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INDUSTRIAL ENERGY EFFICIENCY

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

TO

EXAMINE DRAFT LEGISLATION REGARDING STRENGTHENING AMERICAN MANUFACTURING THROUGH IMPROVED INDUSTRIAL ENERGY EFFICIENCY

MARCH 26, 2009

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INDUSTRIAL ENERGY EFFICIENCY

THURSDAY, MARCH 26, 2009

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

The committee met, pursuant to notice, at 9:34 a.m. in room SD-366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

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

The CHAIRMAN. Why don't we go ahead and get started. I'm advised that Senator Murkowski is on her way and will be here fairly soon.

But we have a couple of other Senators here. Why don't I start with a short opening statement. Then we'll introduce the witnesses.

Good morning. Let me welcome everyone to this hearing. It's a hearing on S. 661.

This is a bill that many of us on this committee are co-sponsoring—Senator Murkowski, Senator Stabenow, Senator Bayh, Senator Snowe, Senator Collins, Senator Brown, Senator Pryor, Senator Kerry and Senator Schumer. The purpose of the bill is to strengthen American manufacturing through improving industrial energy efficiency.

Today our country is struggling with some of the toughest economic challenges we've seen, at least in my lifetime. Our manufacturing employment has hit a 63 year low. We've lost more than 1.3 million jobs in the last year and in this area.

It's not just employment that our country is losing. The industrial foundation upon which the Nation's wealth has been built is also eroding. We are losing technical expertise and the skilled and inventive work force that go with these jobs. We're losing the opportunity to grow our economy and the ability to compete on a global scale.

At the same time we're facing long-term energy climate and competitiveness challenges that go even beyond the economic hurdles that we face today. Our industrial sector consumes a third of our total energy use, produces a third of our greenhouse gas emissions. Our competitors overseas are capturing and manufacturing the advanced energy technologies that were developed here in this country.

However we have an opportunity today to renew and to transform our industrial base to better compete globally through superior technical capabilities and product value while also reducing

our dependence on carbon based fuels, reducing greenhouse gas emissions and increasing our productivity. The manufacturing sector represents one of the most widespread and lowest cost opportunities for energy efficiency in greenhouse gas emission reductions. The tremendous growth in renewable energy and energy efficiency offers an opportunity for the U.S. to increase domestic production of advance energy technologies recapturing the clean energy market.

The legislation that we are focused on today is entitled "Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009." That's a short title.

[Laughter.]

The CHAIRMAN. It takes the first steps in achieving this transformation by focusing on improving the energy productivity of our industry. Through providing financing mechanisms for manufacturers to implement cost competitive, energy efficient equipment and processes and through establishing public/private partnerships with industry to map out where advanced American manufacturing is headed to develop and deploy the breakthrough processes in technologies that will take us there. The bill will help renew our Nation's industrial base into one that is more productive and less reliant on fuels of the past.

We have a distinguished and well qualified panel of witnesses today. Before I introduce the panel, let me first—Senator Murkowski has just arrived here. Would you like a few minutes to get your bearings before we turn to you?

Senator MURKOWSKI. I'm totally beared here.

[Laughter.]

The CHAIRMAN. You've got your bearings. Ok, let me defer to Senator Murkowski for any opening statement she would like to make.

STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

Senator MURKOWSKI. Thank you, Mr. Chairman. I do appreciate the hearing today. S. 661, the Industrial Energy Efficiency Improvement Act is a good bill because I think it really looks toward the future of manufacturing here in the United States. That's a good thing for us all.

Over the last few decades our global competitors have improved their productivity and have captured high value manufacturing capabilities and in products that were invented here in the United States. That ought to charge us all up. If we started it here why are we not continuing with that level of manufacturing? I think that's one of the things that we want to focus on with this bill.

I think this bill will help to revive and strengthen our industrial competitiveness, restore our status as a manufacturing leader. A major focus of the bill is to improve the energy efficiency in energy productivity within the industrial sectors. We should always be working to find ways to get as much or more output from the same or less amounts of energy.

To this end within this bill we established the public/private partnerships that will develop and deploy new technologies and processes. These partnerships will help ensure the commercializa-

tion of these new technologies. So it's something that, Mr. Chairman, I'm pleased that we are including in our energy bill as we move forward.

I think it is an important part of our energy discussion. I'm pleased to have the witnesses before us this morning.

The CHAIRMAN. Thank you very much. Senator Stabenow suggested one of our witnesses today. Let me defer to her to introduce him. Then I'll introduce the rest of the panel.

