension Partnership program and the DOE-supported Industrial Assessment Center at Purdue University.

ETA will continue this exciting work into 2008 to actively seek out opportunities for collaboration in our WIRED regions and in all areas where the potential for cross-fertilization exists. In addition, ETA will continue to work with our energy stakeholders to address the establishment of portable, standardized credentials and all workforce challenges currently being faced by the energy industry.

RESPONSES OF JAMES L. HUNTER TO QUESTIONS FROM SENATOR BINGAMAN

Question 1a. Your testimony on page 1 indicates that the average age of a line man is 51 years old and they are working enormous amounts of overtime. What is the average amount of overtime they work in a year?

Answer. We have many utilities that are averaging 800 hours a year in overtime. That means some people are working over 1200 hours.

Question 1b. Do you think the quality of service provided by some utilities is affecting by the line man shortage, age and large amounts of overtime—if so how?

Answer. The quality of service has been impacted by the reductions in the workforce. We have 40% less workers than in 1990 and the system has increased in size by 30% during that period. When major storms hit the utilities do not have enough trained workers to assist the out of state help that is sent in by reciprocity agreements. One scenario that congress should remember is the major storm in 2003 that hit the DC area. Customers were out of service for over 8 days, inside the DC beltway. Customer hookup times and service complaints have steadily increased over the last few years across the U.S.

Question 2. Do you believe workers in skilled manufacturing jobs that are in danger of being outsourced or whose plants are being closed due to competition are good candidates for training in the utility industry? If so, how can IBEW, the Congress and the executive branch work to tap into this resource?

Answer. The IBEW believes that the manufacturing sector is an excellent source for potential candidates for the utility industry. The IBEW and Congress should work together to attract and pay for retraining initiatives in the utility industry. The IBEW is starting a major training initiative in the utility sector and would welcome Congressional involvement. The IBEW is also working with the Center for Workforce Development (CEWD) to attract people to our industry.

Question 3. Has the IBEW began an assessment of the skilled workforce needed for the increasing demand for solar and wind generation or is it mainly viewed through the connection to the grid?

Answer. The IBEW has not done an assessment of the employment needs of the wind and solar industries. The uncertainty of the tax credits and placement issues have made long term planning difficult.

RESPONSES OF RAY STULTS TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. In your testimony you note the increased demand that will be placed on the workforce for the production of biofuels, for companies such as Colonial—how far out will this impact their pipeline projections? Will new pipelines have to be built to accommodate biofuels or is it possible to use existing pipelines?

Answer. In some regions, and among some job categories, we are hearing that employers already are finding it difficult to hire employees with the skills and experience they need. Colonial, of course, would be in the best position to address the specific impacts on their projects.

The issue of using existing pipelines is sparking keen interest among biofuels companies. While some opportunities may exist to shift existing pipelines to ethanol, there are concerns that differences in the chemical properties of existing fuels, and ethanol, will largely preclude a wholesale redeployment of existing pipeline infrastructure to serve the expanding ethanol production industry, and in most cases it is anticipated that entirely new pipeline systems will be required.

Question 2. You mention that your own laboratory has difficulties obtaining trained professional personnel in biofuels—your facility is one that is primarily R&D, do you think industry will have similar problems in chemical engineers as it scales up to large scale production?

Answer. It is our understanding that industry already is encountering such issues. The shortage of qualified professionals threatens to force delays and drive up costs of important biofuel projects.

Question 3. In your testimony you mention that the U.S. would have to lower the labor hours per blade of a wind turbines by 1/3 to remain competitive with foreign manufacturers—what specific manufacturing technologies do foreign firms have an edge over the U.S. in? Does that mean that most wind turbines are manufactured overseas?

Answer. Because turbine blade manufacture is highly labor intensive, some firms have gone offshore in search of lower labor costs for blade manufacturing facilities; turbine manufacturers import blades for the US market from Brazil, Mexico, and various EU countries. Eliminating shipping import costs provides some advantage for domestic production. However, in order to fully compete on a cost-competitive basis, U.S. firms may have to develop more advanced technologies and systems for U.S. production as well.

As turbines and blades grow larger (2.5MW+), there may be increased efforts to develop advanced manufacturing technologies, fabrication and assembly techniques that are co-located at or near wind farm development sites. This could potentially reduce transportation costs and improve the economies of future wind turbine blade construction.

RESPONSES OF RAY STULTS TO QUESTIONS FROM SENATOR DOMENICI

Question 1. You recommend several studies assessing our energy workforce as an initial policy directive. Do you have recommendations for Federal policy beyond such studies?

Answer. The studies we recommend would provide valuable insights into the future demand for those job specialties that will be needed to support the expanding renewable energy industries. Once those findings are in, we hope to be in a better position to assess the overall picture, and identify potential gaps between the existing workforce and the skills required by industry. Armed with that information, we may be able to prescribe additional initiatives that would be beneficial.

Question 2. Would you say current assessments on our future demand for an energy industry workforce properly account for the projected growth of the renewable energy industry?

Answer. Much depends on the policies enacted to support renewable energy technologies, as well as external forces such as the price of oil. This is why research needs to continually track evolving market trends and government initiatives. As the Nation's energy outlook comes into clearer focus, new policies should be informed by the most current and comprehensive investigation available.

RESPONSES OF PATRICIA A. HOFFMAN TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Does the Department know whether the shortage of transmission linemen has affected the ability to bring a grid up after hurricanes or power outages?

Answer. During an extreme event such as Katrina, linemen came from across the country to aid in restoration. The physical state of the area (e.g. flooding) in addition to the travel time did delay restoration efforts. However, it is difficult to accurately evaluate the impact of workforce on grid restoration time. No two events are identical and the response to specific events (such as Katrina versus Rita) is affected by many factors, such as the availability of poles and transformers or the extent of storm damage. While the electric industry in general maintains a high level of reliability of the electric system, the Department recognizes that one factor that could delay restoration efforts in response to multiple catastrophic events is the availability of skilled linemen.

Question 2. Your August 2006 report on the electric utility industry, which mandated by section 1101 of the 2005 Energy Policy Act states in the executive summary that even with the expanded training programs "analysis indicates a significant forecasted shortage in the availability of qualified candidates by as many as 10,000 line workers, or 20% of the current workforce". What impacts does the Department project of this impact if it is realized?

Answer. If the electric utility industry does experience a shortage of qualified line workers, the most obvious impact will be one of supply and demand—as the supply of workers goes down, wages will go up. There may be a growing divergence in quality and quantity of lineworkers between utilities and regions. Utilities that can afford to hire the top talent will likely do so, while other utilities may pursue other options such as outsourcing. However, this could result in longer restoration times since lineworkers may not be in close proximity to an event.

Question 3. Section 1101 further instructs the Department to report to Congress as soon "as practicable after the Secretary identifies or predicts a significant short-

age of skilled personal in 1 or more energy technology industries". Has the Department identified any other significant shortages besides lineman?

Answer. The report prepared by the Office of Electricity Delivery and Energy Reliability focused on the workforce in the utility segment. The Department of Energy is preparing to enter into an agreement by the end of November with the Department of Labor to engage the National Academies to perform more extensive analysis in other energy technology sectors.

Question 4. Section 1830 of the 2005 Energy Policy Act asks for the Department to enter into an arrangement with the National Academies to study the short-term and long-term availability of skilled workers to meet energy and minerals needs of the U.S. Where is the Department in meeting section 1830?

Answer. The Department of Energy is working closely with the Department of Labor to fulfill the requirements of EPACT section 1830 through a memorandum of understanding we expect to finalize by the end of November. Thereafter, the Department of Labor plans to enter into an arrangement on behalf of the Department of Energy with the National Academy of Sciences (NAS) to conduct the study required by EPACT. We understand that the NAS believes the study will take approximately 18 months to complete.

RESPONSES OF CAROL L. BERRIGAN TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. The NEI has stated at a February 2007 American Nuclear Society meeting that "the average age of employees in the industry is 48 years—one of the oldest of any major industries in the country. Retirement attrition will create the need to essentially re-staff the existing fleet over the next 10 years. We need to get the younger generation into the industry"—and this does not include the expected new plant builds from the 15–30 combined operating licenses to be submitted to the NRC. Have you seen any shift in your employment surveys to indicate a re-staffing is occurring?

Answer. NEI conducted staffing surveys in 2003, 2005 and 2007. The data referenced during the February 2007 CONTE meeting was drawn from NEI's 2005 staffing survey. The most recent survey (for which results were not available at the time of the CONTE conference) indicated increased hiring activity across the industry, most notably in the engineering, operations and vendor segments. The 2007 survey indicates that young engineers (18–27 years of age) made up 7.5 percent of the utility engineering workforce compared to only 5 percent in 2003 and 5.6 percent in 2005. Young operations personnel (18–27 years of age) made up 5.2 percent of the utility operations workforce in 2007 compared to only 3.7 percent in 2003 and 3.9 percent in 2005 and within the vendor workforce, young professionals make up 7.9 percent of the workforce compared to 5 percent in 2005.

The increase in younger workers entering the nuclear industry can also be seen in the growing membership of North American Young Generation in Nuclear (NA-YGN), an organization of young professionals (35 and under) who work in nuclear related fields. At the NA-YGN/ American Nuclear Society Young Professional Congress held in November, the NA-YGN announced that their membership has grown to roughly 3,100 members. This is an increase from approximately 500 in 2003.

Question 2. Your testimony, on page two of your testimony, you note that new builds will require 1,400 to 1,800 workers for construction with a peak of 2,300 and with a outbound of 31 combined operating licenses this is about 43 to 56,000 skilled workers. Do you know where the greatest need in the type of skilled craft the industry will need and will it compete with other utilities?

New nuclear construction will require numerous skill types including: welders, pipefitters, masons, carpenters, millwrights, sheet metal workers, electricians, ironworkers, heavy equipment operators, and insulators, as well as engineers, project managers, construction supervisors and other specialized workers. Many of the skills needed in the nuclear industry will be similar to those used in other energy construction and labor availability will be affected by other competing work within local and regional labor markets.

Based on the companies and consortia that have announced plans to submit combined operating license applications, we expect much of the new nuclear construction will be centered in the Southeastern U.S. (Maryland through Texas) with some additional nuclear construction in other regions. A recent survey by the Southeast Manpower Tripartite Alliance indicated that in the Southeast, the high demand crafts will be pipefitters (includes welders) and electricians and that high growth crafts will include boilermakers (includes welders).

In addition, we have identified growing needs in the following areas: construction management, engineering project management, non-destructive examination, instrumentation and control, quality assurance/control and construction supervision.

Question 3. Nuclear quality control or NQA-1 as the NRC refers is just as much about trained personnel such as welders as components. Does the industry have adequate training programs in place to certify some of the crafts to build new plants to NRC workforce standards?

Answer. As the nuclear industry prepares for new construction, it is actively engaged in developing training and certification programs to support future needs. It is important to note that workers who are trained in industrial skilled crafts support many industries. It is somewhat impractical to establish project based training programs since many of the skills needed require an extended period of training or apprenticeship to become proficient and will work for numerous employers in several industry sectors. Overall, the industry is increasing engagement in regional or state training initiatives which include broader energy/ industrial sector involvement.

In order to adequately answer this question, it is necessary to separate training from qualification. The industry is required to meet applicable NRC qualification standards. In the case of welders, the applicable qualification standard relies on the demonstration of knowledge and skills through a certification process and exam. I believe the industry will have ample capacity to certify the needed workers for new construction in compliance with NRC requirements.

Question 4. There has always been a strong link between trained personnel in the nuclear navy and civilian reactor fleet, how has the draw down in size of the nuclear submarine fleet affects if any the staffing of the civilian fleet?

Answer. During the draw down of the nuclear submarine fleet, the nuclear industry was able to recruit significant numbers of workers with prior nuclear navy experience for employment in the civilian nuclear sector. While the industry is still able to recruit some personnel with prior nuclear navy experience, the industry is relying more and more on development of local talent pools through community college, apprenticeship and skills center training programs. In addition, the industry is also recruiting mid-career personnel from other industries. The industry also continues to participate in and support programs that assist returning military personnel transition into the civilian workforce such as the Helmets to Hardhats and the Hire a Hero programs.

Responses of Carol L. Berrigan to Questions From Senator Domenici

Question 5. We have heard a lot today about the overall scale of the looming workforce shortage facing the energy industry. Could you give us some specific recommendations for actions the federal government could take that would be most effective in addressing these problems?

Answer. In my testimony, I outlined six areas where action is needed. I believe the federal government can take effective action in many of these areas.

Raising awareness—This committee has continued to demonstrate strong leadership on energy workforce issues and holding this hearing on November 6th continued this legacy. During the hearing, Senator Murkowski suggested conducting a similar hearing for the HELP committee to better educate her peers on that committee about these issues. Holding such a hearing would continue to raise awareness of this important issue. In addition, I would encourage members of the committee to seek other venues through which awareness of this issue and the opportunities afforded to workers in the energy sector can be raised among decision makers at the federal state and local level and with the public.

Aligning investments, elevating image, training workers, building partnerships—Since much of the funding used to invest in workforce development comes from the Federal government, a coordinated Federal approach that includes the Departments of Labor, Energy, Education and Interior in close consultation with the energy industry and organized labor is warranted. This approach should include measures to increase career awareness at the secondary education level, support pre-apprenticeship career technical education for all energy related skilled crafts, support community college and skill center training for specialized technicians, and provide regional grants for integrated workforce development programs.

In addition, the Federal government should consider employer tax credits for apprentice utilization, incumbent worker training and displaced worker training for employment in the energy sector.

Question 6. Assistant Secretary DeRocco pointed out that some segments of the energy industry lack "portable certification" credentials for their workers. Is this an

industry issue? Is there a role for the Nuclear Regulatory Commission for helping to develop certification programs, beyond what is currently being done?

Answer. The portable certification issue raised by Assistant Secretary DeRocco, is generally not an issue for the nuclear industry. Many workers in the nuclear industry require qualification with specific industry-wide or consensus standards such as those promulgated by ASME, ANSI, ASNT or the National Academy of Nuclear Training. Others, such as reactor operators, are required to be licensed by the NRC on the specific reactor design that they will operate.

I do not believe that that there is a role for Nuclear Regulatory Commission in this area as their purview is nuclear licensees and the issue the Assistant Secretary described is multi-sector. Any additional certifications the NRC develops may further complicate portability of certification since it would be nuclear specific and the energy skilled trades workforce is transient between nuclear and non-nuclear energy infrastructure.

Question 7. In your testimony, you highlight the relationship between the manufacturing workforce and energy industries. Would you recommend addressing manufacturing workforce issues, such as outsourcing, simultaneously or separately from energy workforce issues?