STATEMENT OF HON. DEBBIE STABENOW, U.S. SENATOR FROM MICHIGAN

Senator STABENOW. Thank you very much, Mr. Chairman, not only for this distinguished panel. I'm very pleased to be introducing one of our witnesses, but also for your consistent advocacy for manufacturing within renewable energy, alternative energy. I very much appreciate coming from the great State of Michigan and a great manufacturing State that you understand the importance of supporting manufacturing and our ranking member as well. Senator Murkowski, thank you very much for those comments.

Mr. Jeff Metts is president of Dowding Machining, a manufacturing company in Eaton Rapids near Lansing, my home, just south of me. He is also representing MAG, a partner with Dowding. I see MAG President Roger Cope sitting right behind him, who is also here. We welcome you.

These gentlemen epitomize the opportunity that our manufacturers have to make a situation in our country today work for us as it relates to our new energy manufacturing. Together they have developed a revolutionary manufacturing process to produce wind turbines. If successful, if funding can be obtained, this will develop to full scale wind turbine manufacturing in the United States.

While a wind turbine has over 8,000 parts. I've said this more than once, every single one of those can be made in Michigan. This means a lot of jobs.

Currently 70 percent of all the jobs that are created through wind power come from manufacturing. So this is absolutely critical. Companies like Dowding and MAG, true green job employers, are an example that we can meet our energy goals and create substantial numbers of jobs.

However in this credit crisis we have to make sure they have the financial support to get their innovations and jobs developed and get them off the ground. So Mr. Chairman, I look forward to the hearing. I know that our energy policy and climate change policy will work for jobs if we do this right and focus on manufacturing.

I would finally just say, Mr. Metts, I really appreciate your enthusiasm. It's contagious. Your business plan is an excellent example of the great opportunities we have for advanced manufacturing in Michigan and across the country. Thank you.

The CHAIRMAN. Thank you very much. Let me just see if Senator Udall had any opening comment he wanted to make before I introduce the rest of the panel.

Senator UDALL. I'm eager to hear the panel, Mr. Chairman.

The CHAIRMAN. Alright. Let me introduce them.

David Rodgers, who is a regular testifier here. He is the director for Strategic Planning and Analysis in the Office of Energy Effi-

ciency and Renewable Energy in the Department of Energy. Thank you for being here.

Neal Elliott is associate director for research with the American Council for an Energy-Efficient Economy. Thank you very much for being here.

Dr. Savitz is a Ph.D. from Los Angeles, California. We appreciate your testifying today.

David Zepponi is the president of Northwest Food Processors Association. Thank you for coming.

Stephen Harper is the global director for Environment and Energy Policy for Intel. Thank you very much for being here.

Why don't we get started with Mr. Rodgers and hear the Department of Energy's perspective. If each of you could take 5 or 6 minutes and give us your main points you think we need to understand. We will include everyone's written statement in the record in full. But we would like to know the main points so that we can ask you some questions about them.

Mr. Rodgers.

STATEMENT OF DAVID RODGERS, DIRECTOR FOR STRATEGIC PLANNING AND ANALYSIS, OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY

Mr. RODGERS. Thank you, Mr. Chairman, Ranking Member Murkowski, members of the committee. It's a tremendous opportunity to appear before you today as you consider the Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009. While the administration has not finished its review of this bill and has yet to take a formal position, I'm pleased to answer your questions and provide comments on the cutting edge research and development activities at the Department of Energy's Industrial Technologies Program.

As you've mentioned, the manufacturing sector is central to the health and vitality of America's economy, contributing more than 12 percent of our Gross Domestic Product in 2007. The sector directly employs more than 13 million people and supports millions more jobs in other sectors of the economy. Although capital is tight right now in the current economic environment, there could be no better time for industry to invest in energy efficiency improvements that lower production costs, improve productivity, improve competitiveness, and promote job retention here in the United States.

With worldwide industrial energy use projected to increase 55 percent by the year 2030 from 2005 levels, there will be a global market for energy technology solutions. We believe that this new market presents enormous economic opportunities for America's workers and scientists. Our Industrial Technologies Program relies on collaborative partnerships to reduce energy use and carbon emissions in some of our most energy intensive industries. We have built long-standing partnerships with core industries that convert raw materials into the essential building blocks for U.S. manufacturing such as steel and chemicals.