Answer. I would recommend addressing manufacturing workforce issues in conjunction with energy workforce issues only in cases where there is significant overlap in the labor pool and specific challenges. For example, I would not attempt to address outsourcing issues for manufacturing simultaneously with energy workforce issues. Utility jobs are largely unaffected by overseas outsourcing. However, it may be effective to address ASME qualified welder issues for both manufacturing and the energy workforce since the skill sets will be similar.

Question 8. Your testimony highlighted an increase in nuclear engineering enrollment between 1998 and 2006. Can you identify factors leading to this increase?

Answer. The increase in enrollment in nuclear engineering can be attributed to numerous factors. They include: the President's Committee of Science and Technology Advisor's (PCAST) 1997 report advocating the continuation of DOE's historical support for maintaining the discipline and stewardship of university infrastructure, Congressional support in legislation for increased federal investment in nuclear engineering education through the DOE University Reactor Infrastructure and Education Assistance Program during the late 1990's through 2006; increased media coverage and resultant public awareness about the nuclear renaissance; expanded career awareness outreach conducted by industry, professional societies and government; enhanced recruiting and hiring within the industry, government and national laboratories, and improved recruitment of students into nuclear engineering programs by universities.

Question 9. In your testimony, you state that the "nuclear industry faces additional hurdles. Specifically, there are few workforce training programs focused on the skills needed for successful employment in the nuclear energy industry." How would you address this issue at the federal level? At the state level? At the local level?

Answer. At the Federal level, I would:

1. Direct the Department of Labor, in cooperation with the Departments of Energy and Education, the National Science Foundation and the Nuclear Regulatory Commission, and in consultation with the nuclear industry and organized labor, to create an integrated, national nuclear workforce development program. Key elements of this program would include: expanding nuclear technology and nuclear career awareness at the primary and secondary education levels; developing community college and skill center training programs for nuclear technicians (e.g. radiation protection technicians) based on industry standards; supporting development of construction management personnel for nuclear construction projects; and providing regional grants for integrated nuclear workforce development programs.

2. Appropriate sufficient funds to the Department of Energy for the execution of their stewardship responsibility for Nuclear Engineering and Health Physics Education, to support the necessary infrastructure for the continued safe operation and needed upgrades of existing training and test reactors and to develop new or expand the capabilities of existing training and test reactors as needed.

3. Provide tax incentives to support apprentice utilization, incumbent worker training and displaced worker training for employment in nuclear industries.

At the State level, I would:

1. Include the energy sector (specifically nuclear) in state workforce development and economic development plans,

2. Integrate nuclear-related jobs into the career cluster framework used in each state,

3. Provide academic credit for career and technical education in nuclear-related fields at the secondary level and articulation of this academic credit at the post secondary education institutions,

4. Provide funding for the maintenance of nuclear workforce development programs at community colleges, skill centers and other educational institutions,

5. Develop more flexible teacher certification rules that would facilitate nuclear professionals entering the classroom.

At the Local level, I would work on better educating local schools science teachers, guidance councilors, and workforce development professionals about the career opportunities available in the nuclear industry and work to provide education opportunities for individuals who wished to enter these lucrative careers.

RESPONSES OF NORM SZYDLOWSKI TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. On page 5 of your testimony, you estimate that the cost of building a new pipeline along your existing pipeline between Baton Rouge and Atlanta has risen from $1 to 2 billion, how much of that increase is due to material and that due to a shortage of labor?

Answer. From the time we first estimated the cost of this project—about three years ago—to our current projection with completion in 2012, labor cost and materials cost have doubled.

Question 2. You note that you have the same retirement statistics as the rest of the petroleum sectors—27 percent eligible for retirement in five year except it is two years for Colonial. Does Colonial anticipate a large wave of retirements or do you believe your workforce will continue to work past retirement?

Answer. Taken in its entirety, the 650-person workforce of Colonial fits the same eligible-to-retire profile as the rest of the petroleum industry. That is, 27 percent of our overall workforce will be eligible to retire within five years. Note that this snapshot of Colonial's workforce includes administrative, accounting, IT and all other workers—as well as those who are actively engaged in operating the pipeline. In our testimony, we attempted to describe a more focused picture of the challenge we face with employees responsible for operating the pipeline. (This includes a wide variety of engineers, controllers, schedulers and others in addition to those who physically operate the line for Colonial.) Our personnel records show that 35 percent of our Operations workforce will be eligible for retirement within two years. While that number is slightly higher than the all-inclusive employee number, it is the potential of losing these trained and experienced workers within two years that has focused all of us at Colonial (and especially our Human Resources Department) on finding ways to retain talented workers and recruit talented new employees.

Question 3. You mention that foreign workers represent a sizeable pool of talent; do you know what countries Colonial typically hires from and what occupations?

Answer. Colonial views those foreign workers who are legally permitted to work in the United States as one of several solutions to the rising labor challenge faced by the petroleum industry. Within our company, we have two employees—both engineers—who are not U.S. citizens. One is a system integrity engineer from Canada, and the other is a Venezuelan responsible for Colonial's electrical systems analysis, design, construction and maintenance. We do not keep records that distinguish nationalized citizenship for employees. However, a review of our employee roles suggests that there are approximately a dozen employees, primarily of eastern Asian heritage, who are U.S. citizens and work in the Engineering, IT and Operations fields. While greater access to a larger skilled workforce may contribute to Colonial's employment pool, the greater impact will be within the construction trades we contract with to build new lines and to help Colonial with repairs and other short-term projects.

Question 4. You mention in your recommendations the ability to have the IRS provide relief on phased retirement so that retirement age employees can still contribute to the workforce—can you please explain this in more detail?

Answer. This challenge is shared by other companies in our industry, but my examples will draw from Colonial's experience and from the policies in effect at our company. Colonial offers a very competitive benefits package in order to attract the talent we need. That package includes a pension plan that offers a lump-sum payout as soon as the early retirement age of 55 for qualified workers. Our experience has been that employees take advantage of this opportunity upon reaching the average age of 57, at which point their employment must be terminated. Many are interested in continuing to work, but IRS rules against "sham retirements" prevent them

from continuing at Colonial after receiving their lump-sum pension payout. Most who are interested in continuing to work will go to other companies. A smaller number leave for a six-month waiting period before returning to Colonial either as a contractor or as a part-time worker.

We hoped that the Pension Protection Act's phased-retirement initiatives would let companies make in-service distribution of retirement benefits. This would give persons who retired early to secure their lump-sum benefit a means of accessing their lump-sum benefit and remain with Colonial. However, the IRS rules do not allow this for employees under the age of 62. The IRS does allow companies to lower the full retirement age to 62 or below 62 if that is an industry standard. However, this option is prohibitively expensive because the retirement would be at full rates and not reduced for the early departure. Indeed, we expect this approach would give an even greater incentive to retire for -eligible, 55-year-old employees.

A solution we offer for consideration is to lower the in-service distribution age for retirement plans from 62 to -55 -, and to retain the current plan's early retirement reduction factors. This would give Colonial, and companies like us, a legally permissible means of allowing employees their lump-sum pension benefit without reducing the full retirement standard of age 65. Companies could retain experienced workers and employees could secure their lump-sum benefit without having to terminate their employment. Effective Jan. 1, 2008, lump-sum calculations will be based on a New Mortality Table (which reflects that people are living longer) and New Interest Rates (based on corporate bond yields). The expected impact is that lump-sum benefits for persons retiring at age 55 will decline 1.4 percent in 2008 and by 13 percent by 2013. This information will give eligible employees more reason to retire now.

RESPONSES OF NORM SZYDLOWSKI TO QUESTIONS FROM SENATOR DOMENICI

Question 5. In your testimony, you point to "more glamorous" career opportunities and a perceived unreliability of the energy workforce as inhibitors to recruiting new workers. How would you address these perceptions? What role, if any, do you see for the Federal government in addressing these inhibitions?

The perception of our company and our industry as worth the consideration of people searching for a career is primarily our responsibility. The American Petroleum Institute currently is conducting a significant education campaign to explain the industry's role and its work as a critical part of America's energy solution. All of us as individuals can recognize the value and honor of craftspeople and appreciate vocational/technical education. The message we often send our children, that the only successful career is the one that includes a four-year university degree and work in an office environment, must change. The Federal government can play a helpful role by coordinating state and regional workforce development efforts and facilitating their broader application.

Question 6. You recommend IRS tax relief as a possible solution to retain retirement-eligible employees. Do you regard this tactic as a short-term or long-term solution?

Answer. It would be an important part of the solution. Other actions are also necessary, such as better transfer of knowledge from the more-experienced employees to the newer ones. Increased recruiting from technical schools and four-year colleges is needed. But at a time of growing demand for knowledgeable workers, and a time when workers are willing and more able than ever to continue working, we should not increase the incentive to retire early through tax policy. The challenge of meeting the energy needs of a growing economy is a good problem to have. We will need the help, knowledge and innovation of our experienced workers along with that of our newer workers to solve it.

In addressing this IRS-pension question from both Sens. Bingaman and Domenici, we have tried to be direct and concise in our reply. The following summary was provided by Colonial's Vice President of Human Resources, Wayne St. Claire, in case greater detail is helpful. Of course, we are ready to help further as you consider how to ensure the energy industry is adequately staffed and position to continue meeting our Nation's energy needs.

ATTACHMENT

Retention Issues—Phased Retirement/In-Service Distributions

Our employees retire (on average) upon reaching the age of 57 take advantage of our retirement plan's generous lump-sum pension benefit. They reason that they are better off if they retire, take their lump sum, and work elsewhere in a comparable job. They conclude that because the Pension Protection Act is decreasing lump sums and because it appears that interest rates are rising which also decreases lump

sums, they had better retire now and get their lump sum before it goes down. As a result, we are losing our most experienced staff. In the next five years, we can lose 25% of our workforce due to retirement alone.

In many cases, these retiring employees would like to continue working. They just want to secure their lump-sum benefit at an opportune time. The IRS rules do not allow them to retire to receive their lump sum and then be reemployed by us full-time. So, they retire and then go to other companies or contract back to our company, but this usually as part-time work under very strict and specific rules and guidelines.

Our pension plan does not allow the participants to draw their pensions or receive their benefits without terminating employment. We hoped that Pension Protection Act phased retirement initiatives would permit companies to make in-service distributions of retirement benefits. This would permit persons who retired early just so they could receive their lump sum an alternate way to access their lump sum and stay with our company. The Pension Protection Act does this, but only for employees at least age 62. Consequently, these provisions are not very useful because they do not allow in-service distributions below age 62 where the majority of our retirements occur.

There is a second way participants can access their pension and then continue to work with our company. New IRS regulations make it clear that plans can permit distributions after persons attain their normal retirement age. These new regulations also state that plans can lower their normal retirement age to 62 without any question or lower it to be below age 62 if a lower age is customary in the industry. While this would be a useful way of letting employees receive their lump sum while continuing to work, it is expensive because benefits are not reduced for early commencement at normal retirement age. Lowering the normal retirement age to say age 55–57 would be very costly. So, this approach is not useful.

There is a principle that the retirement trust is a tax-favored vehicle and should have restrictions as to participants' ability to access the funds. So, under IRS rules participants need to separate from service to have access to their funds. In our case, employees are quite willing to separate from service to have access to the funds; they simply retire early to get the funds and go to work elsewhere. If an employer would let employees retire and then come back immediately to their old jobs, the IRS would view this as a "sham retirement" designed to skirt their rules. This is why companies that comply with the IRS rules place restrictions on reemployment. Since there is no clear guidance on what employers must do to avoid being accused of bypassing the rules, 5 the employers impose restrictions on rehire that generally involve a waiting period, reemployment only as a part time-time employee, or a change in job duties. Faced with the prospect of working only part time or in a different job many retiring employees just go to work elsewhere, usually for our competitors.

Our company has a comprehensive review process for hiring leased/contract employees that include restrictions along the line of the restrictions described above. Our company understands the importance of classifying employees correctly since employees have many more rights than do leased/contract employees. Our company also requires legal review before rehiring former employees.

The improvement Norm Szydlowski raised was to have the IRS lower the in-service distribution age for retirement plans from 62 to say 55 or 56 while retaining the plan's current early retirement reduction factors and normal retirement age. Companies like ours need a legally permissible means of allowing employees receive their lump sum distributions without having to lower the normal retirement age which would greatly subsidize the entire participant population. This would give companies the ability to retain employees with years of valuable work experience yet continue contributing to our company instead of our competitors. That way, employees get access to their pension benefits and have the option of continuing their career with their current employer. In the foreseeable future, companies like ours who offer valuable benefits to our employees could lose valued employees in a period of time when we need most of these employees to continue meeting the needs of our customers, the national security and economy of this country, and have the ability to reasonably transfer knowledge from our existing workforce (before they retire) to our new employees.

Effect of PPA on Lump Sums

Effective January 1, 2008, The Pension Protection Act modified the minimum lump sum requirements by specifying that lump sum calculations be based on:

- A New Mortality Table—The table not only reflects that people are now living longer, but also project future improvements in mortality.

- New Interest Rates—New interest rates based on corporate bond yields replace the 30-year Treasury Bonds rates that are currently used. There are three interest rates—one rate for the benefits expected to be paid in the first five years, a second rate for the benefits to be paid in the next 15 years after that, and a third interest rate for benefits expected to be paid more than 20 years in the future.

The expected impact is that lump sums of persons retiring at age 55 will decline 1.4% in 2008 and by 13% in five years when the new lump sum basis is fully phased in.

Survey Information

Here are some third-party surveys and statistics you may find helpful:

- The Society of Actuaries' Phased Retirement and Planning for the Unexpected, 2005 Risk and Process of Retirement Survey found that only 38% of pre-retirees actually stopped working all at once.
- A 2005 AARP survey found that 40% of 50+ retirees would be interested in participating in a phased retirement program (i.e., reduced work schedule).
- A January 2006 AARP Public Policy Institute paper reviewed study results by researchers at the University of Massachusetts-Boston and Cornell University which found that phased retirement was more prevalent among better educated, white-collar, or highly skilled workers. It also found that it is more prevalent at the younger end of the of the older worker age span, reflecting a transition to full retirement. Persons who work for the same employer as a phased retiree are more likely to have more positive views of work than those who come from other employers. Many phased retirees would work even when they do not need the income—i.e., money is not the only motivator for work.
- In addition, AARP reported in a research report in March of 2005 that the number of workers age 55 and older is expected to increase 49% while the number of workers under age 55 is expected to grow by only 5%. AARP noted that employers who do not attract and retain older workers might have difficulty finding qualified workers.