When we make energy efficiency advances in these industries, they have a cascading effect throughout the economy. For example, chemicals are the building blocks of many products that meet our fundamental needs for food, shelter, and health. They're also essen-

tial to advance computing, telecommunications, and transportation. In addition to these core industries, we're also advancing technologies in the industries of the future such as information and communication technologies, helping make data centers more efficient.

Through our Save Energy Now program, the Department provides training and delivers energy savings that benefit U.S. manufacturing plants today. For example, our energy experts use specialized energy assessment tools and technical software to train plant staff in accurately identifying potential efficiency improvements. These tools are used by the Department's university based, Industrial Assessment Centers to help reduce energy consumption across the industrial sector.

Our Industrial Assessment Centers send teams of engineering faculty and students from 26 participating universities to local plants who need assessments. These teams perform detailed analyses to produce specific recommendations with related cost estimates, performance and pay back times. These Industrial Assessment Centers also serve as a training ground for the next generation of energy savvy engineers and provide a launching pad for many students into green jobs. Since 1977, over 2,500 alumni of the Department's Industrial Assessment Centers have gone on to careers in the energy industry.

The Save Energy Now program has completed over 2,000 assessments at plants across the country with identified energy savings of more than $1 billion. Energy savings of more than $190 million have already been implemented on the ground. We've also identified potential emissions reductions of carbon dioxide of more than ten million metric tons.

The Department and its partners are bridging the gap between mission-oriented science and applied research that leads to energy innovations in the marketplace by competitively awarding cost shared funding to collaborative research teams. Since the inception of our program, we've commercialized dozens and dozens of technologies, saving more than five quadrillion BTUs of energy, and earning more than 48 R and D 100 awards. For example, as this committee has recognized, the application of innovative, energy efficiency technologies such as combined heat and power represents a promising near term energy option for the industrial sector that combines environmental improvements and economic viability with improved competitiveness.

In December 2008, our Oak Ridge National Laboratory released a report that describes how combined heat and power, with the appropriate market and policy incentives, could supply up to 20 percent of U.S. electric generating capacity and could potentially reduce the increases in our carbon dioxide emissions by 60 percent by the year 2030. We've distributed a copy of this report to the committee. We look forward to discussing those topics with you.

We believe the industrial sector has made significant advancements toward the application of more efficient energy practices over the last several years. But many barriers remain. As has been mentioned, the tight capital markets make it difficult for industry to invest in energy efficiency. In many cases we need to increase

the awareness of the energy efficiency technologies among the private sector, which can benefit from its implementation.

However, we feel that challenges can be addressed by the energy efficiency innovation in the industrial sector, as has already been demonstrated. We believe that this legislation can help us further leverage our partnership with industry, universities, and the National Laboratories. We will continue to champion collaboration that propels science from the laboratory into the marketplace and helps meet our Nation's environmental energy and economic challenges.

Thank you again for the opportunity to appear before you today. I'm happy to answer any questions.

[The prepared statement of Mr. Rodgers follows:]

PREPARED STATEMENT OF DAVID RODGERS, DIRECTOR FOR STRATEGIC PLANNING AND ANALYSIS, OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY

Mr. Chairman, Ranking Member Murkowski, members of the Committee, thank you for the opportunity to appear before you today as you consider the Industrial Energy Efficiency Improvement Act of 2009. While the Administration has not finished its review of this bill and has yet to take a formal position, I am pleased to offer some preliminary comments on the cutting-edge research and development activities under the Department of Energy's (DOE) Industrial Technologies Program (ITP). ITP collaborates with industry, academia, and the national laboratories to develop the next-generation technology solutions to industry's critical energy and carbon challenges.

Many types of energy efficiency improvements offer industry the fastest, lowest risk, most economical way to lower greenhouse emissions and reduce energy use. Improvements in energy efficiency can be made today, with significant benefits: the McKinsey Global Institute identified energy savings sufficient to cut world-wide consumption growth in half using only existing technologies that offer at least a 10 percent internal rate of return.[1]

THE IMPORTANCE OF INDUSTRY

The manufacturing sector is central to the health and vitality of America's economy, contributing 12 percent to U.S. gross domestic product (GDP) in 2007. The sector directly employed 13.3 million people in 2007 and supports millions more jobs in other sectors of the economy.[2] Internationally, the United States produces nearly one quarter of the world's manufacturing output, and in terms of collective economic output,[3] U.S. manufacturers rank first in the world, though it is unclear to what extent the recent economic downturn has impacted these statistics.