Caring About Retiring Employees

Retaining our experienced workforce is not our only objective. We find that our retiring employees think in terms of today's dollars. They do not understand how general inflation, rising health care costs, and extended lifetimes will require greater retirement amounts than ever. If we can keep them in our workforce longer, either as full-time or part-time employees, we can continue educating them and help them accumulate the additional funds they will need to cover rising future costs. We want them to make the right financial decisions based on solid knowledge.

APPENDIX II

Additional Material Submitted for the Record

STATEMENT OF WILL GREEN, PRESIDENT, AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

To the Chair and Members of the Committee: I would like to thank the Chairman and this Committee for holding a hearing on the workforce challenges facing the domestic energy sector. It is a challenge. As President of the American Association of Petroleum Geologists (AAPG) I want to assure you that we are taking active steps to address it. But U.S. national and economic security also demands federal action to ensure the availability of a future petroleum industry workforce.

AAPG, an international geoscience organization, is the world's largest professional geological society representing over 30,000 members. The purpose of AAPG is to advance the science of geology, foster scientific research, promote technology and advance the well-being of its members. With members in 116 countries, more than two-thirds of whom work and reside in the United States, AAPG serves as a voice for the shared interests of petroleum geologists and geophysicists in our profession worldwide. Included among its members are numerous CEOs, managers, directors, independent/consulting geoscientists, federal and State regulators, educators, researchers and students.

AAPG strives to increase public awareness of the crucial role that geosciences, and particularly petroleum geology play in energy security and our society. As the National Petroleum Council (NPC) notes in its 2007 study, Hard Truths: Facing the Hard Truths about Energy, oil and gas demand will not abate anytime soon. Aggregating data from multiple oil and gas demand predictions, they report:

- Global oil demand in 2030 will be 103 to 138 million barrels per day, up from 76 million in 2000;
- Global natural gas demand in 2030 will be 152 to 225 trillion cubic feet per year (TCF), up from 94 TCF in 2000;
- U.S. oil demand in 2030 will be 22 to 30 million barrels per day, up from 19 million in 2000; and
- U.S. natural gas demand in 2030 will be 25 to 30 TCF, up from 21 TCF.

Where is the workforce that will ensure there is adequate supply to meet this demand in 2030? According to U.S. Department of Labor estimates, over one-half of the U.S. technical workforce will retire in the next fifteen years. The NPC 2007 study concurs, stating that "Nearly half of the personnel in the U.S. energy industries will be eligible for retirement within the next ten years, and fewer people have entered the workforce over the past generation." The demographics of AAPG's 30,000 members demonstrate the challenge: The median age of our members in 1991 was 41, in 2001 it was 48, and in 2006 it was 53.

And it isn't just industry that is facing the challenge. AAPG's membership includes many faculty members whose hair color is as gray as that of their industry colleagues, and there are fewer faculty prepared to teach the next generation of geoscientists and engineers. According to the American Geological Institute, the number of geosciences bachelor degrees has decreased from 7,180 in 1982 to 2,436 in 2005, a 66% decline. The number of geosciences master degrees decreased from 2,047 in 1987 to 1,074 in 2005, a 48% decline. And the number of geosciences doctoral degrees reached a peak of 1,058 in 1989 decreasing to 457 in 2005, a 57% decline.

The good news in these bleak statistics is that we have seen an uptick in petroleum geosciences and engineering enrollments in the past year. This suggests that students have become aware of the career prospects in the petroleum industry, and are interested in pursuing related geosciences and engineering studies. We're getting the students' attention. The question is whether we, as a Nation, can provide

the opportunities and infrastructure needed to turn this uptick into a sustained reversal.

The federal government needs to play an active role in reversing the current petroleum workforce trends. Programs that encourage science and math education in elementary and secondary schools provide a solid foundation for students entering university. At the university level much of the federal support for science comes in the form of competitive research funding. This funding provides direct benefit to society by enhancing our understanding of the natural world and developing new technologies. The second, no less direct, benefit is that these funds provide research support for faculty, graduate research opportunities, and the means to develop and maintain laboratories and instruments to conduct this research.

The elimination of the Department of Energy's oil and gas research program has significantly impaired the Nation's ability to train a future petroleum workforce. These funds had historically provided this support to geoscience and petroleum engineering programs at U.S. universities. The funds are now gone, weakening the departments at the same time as we're asking them to attract and train talent for the next generation.

The America COMPETES Act of 2007 is a very good start. But it does not go far enough to ensure that we can successfully reverse current workforce trends.

AAPG recognizes that the solution to the Nation's petroleum workforce challenge requires both government and private involvement. To that end, I would like to share with you what AAPG is doing to promote interest in geosciences, and particularly petroleum geology, and its positive impact on the United States.

Through our local affiliated societies we strongly encourage elementary and secondary school students to take classes in science and math. In October 2007 many of our societies participated in the Earth Science Week program of the American Geological Institute. The West Texas Geological Society, my local society, sent volunteers into 50 local schools to talk to fourth to sixth grade students about the geosciences. In addition, AAPG's regional sections train middle school teachers in geology, with applications to petroleum geology, through our "Rocks in your Head" seminar.

The AAPG Foundation's Grants-in-Aid program supports graduate students in earth sciences whose research has application to the search for and development of petroleum and energy mineral resources and to related environmental geology issues. These awards are competitive, and in 2006 AAPG celebrated the 50th anniversary of this program.

We also support the Visiting Geoscientists Program where professional geoscientists visit campuses, give lectures or seminars, and meet with students. These one-on-one interactions give students an opportunity to discuss career options and learn from someone who is professionally active in the field.

AAPG encourages the development of student chapters at schools around the world. There are currently 160 student chapters worldwide, 80 in the United States and 80 internationally. We regularly conduct student expos for students to meet with the oil industry to receive career information. And just this year AAPG launched a contest for the student chapters that provides a real-world experience of working as a team to predict the petroleum exploration potential of a particular geologic basin. The contest was well received, and we're expanding it this year.

In addition to our educational activities in schools, colleges, and universities, AAPG has a long history of providing its members with continuing education programs. These programs range from day-long workshops to week-long short courses and field trips.

We have recently moved to significantly increase this activity through the Petroleum Technology Transfer Council (PTTC). The program was developed by oil and gas producers with the support of the Department of Energy and designed to provide continuing education workshops and technology transfer to oil and gas producers on engineering, geology, geophysics, and oil and gas operations and technologies. PTTC links universities, State geological surveys and bureaus, local oil and gas producers and others involved in the industry. On September 27, 2007 the PTTC board approved a proposal by AAPG to assume leadership of PTTC. We will continue to work closely with the organizations that have been involved in the past, including the Department of Energy, and are inviting other associations to join us.

Our current workforce challenge did not emerge overnight, and neither will the solution. But it is essential to find a solution if the United States is to develop its oil and gas resources in a beneficial and environmentally responsible way. Mr. Chairman, I want to thank you for holding this hearing and encourage you to hold additional hearings to further highlight the national workforce challenge we face in the petroleum and other industries. The federal government must play an active

role to solve the problem. But by working cooperatively, I believe we can. AAPG stands ready to assist.

Thank you for the opportunity to submit this testimony to the Committee.

STATEMENT OF DANIEL H. LÓPEZ, PRESIDENT, NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY, SOCORRO, NM

Thank you for your leadership and commitment to the workforce crisis in the United States and for the November 5, 2007 hearing before the Senate Energy and Natural Resources Committee. As you know, this is an issue of great importance to New Mexico Tech, the citizens of New Mexico and the American people.