To fuel the furnaces and power the engines of American factories, U.S. industry consumed 32.3 quads of energy in 2007—nearly a third of all U.S. energy consumption.[4] U.S. industry alone uses more energy than the total energy used by any other G8 nation and about half of the total energy used by China. U.S. industry is also responsible for significant greenhouse gas emissions, producing an estimated 1,640 million metric tons of carbon dioxide from energy consumption in 2007.[5]

Over the last several decades, U.S. industry has committed to using energy more efficiently. Although capital is tight in the current economic environment, the Department is partnering with industry to continue to invest in industrial energy efficiency. By lowering production costs, energy efficiency contributes to productivity,

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[1] McKinsey Global Institute, "Curbing Global Energy Demand Growth," May 2007.

[2] Bureau of Economic Analysis (applies both to GDP percentage and jobs), http://www.bea.gov/industry/gpotables/gpo_action.cfm?anon=91793&table_id=23975&format_type=0, http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-ds_name=EC0700CADV1&-_lang=en. Note: Indirect manufacturing support jobs removed for 13.3 million. Total is actually 14 million.

[3] United Nations Industrial Development Organization, http://www.unido.org/fileadmin/user_media/Publications/IDR/2009/IDR_2009_print.PDF; Industrial Development Report 2009, http://www.uschina.org/public/documents/2009/us_manufacturing.pdf.

[4] Energy Information Administration, Annual Energy Review 2007, http://www.eia.doe.gov/aer/pdf/aer.pdf.

[5] Energy Information Administration, Emissions of Greenhouse Gases in the United States 2007, http://www.eia.doe.gov/oiaf/1605/ggrpt/pdf/0573(2007).pdf.

competitiveness, and job retention. For the long term, early action on carbon mitigation may provide a competitive advantage for some industrial companies under carbon cap-and-trade policy. With worldwide industrial energy use projected to increase 55 percent by 2030[6] (from 2005 levels), a global market for energy technology solutions is rapidly emerging. This new market presents enormous economic opportunities for American workers and scientists. U.S. industry and the American research community have the commitment, talent, and skill to lead the world in implementing energy efficiency and industrial technology innovation.

DOE'S INDUSTRIAL TECHNOLOGIES PROGRAM STRATEGY

The Department of Energy's Industrial Technologies Program relies on robust, collaborative partnerships to reduce energy use and carbon emissions in some of the most energy-intensive industries. The Department has built long-standing partnerships with many core industries that convert raw materials into the essential building blocks for U.S. manufacturing, such as steel and chemicals. Energy efficiency advances in these industries have a cascading effect throughout the economy. For example, chemicals are the building blocks of many products that meet our fundamental needs for food, shelter, and health; they're also essential to advanced computing, telecommunications, biotechnology, transportation, and more.

Each of our partner industries has developed a broad vision for the future and developed technology roadmaps that lay out clear pathways and priorities for research and development (R&D). Many of the priorities involve costly, complex research on basic energy-intensive processes that are integral to an entire industry—not the type of research that individual companies are willing to undertake alone. The Department brings together collaborative teams that share the costs and risks of research and draw on the diverse strengths of industry, academia, and the National Laboratories to solve these technological challenges for today and for the future.

DOE HELPS INDUSTRY SAVE ENERGY NOW THROUGH OUTREACH AND DEPLOYMENT

Through its Save Energy Now program DOE provides training and delivers energy savings that benefit U.S. manufacturing plants today. Our energy experts use specialized energy assessment tools and software to train plant staff in accurately identifying efficiency gains in common plant systems such as steam and heat generation, pumping, motor and fans, and compressed air systems. These tools are used by the Department's university-based Industrial Assessment Centers (IACs) energy experts on manufacturing facilities to help meet the goal in the Energy Independence and Security Act of 2007 of 25-percent reduction in industrial energy intensity by 2017 (2007 baseline). Companies nationwide can participate in no-cost energy assessments and access DOE resources to reduce unnecessary expenditures and boost productivity through improved energy efficiency. In addition, the Department's IACs also send teams of engineering faculty and students from 26 participating universities to local plants requesting assessments. These teams perform detailed analyses to produce specific recommendations with related cost estimates, performance and payback times. Just as importantly, the IACs serve as a training ground for the next-generation of energy-savvy engineers and provide a launching pad for many students into "green collar" energy efficiency jobs.

As of March 2, 2009, Save Energy Now has completed over 2,000 assessments with 1,873 plants reporting:[7]

- Potential energy cost savings of more than $1.2 billion, of which industry has already implemented more than 15 percent, achieving energy cost savings of more than $190 million
- Potential natural gas savings of 131 trillion Btus
- Total potential reduction in carbon dioxide emissions of 10.3 million metric tons.

DOE AND PARTNERS DEVELOPING NEXT-GENERATION ENERGY TECHNOLOGIES

DOE and its partners are bridging the divide between mission-oriented science and the applied research that leads to energy innovations in the marketplace. Collaboration among world-class scientists from industry, academia, and the Department of Energy's National Laboratories is fundamental to technology development success. Technological innovation drives economic growth, but such innovation re-

[6] Energy Information Administration, International Energy Outlook 2008. http://www.eia.doe.gov/oiaf/ieo/pdf/0484(2008).pdf.

[7] Save Energy Now Results, Industrial Technologies Program, DOE, http://apps1.eere.energy.gov/industry/saveenergynow/partners/results.cfm.

quires sound science to serve as the springboard for market prosperity. With these realities in mind, the Department competitively awards cost-shared funding to collaborative research teams—and industry's active participation on these teams helps ensure that the technologies meet real-world criteria (e.g., effective operation in harsh industrial environments), ultimately accelerating technology commercialization.

A history of leveraging these partnerships has enabled DOE to transform innovative science into cutting-edge commercial products that improve American productivity, enhance domestic manufacturing competitiveness, and reduce national energy consumption. Since the inception of the Department's Industrial Technologies Program, DOE and its partners have successfully:[8]

- Commercialized many technologies, 104 of which are currently being followed in industrial markets to track their energy impacts
- Saved 5.6 quadrillion Btus of energy
- Achieved emissions reductions of 103 Million Metric Tons of Carbon Equivalent (MMCTe)
- Earned 48 R&D 100 Awards between 1991 and 2008 with our partners in the National Laboratories and universities representing over half of the awardees.

Technological change has long been one of the most profound forces spurring productivity growth in the United States. The development of next-generation products, services, and ways of doing business are central to America's long-term prosperity. Today, the Department is forging even stronger partnerships with the National Laboratories, academia, and industry to address the Nation's energy and climate challenges. Nanotechnology and Combined Heat and Power represent two especially promising areas in which DOE and its partners are working to positively impact the energy intensity, carbon management, and competitiveness of American industry.

NEAR-TERM AND NEXT-GENERATION INDUSTRIAL TECHNOLOGY EXAMPLES

Combined Heat and Power (CHP) solutions represent a promising near-term energy option that combines environmental effectiveness with economic viability and improved competitiveness. After years of success in this arena, DOE and its partners are poised to take CHP's potential to the next level. With targeted development and deployment efforts, the United States has the potential to save energy, reduce carbon emissions, create high-quality "green" jobs, improve the Nation's energy security, and stimulate economic growth (see Figure 2).[9] The Department's CHP partnerships have already yielded impressive returns. In December of 2008, Oak Ridge National Laboratory released a report detailing the enormous promise CHP continues to hold. The report, Combined Heat and Power: Effective Energy Solutions for a Sustainable Future, suggests that with market and policy incentives, CHP could potentially (and cost effectively) reduce the projected increase in U.S. carbon dioxide emissions by 60 percent by 2030.[10]

20 % of U.S. Electricity Generating Capacity	240,900 MW
Annual Energy Savings	5.3 Quads
Annual CO_2 Reduction	848 MMT
Annual Carbon Reduction	231 MMT
Cumulative Jobs Created Through 2030	1 million

Figure 2. ORNL Report identifies potential benefits that could occur if 20% of electrical capacity was CHP by 2030.

The Department is also working to transform nanotechnology science into real-world solutions for industrial nanomanufacturing. As part of the National Nanotech-

[8] Impacts: Industrial Technologies Program: Summary of Program Results for CY2006 http://www1.eere.energy.gov/industry/about/pdfs/impacts2006_full_report.pdf.

[9] This level of market penetration would require significant market and policy incentives. A complete analysis of the cost of these incentives for comparison to the above potential benefits has not been completed.

[10] Combined Heat and Power: Effective Energy Solutions for a Sustainable Future, Oak Ridge National Laboratory, December 2008, http://www1.eere.energy.gov/industry/distributedenergy/pdfs/chp_report_12-08.pdf

nology Initiative (NNI) established in 2001, DOE worked with industry experts to identify priority needs and opportunities and worked with the National Laboratories to initiate DOE's first call for nanomanufacturing projects. Projects were judged by a diverse team of university, government, business, and consulting nanotechnology experts before the Department ultimately selected 20 projects from 8 DOE National Laboratories.