This hearing and others that follow will serve to help identify where members can effectively focus attention and resources to insure the needs of the American people are met. Mr. Chairman, I urge you to have additional hearings on this important issue. Today's discussion only addresses part of the problem. The Committee must fully explore the educational crises in the Nation's geologic, petroleum and mining sector. This is made even more important because this Nation will need more skilled geologists as we explore ways to capture & store carbon dioxide in deep rock formations, as recently announced by the U.S. EPA.

We truly have an education & workforce crisis in this country that if left unchecked will harm our national security, ability to compete with the rest of the world and our fundamental way of life. The United States is the world's largest user of mineral commodities. Minerals and petroleum power our cars, computers and homes, accounting for nearly $500 billion of the U.S. economy. The continued development of our Nation's resources is a critical factor in maintaining our quality of life and ensuring that our Nation has the basic fuels and materials to keep our economy strong.

Workforce availability has become a significant problem for the domestic petroleum and mining industries. Numerous reports have repeatedly warned that not enough students are graduating from these programs schools to replace the large number of active engineers and geologists who will be eligible to retire in the next 10 years. The number of college students pursuing petroleum and mining degrees dropped 80 percent over the last two decades and the Nation is now down to 17 petroleum schools (from 34 in 1983) and 12 mining schools (from 25 in 1983).

An example of the extent to which the age profile of mining professionals is advancing can be gained by examining the ranks of the geoscientists (geologists, geophysicists, metallurgists, and mining engineers) employed by the United States government. Around 2500 of these professionals are employed by the various federal agencies, with around 60% in the Department of the Interior. Just slightly under half (49.4%) of these individuals are currently over the age of 50, and a quarter of the (25.5%) over 55. The demographics for the subset holding positions as mining engineers—a more direct indicator of the situation facing the U.S. mining industry—are identical.

At the same time, government funding for university research in mineral resources disciplines has been eliminated or greatly reduced. A large percentage of the faculty in mineral resources programs are retiring and there are few PhDs in the pipeline to replace them.

Further compounding the problem, according to the U.S. Bureau of Labor Statistics, almost half of the working engineers and geologists in the petroleum and mining industries are over 50. The potential for significant workforce losses to retirement in the next 10 years is huge while the number of replacements is much too low to sustain the industry. Among the mining schools, the situation is nearing a critical point as 25 percent of the Nation's mining engineering 70 faculty members expect to retire in the next 5 years; fully 50 percent expect to retire in the next 10 years.

Skilled trades people are in short supply across the industry. Industries looking for qualified applicants to fill these jobs are often forced to turn to foreign schools to fill their vacancies. Without an adequate workforce, the basic building blocks of the economy—energy and minerals cannot be domestically produced.

We recently wrote to urge your support for the Energy and Mineral Schools Reinvestment Act (EMSRA). EMSRA sets out the policies for maintaining a healthy domestic energy and mineral workforce at the professional, technical, and blue collar levels. It establishes policy to fund research to support the educational institutions that produce the workforce. It establishes policy for sustainable energy and mineral development by the application of science and engineering. It sets the goal of sustaining and protecting America's competitive edge in the 21st century economy through research.

In sum, EMSRA will begin to restore the petroleum and mining engineering and technological world leadership of the United States which has been maintained for more than two centuries. It means New Mexico Tech and similar institutions or programs, from West Virginia to Arizona, Pennsylvania to South Dakota, and others can build capacity in petroleum and mining teaching and research that would attract the best and brightest faculty and students for the coming energy resource global competition.

We strongly urge you to sponsor EMSRA and to do everything in your power to have Congress enact this legislation during the current 110th congressional session. This legislation can have a regenerative impact on the Nation's mining and petroleum engineering schools and encourage the growth of the energy and minerals workforce to meet the Nation's needs.

The consequences for failing to address this educational crisis are real, and include: higher commodity prices, overall loss of industry, loss of technology, and educational infrastructure. In short, you lose the ability to educate the people necessary to produce the energy for this country over the long term.

Thank you for your support and leadership on this important issue to the state of New Mexico and the Nation.

CONSUMER ENERGY ALLIANCE,
Houston, TX, November 13, 2007.

Hon. JEFF BINGAMAN,
United States Senate, Washington, DC.

Hon. PETE DOMENICI,
United States Senate, Washington, DC.

DEAR CHAIRMAN BINGAMAN AND SENATOR DOMENICI: Consumer Energy Alliance applauds the Committee on Energy and Natural Resources for recognizing the importance of a strong domestic energy workforce. While we appreciate the efforts of the committee and chairman to address this important issue, we also encourage you to expand your focus to include education programs for petroleum, mining and geological engineers, as these programs are the foundation for a healthy energy workforce and economy.

The strength and success of our Nation depends on a highly-skilled, competitive workforce equipped with education and training. In the past few decades, workforce availability has become a significant problem due to the lack of petroleum, mining and geological programs in the U.S. The number of students graduating with petroleum and mining degrees dropped more than 80 percent over the last two decades, and the Nation is now down to 17 petroleum schools (from 34 in 1983) and 12 mining schools (from 25 in 1983). Studies show that there are simply not enough petroleum and mining graduate students to replace the active engineers and geologists who plan to retire in the next ten years, creating a 38 percent shortage of qualified U.S. engineers and geologists by 2009. A severe lack of qualified professionals threatens our ability to compete in today's rapidly changing global economy.

What was once an issue of concern has now become a national crisis.

In order to raise awareness on the gravity of this situation, Consumer Energy Alliance is working with members of our Board and interested stakeholders to bring the petroleum, mining and geology industries together with academia to organize and mobilize a broad coalition in support of engineering education. We recognize the importance of academic institutions in creating a highly-skilled workforce and in generating the research base necessary for the competitiveness of tomorrow's industry. We are also aware that failure to support these programs will ultimately increase our Nation's dependence on foreign sources of intellectual capital, threatening domestic economic and energy security.

If we fail to generate the necessary support for our Nation's education infrastructure, current workforce trends in these vital areas will only worsen. We have already seen severe declines in the number of training programs around the country, and now our schools are nearing a critical point as 25 percent of the Nation's 70 mining engineering faculty members expect to retire in the next 5 years and 50 percent expect to retire in the next 10 years. The aging of faculty and a decline in graduates could result in a serious shortage of teaching and research staff, as well as talented workforce. point as 25 percent of the Nation's 70 mining engineering faculty members expect to retire in the next 5 years and 50 percent expect to retire in the next 10 years. The aging of faculty and a decline in graduates could result in a serious shortage of teaching and research staff, as well as talented workforce.

A lack of qualified engineering professionals hinders our ability to develop new energy resources and technologies, and with the demand for crude oil on the rise,

it is vital that we act now to improve the workforce crisis. In a 2007 report, the National Petroleum Council found that oil and gas demand will significantly increase in the next 30 years. For example:

- Global oil demand in 2030 will be 103 to 138 million barrels per day, up from 76 million in 2000;
- Global natural gas demand in 2030 will be 152 to 225 trillion cubic feet per year (TCF), up from 94 TCF in 2000;
- U.S. oil demand in 2030 will be 22 to 30 million barrels per day, up from 19 million in 2000; and
- U.S. natural gas demand in 2030 will be 25 to 30 TCF, up from 21 TCF.