In concert with its other initiatives, DOE is providing energy technology and deployment solutions that meet industry's critical needs today and deliver the next-generation and transformational technologies that will support America's industrial leadership in the decades ahead.

CHALLENGES AND OPPORTUNITIES

While the industrial sector has made significant advancements toward more energy efficient practices, a number of barriers remain, such as tight capital markets. In addition, industrial energy efficiency at times suffers from a lack of awareness among the very private sector interests that stand to benefit from its implementation. This situation hampers sound energy management and technology investment policy from becoming implemented. Many of the benefits that industry would enjoy from improved energy management would also provide public benefits, such as reduced emissions of pollutants and greenhouse gases.

However, many of these challenges can be addressed by the type of innovation that the industrial sector has already demonstrated. DOE's Industrial Technologies Program and its partners have already broken ground on the next generation of energy technology in areas such as nanomanufacturing; and cultivating new industries of the future, such as those manufacturing wind turbines, solar panels, and advanced batteries, can contribute to energy security and economic development. By further leveraging its partnerships with industry, universities, and the National Laboratories, the Department will continue to champion collaboration that propels science from the laboratory into the marketplace and helps to meet the Nation's environmental, energy, and economic challenges.

Thank you again for the opportunity to appear before you today. I am happy to answer any questions.

The CHAIRMAN. Thank you very much.

Dr. Elliott.

STATEMENT OF R. NEAL ELLIOTT, PH.D., P.E., ASSOCIATE DIRECTOR FOR RESEARCH, AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Mr. ELLIOTT. Mr. Chairman, Senator Murkowski and members of the committee, thank you for the opportunity to be here today. The ACEEE is a non-profit organization dedicated to advancing energy efficiency to promote both economic prosperity and environmental protection.

I've been involved in the manufacturing area for now over 30 years, the last 16 of those as the Founding Director of the Industrial program at ACEEE. As you noted the manufacturing sector remains a very important part of the U.S. economy. While many people now talk about us moving into a post industrial economy, the reality is the United States is now still over a fifth of the global manufacturing capacity. As the chairman mentioned accounts for about a third of the energy consumption in the United States today.

Prior to the current economic downturn our analysis indicated that the manufacturing sector was poised to enter a period of major reinvestment in capacity expansion. As recently as the third quarter of last year, we saw many sectors of the U.S. manufacturing industry in a state of full capacity utilization. When the economic downturn occurred obviously we saw that drop. We now are in a period of unprecedented—we almost are now describing it as hiber-

nation for the manufacturing sector with many plants just attempting to survive through the economic downturn.

The drop has occurred very, very rapidly. But we also anticipate that once the economy recovers that the demand is likely to recover very rapidly as well for the manufacturing sector. When that recovery occurs the manufacturing sector will need to make major new investments in manufacturing capacity to enhance its global competitiveness.

We, based on our conversations with manufacturing over the last 15 years have identified 5 key categories of what we will call infrastructure that are necessary to improve the energy efficiency of the manufacturing sector and its global competitiveness.

Those are new technologies, products and processes.

The access to industry specific technical expertise.

Access to assessment and training services for workers.

The availability of a trained and capable workforce ranging from equipment operators, plant floor operators, all the way to senior engineers and management.

Finally, as David Rodgers had mentioned, access to capital needed to make those investments.

At this point we don't see the industry making the investments today. However, one of the things that I think is important to remember is it takes time to make an investment in the manufacturing sector. We basically turn a switch and we go out and buy a light bulb.

Changing out major process elements in the manufacturing sector which is where the big opportunities are can take 3 to 5 years to plan and schedule and bring all the pieces of equipment together. So what we do today is going to affect what's going to happen over the next 5 years. As Senator Murkowski had indicated though, we have not been investing in the manufacturing sector here in the United States over the last 15 years.

At the same time our competitors globally have been making major investments and that puts us at a competitive disadvantage in this country. Today the industrial technology program with the Department of Energy is the only remaining Federal resource for the manufacturing sector in terms of their competitiveness and energy efficiency. While the program has experienced significant budget cuts and staffing reductions over the last 15 years, the program is continuing to be able to make major contributions to U.S. manufacturing as Mr. Rodgers had indicated.

What we need to do now is begin to rebuild the Department and rebuild that program in particular and bring its staffing up to the levels. Senator, you and your colleagues, we'd like to commend you for the introduction of the Restoring America's Manufacturing Leadership through Energy Efficiency Act because we think this is probably the most important piece of manufacturing energy legislation we've seen in the past 15 years in the United States.

We think there are many important provisions in the bill that will get the DOE industrial program back on track. We hope get the Federal Government reengaged in support of the manufacturing sector. We would like to note two provisions.

The Industrial Research and Assessment Center provision that is in the Act is a very important addition. As David Rodgers had indi-

cated, the Industrial Assessment Center program is a long running program that has been very successful and contributed many, much to the industrial sector. We think the program is poised to be able to expand significantly from its current levels.

We think the provisions that are set forward in the Act would do that in a way that is sensitive to the elements that have made the program successful over the many years. We'd like to also endorse the creation of the Industrial Technology Steering Committee. We think it's important that the program is responsive to the needs of the manufacturing sector.

In the last few years, we've seen that close relationship that existed in prior years between the manufacturing companies and the program has diminished. We are pleased to see a direction and a return to that. We've certainly heard indications of that from staff at DOE and so we appreciate that.

So it's my pleasure to endorse this bill. We'd like to express our appreciation to you, Senator Murkowski and to the other members who've been supportive of this bill. We think this is an important bill and look forward to working with the committee and the Department on its enactment and implementation. Thank you.

[The prepared statement of Mr. Elliott follows:]

PREPARED STATEMENT OF R. NEAL ELLIOTT, PH.D., P.E., ASSOCIATE DIRECTOR FOR RESEARCH, AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

SUMMARY

Thank you for the opportunity to testify in support of the Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009. ACEEE feels that this bill represents an important complement to existing law. The timing of this bill is particularly important, as our country needs to prepare now if we are to be ready to seize a once-in-a-generation opportunity to influence the energy efficiency and sustainability of the manufacturing sector once it emerges from the current economic downturn. The manufacturing sector and its contributions to the nation's economy and jobs have been ignored for far too many years, and it is important that this neglect be reversed. This bill will make significant progress if all of its provisions are enacted and funded.

Manufacturing continues to represent an important component of the United States economy, accounting for about 14 percent of gross domestic product. The manufacturing sector was responsible for almost a third of national energy consumption in 2007. According to the National Association of Manufacturers, the U.S. share of global manufacturing output has remained constant at between 20 and 23 percent over the past decade, in spite of perceptions that U.S. manufacturing has been in rapid decline. In fact, economic data have shown that up until the recent economic downturn, U.S. manufacturing was increasingly healthy, having recovered from the energy price shocks of the first half of this decade. ACEEE's analysis released last summer suggested the manufacturing sector was poised to enter a period new capacity investments as the economy approached full utilization of existing capacity.

Beginning in the second quarter of 2008, however, manufacturing output in the U.S. began to decline as the economy began to slow, with all industries experiencing a sharp drop in production as demand for manufactured goods dropped precipitously in the last quarter of 2008. These firms are now hibernating in an attempt to survive the economic winter. They need the cash to preserve their manufacturing capacity and to retain the trained workforce necessary for a future return to operation when demand for manufactured goods recovers.

When the economy recovers, the manufacturing sector will find itself in need of significant investments in new manufacturing capacity, and will face the need for a trained workforce. This renewed investment in expanded and modernized manufacturing capacity will represent a unique opportunity not seen in over a generation. To accomplish this, however, the necessary infrastructure to support a more sustainable industrial base must be built now, before industry is fully ready to invest. This infrastructure will take several years to implement fully, but it will be needed in

order for manufacturing companies to modernize, especially since we have underinvested in this infrastructure over the past decade. ACEEE research indicates that this infrastructure falls into five key categories:

1. New technologies, products and processes
2. Access to industry-specific technical expertise
3. Access to assessment and training services for workers
4. Availability of a trained and capable workforce, ranging from operators to senior engineering and management
5. Access to capital to make needed investments

The coming economic recovery will likely occur quite rapidly, since inventories are being drawn down. Once demand for manufactured goods recovers, industry will need to rapidly return to production. Firms will then need to invest in new capacity to meet increased market demands. This situation dictates that now is the time to invest in new sustainable capacity for these key resources and not wait till the recovery actually begins. If we are not prepared, we run the risk of locking in less efficient capacity for decades or losing manufacturing capacity and jobs to other parts of the world.