Without an adequate workforce to access and develop energy resources, we could face serious shortages in energy supply that jeopardize our economic security. Consumers are already feeling the impact of high energy prices, as business energy costs increased 51 percent from 2000 to 2005, and companies such as American Airlines are paying billions of dollars more for fuel each year. With the price of gasoline increasing 105 percent since 2001, the price oil approaching $100 a barrel, and global energy demand on the rise, it is more important now than ever to support the institutions and professionals that work to improve domestic energy security.

Consumer Energy Alliance is extremely concerned about the future of our Nation's petroleum, mining and geological programs, as well as our economy. We encourage you to boost support for the academic institutions that provide education and training for these professionals so that we may replenish our dwindling energy workforce and strengthen national security. A healthy education system is vital to the production of a well-qualified workforce able to meet the needs of the industry and compete with the ever-changing global economy.

Once again we thank you for your efforts in addressing our Nation's energy workforce issue, but we hope you will hold additional hearings to consider petroleum, mining and geological education. These professionals play a critical role in energy and economic security, making it vital that interested stakeholders and the federal government work together to increase support for the academic institutions that sustain and protect America's competitive edge in the 21st century.

Sincerely,

DAVID HOLT,
Executive Director.

INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA,
Washington, DC, November 20, 2007.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

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

DEAR CHAIRMAN BINGAMAN AND SENATOR DOMENICI: On behalf of the Independent Petroleum Association of America (IPAA), representing over 5,000 independent producers of American oil and natural gas, I would like to thank you and the committee for shedding light on the mounting workforce challenges the domestic energy sector continues to face. Meeting America's growing demand for oil and natural gas will require a skilled, educated workforce. IPAA and its members, who drill 90 percent of all American wells and produce 68% of domestic oil and 82% of domestic natural gas, would like to work with you and your staffs in your attempt to address this important, but challenging issue.

The problems associated with meeting the workforce needs of the energy sector, and in particular the oil and gas extraction industries' needs are not new. The American petroleum industry reduced its workforce fully 60% between 1986 and 2000, with a record 38,000 job lost in 1999 alone, due in large part to the volatility of the market. Of the remaining oil and natural gas industry workforce, half are now between the ages of 50 and 60, while only 15 percent are in their early 20's to mid-30's. The average age in the industry is 48, with some major and super major companies reporting an average age in the mid-'50's. According to one of the larger independent producers quoted in the Interstate Oil and Gas Compact Commission's (IOGCC) report, "Petroleum Professionals—Blue Ribbon Task force: A Follow-up Report" (Jan. 2007), "One third of our (the industry's) geotechnical staff is eligible to retire in the next five years." According to an American Petroleum Institute's (API) 2005 report on workforce issues, since the peak employment of more than 860,000

jobs in the petroleum industry in 1982, more than 500,000 jobs were lost by 2000. The report goes on to say that "this sharp drop was accomplished by sustained layoffs, which gave the industry a reputation of an unreliable employer and sharply curbed entry into the industry by nearly a full generation."

After peaking at 11,000 in 1982, petroleum engineering enrollments in the U.S. fell to a low of 1,300 in 1997—a year before the most recent downturn. Although there has been a slight up tick in the number of enrollments within the last 2 years, in 2005 for example, enrollment in petroleum engineering in U.S. universities stood at approximately 1,500, still down 85% from the 1982 peak. In 2004, only 303 students graduated with bachelor's degrees in petroleum engineering in the U.S., according to a study by Texas Tech petroleum engineering department head Lloyd Heinze. From 1982 to 2005, the number of baccalaureate programs producing petroleum engineers declined from 34 to 16, while a very similar scenario occurred in the geosciences programs. The number of undergraduate geologists in U.S. universities plunged to 3,381 in 2003 from 7,524 in 1984, reflecting a drop ite 300 Washington, D.C. of 55%. For example, in 1982, approximately 4,000 advanced degrees (PhD and masters) were awarded in the geosciences, with about 50% winding up employed by the petroleum industry. These days that number is about 500 annually, with perhaps 100 of them entering the petroleum industry. Considering that the National Petroleum Council (NPC) notes in its 2007 study, "Hard Truths: Facing the Hard Truths About Energy", that the rise in demand for supply of oil and natural gas will continue, with U.S. oil demand in 2030 expected to be 22 to 30 million barrels per day, up from 19 million in 2000, and U.S. natural gas demand expected to be 25 to 30 trillion cubic feet per year (TCF) up from 21 TCF in 2000, educating and sustaining an adequate and skilled workforce in order to meet these needs should be viewed as an issue of paramount importance.

IPAA views education as the key to developing and sustaining a skilled workforce. In its workforce mission statement, IPAA states the need to both educate and encourage target audiences as to the prospective career opportunities associated with the oil and natural gas industry. In fact, IPAA's board of directors, at its recent annual meeting in San Antonio, Texas, moved forward with the consolidation of its separate Workforce and Education Committees, demonstrating the inextricable linkage between the two areas. IPAA also views as vital the development of initiatives that encourage both professional and vocational education to expand the industry workforce, necessarily covering both ends of the spectrum.

IPAA is working in secondary schools and universities to reveal the employment opportunities in the oil and natural gas industry.

The IPAA Educational Foundation, founded more than a decade ago, has provided funding to dozens of nationwide programs that help educate consumers, lawmakers and students about the industry. Detailed in this brochure are the successful undertakings that IPAA has been able to work on thanks to the contributions of its member companies, volunteers and staff.

In 2006, IPAA launched its Education Center in Houston. The Education Center is dedicated to coordinating initiatives in public education and workforce expansion. IPAA education initiatives operated by the Education Center, include:

Academies for Petroleum Exploration & Production Technology.—IPAA is pleased to announce that the Advanced Placement Math and Science Program at Milby Science Institute was chosen as the first IPAA sponsored academy in the country—with more to come in California, Colorado and Texas. IPAA has coordinated the curriculum development as well as programs that encourage the collaboration between academia and industry, student field trips, industry speakers, internships/mentoring plus various other educational initiatives. IPAA has also spearheaded the drive to bring laptop computers, reservoir software, as well as technical equipment to this unique advanced academic learning environment.

Science and Engineering Fair of Houston (SEFH).—IPAA is a co-sponsor of the 48th Science and Engineering Fair of Houston. The fair includes entries from over a hundred schools and more than 28,000 projects entered in the preliminary school/district fair competitions.

The NEED Project.—IPAA serves on the board of the National Energy Education Development Project, a 501(c)(3) nonprofit education association dedicated to promoting a realistic understanding of the scientific, economic, and environmental impacts of energy so that students and teachers can make educated decisions. To ensure that teachers and students are working with accurate information, NEED materials are updated on a regular basis, using the latest data from the U.S. Energy Information Administration, as well as from a wide range of energy industry partners. NEED works with educators and students to improve existing materials and

develop new ones to meet national and state curriculum requirements. NEED provided curriculum, hands-on kits and training to over 52,000 classrooms in 45 states.

The Taft Oil-Technology Academy.—IPAA is working with the Taft Oil-Technology Academy in California provides 10th through 12th grade curriculum in industry-related courses of study (college prep curriculum), while enabling and encouraging them to earn paid internships at leading oil and technology companies, obtain employment after graduation, and pursue higher education.

World Affairs Council of Houston/Global Energy Initiative.—As one of the largest funding sources for the Council, IPAA has helped introduce energy policy issues to students. Last year over 330 Texas Teachers benefited from the Council's energy programs impacting 43,000 students statewide.

Over the next year, we hope to build on IPAA's educational initiatives throughout the country. Again, we thank the Committee for turning its attention to this important issue, an issue that is inextricably linked to meeting the oil and natural gas supply needs of this Nation. The Committee has made a good first step towards addressing this issue in the form of its November 6 hearing; however, since the witness list did not include any witnesses from the oil and gas extraction community, we would urge you to consider scheduling a second hearing, in order to allow you to hear from the entire energy sector. In the interim, we look to working with you and your staffs as you attempt to take on this difficult, but important issue.

Sincerely,

BARRY M. RUSSELL,
President and CEO.

STATEMENT OF MARY POULTON, DEPARTMENT HEAD AND PROFESSOR, MINING & GEOLOGICAL ENGINEERING, UNIVERSITY OF ARIZONA, TUCSON, AZ

Mr. Chairman, thank you for your leadership and commitment to workforce issues in energy and natural resources. I urge the committee to conduct additional hearings on the workforce education crisis in this country to more fully develop the extent of the problem we face in educating mining and petroleum engineers and resource geologists and developing near-term solutions. Time is of the essence in solving these problems, and I look forward to working with the committee on a hearing to explore these important issues in the coming days.

I am Dr. Mary M. Poulton, Professor and Head of the Department of Mining and Geological Engineering at the University of Arizona. On July 8, 2004 I testified in front of the House Subcommittee on Energy and Mineral Resources regarding the impending "demographic earthquake" in the energy and minerals sectors. I will summarize some of my testimony here and provide updated information.

FROM JULY 2004 TESTIMONY

> We are faced with a situation where the engineering workforce in the minerals and petroleum sectors are aging and we are losing our capability to educate the next generation of engineers because of the frail state of mining engineering and petroleum engineering departments at US universities. I believe for mining engineering we are in a crisis and a crisis is an opportunity.
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> The mining business is "graying," with the great majority of current workers approaching retirement in the coming 10-15 years, and few younger workers entering the business. Nowhere is this fact more evident than in the professional ranks underpinning the industry. SME statistics are instructional. The portion of members over 50 years old will soon exceed 60%, with the number of new professional level entrants almost insignificant—less than 4% of the 2003 membership is younger than 30.
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> An example of the extent to which the age profile of mining professionals is advancing can be gained by examining the ranks of the geoscientists (geologists, geophysicists, metallurgists, and mining engineers) employed by the U.S. government. Around 2500 of these professionals are employed by the various federal agencies, with around 60% in the Department of the Interior. Just slightly under half (49.4%) of these individuals are currently over the age of 50, and a quarter of the (25.5%) over 55. The demographics for the subset holding positions as mining engineers—a more direct indicator of the situation facing the U.S. mining industry—are identical.
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> The convergence of these two trends—the approaching retirement of the experienced mining cohort and lack of young people entering the industry—has a major negative implication for Arizona's First University—Since 1885

mining companies. The opportunities to transfer experience from the older to the younger generation has been seriously impaired.

We are losing our technical mineral resource workforce, especially our academic mining engineering workforce, in this country and we do not have a global surplus on which to draw. Once you lose your capability to educate a technical workforce you do not easily regain it. We are on the verge of losing that capability in the US and I thank this Subcommittee for their interest and advocacy.

The University of California Berkeley, University of Illinois, Ohio State, University of Minnesota, University of Alabama, University of Idaho, Columbia University, University of Pittsburgh, Texas A&M, University of Washington, University of Wisconsin—Madison and Platteville, University of Wyoming have all closed their mining engineering programs since 1985, most on this list have closed since I made the decision to enter academia in 1987.

James Wicklund also testified at the July 8, 2004 hearing, focusing on issues in the energy sector and the economic implications of our declining workforce. Mr. Wicklund, in answer to questions from Chairwomen Cubin, testified that when we lose the technical workforce capacity in the energy sector (and the same is true of the minerals sector) in this country we lose leadership in the industry. When we lose leadership we lose the ability to affect purchases from suppliers in this country. When we lose suppliers we lose high paying jobs, and the tax base they support. The repercussions are felt beyond just the lack of the technical professionals and the multiplier for the economic impact is large.

CURRENT SITUATION

Undergraduate enrollments at most mining engineering programs have responded to market forces and have risen to 906 enrolled in 2006. In 2006, 128 BSc mining engineers graduated in the US, up from a low of 86 in prior years. Yet, the shortfall for mining engineers in the US to replace retirees is projected to be 300% and when production increases are factored in (including the oil sands industry in Canada which hires US graduates) we may be short by 600%. The workforce shortage is not just restricted to university degrees but is also felt in the skilled trades such as diesel mechanics, electricians, pipe fitters, etc. The shortage has already manifested itself as major delays and cost overruns on new mining projects. The next manifestation is being felt in safety.

Our capacity to increase enrollments in our university programs is limited. Faculty sizes for mining programs in the US are typically 5-10 full time professors supplemented by part time adjunct faculty. Faculty sizes in Canada, Australia, and South Africa tend to be larger than US mining faculties. Faculty sizes in the US tend to be small because federal research opportunities to support faculty and their graduate students are nearly nonexistent after the closure of the US Bureau of Mines. Other countries have supported technological advances to a much greater degree, to the point where US R&D dollars are being spent in Australia instead of the US because the Australian government will leverage those dollars and the US government will not.

The age profile of mining engineering faculty is another limiting factor in expanding capacity. Professor M. K. McCarter from the University of Utah has published an analysis of the current and future professorate in mining engineering in the September 2007 issue of Mining Engineering (p. 28). The number of mining engineering faculty in the US peaked at nearly 120 in 1984 and today there are a total of 86 budgeted lines for mining engineering faculty at all US universities with mining engineering departments. The average age of the faculty is 52. We expect nearly 30 retirements out of the 86 faculty lines in the next 5 years. Of the 27 of PhD candidates expected to graduate in 2007 only 4 are expected to even consider the option of a university position. Further exacerbating the problem, the specializations of current Ph.D. candidates is mismatched with the anticipated specializations to replace retiring faculty. For example, there is a pressing need for mine design specialists and there are almost no PhD candidates in this area.

The recent National Research Council publication on "Minerals, Critical Minerals, and the U.S. Economy" outlines how essential minerals are to vital sectors of our economy from defense to telecommunications and computers to automotive. Everything we use on a daily basis starts with a mined commodity. We have enjoyed an economy of abundance for more than 50 years and take for granted that we will always be in first position anywhere in the world to take resources from others that we are not willing to produce ourselves. This is no longer the case. Not only do we increasingly lack the political and economic clout to develop resources in other coun-

tries but we are quickly losing the technical capability as well. Do we want an economy of scarcity to be our legacy?

From my perspective, the way forward is obvious.

1. We must have a rational mineral policy and legal framework that ensures we can provide basic materials for our economy. Rational mining law reform can accomplish this.
2. We must have a research base that tackles the grand challenges in mineral resource development that will allow environmental protection, growth, and resource development to co-exist. The Energy and Mineral Schools Reinvestment Act can accomplish this.
3. We must communicate to our university presidents that the remaining mining engineering departments in the US must be a priority for support so we do not lose more capacity. Letters or meetings with the 13 university presidents with mining programs can accomplish this.

Mr. Chairman, you are in a position to make a major contribution to the country that will last for generations by taking action on these issues.

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