Over the past 15 years, federal policy makers have largely ignored the manufacturing sector at best, and actively worked to undermine the programs intended to serve this sector at worst. This neglect has occurred all while the sector has experienced an unprecedented series of challenges: the globalization of markets, energy price instabilities and global competition for resources, including both feedstocks and trained workforce. Over the past decade, ITP has experienced significant reductions in funding and the attrition of experienced staff, seriously compromising its efficacy with funding for industry-specific research declining 84% since 2001, leaving the pipeline for new technologies and innovative practices empty. Concurrently, clarity of the program's goals and mission has been lost due to lack of senior leadership within the agency and in the prior administration. In spite of these challenges, the program has achieved continued success.

ACEEE commends Senator Bingaman and his colleagues for introducing the Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009 (S. 661). We feel this bill changes course on support for manufacturing, and complements the industry-specific research and development activities authorized in EISA Sec. 452, beginning to address many of the infrastructure needs we have identified for the support of greater energy efficiency and economic competitiveness of the U.S. manufacturing sector.

- The Industrial Energy Efficiency Grant Program (Sec. 2), Small Business Loans (Sec. 5), and Innovation in Industry Grants (Sec. 7) all address the most pressing current challenge facing manufacturing industries: a lack of access to capital. By providing available credit, these provisions support manufacturers who want to make investments in energy efficiency and capacity to manufacture innovative, new technologies.
- The Coordination of Research and Development of Energy Efficient Technologies for Industry (Sec. 3), Energy-Efficient Technologies Assessment (Sec. 4), Industry-Specific Roadmaps (Sec. 5) and Study of Advanced Energy Technology Manufacturing Capabilities (Sec. 8), are all excellent complements to the industry-specific research activities authorized by EISA Sec. 452, enabling the research needed to put new technologies, products and processes into the market to keep U.S. manufacturing efficient and competitive.
- ACEEE is particularly excited to see the inclusion of the Industrial Research and Assessment Centers (Sec. 5) provision. This proposal expands and enhances the aforementioned Industrial Assessment Center (IAC) program. The 26 university-based IACs play the role of providing access to expertise for small and medium-sized manufacturing facilities while also providing invaluable experience to students who participate in the plant assessments and supporting their faculty's interest in manufacturing energy efficiency. The proposals in this section expand and enhance the IAC program while maintaining the elements that have made the program so successful over its 33 year history. By expanding the number of centers, the benefits of assessments will become available to many industrial facilities not currently located near an existing IAC, and the number of graduates from the centers will increase significantly, helping to meet the trained workforce needs that have been identified by manufacturers as a key challenge facing the manufacturing sector.
- We also endorse the creation of an Industrial Technologies Steering Committee (Sec. 9) for U.S. Department of Energy's Industrial Technology Program. The past effectiveness of the program was in large part a result of its strong work-

ing relationship with private manufacturing companies that allowed the program's activities to be tailored to address the actual technology and market needs of industry, enabling manufacturers to become more efficient and competitive. Over the past eight years, we have seen this close coordination erode, and we feel that the creation of this committee will help reverse this trend.

Thank you again for the opportunity to testify in support of this bill, and we look forward to working with the committee to see that it is passed expeditiously. The manufacturing sector needs the infrastructure that is enabled by this bill more now than ever before.

INTRODUCTION

My name is Neal Elliott, and I am the Associate Director for Research of the American Council for an Energy-Efficient Economy (ACEEE), a nonprofit organization dedicated to increasing energy efficiency to promote both economic prosperity and environmental protection. I have worked actively on manufacturing energy efficiency issues for over 30 years, the past 16 as the founding director of the Industrial Energy Efficiency Program at ACEEE. ACEEE's Industrial Program is the leading manufacturing energy policy research program in Washington's public interest community, working closely with manufacturing companies, trade associations, state and federal agencies, other nonprofits and publicly funded industrial energy efficiency programs across the country. Because of our wide range of contacts, we play a unique convening role, bringing together diverse groups to help develop policy and program proposals that address the needs of the manufacturing sector for improved energy productivity, cost-effective environmental compliance and greater competitiveness in a global marketplace, while addressing the environmental and economic challenges facing our country as a whole.

Manufacturing continues to represent an important component of the United States economy, accounting for about 14 percent of gross domestic product.[1] The manufacturing sector was responsible for almost a third of national energy consumption in 2007.[2] According to the National Association of Manufacturers, the U.S. share of global manufacturing output has remained constant at between 20 and 23 percent over the past decade, in spite of perceptions that U.S. manufacturing has been in rapid decline. In fact, economic data have shown that up until the recent economic downturn, U.S. manufacturing was increasingly healthy, having recovered from the energy price shocks of the first half of this decade. ACEEE's analysis released last summer suggested the manufacturing sector was poised to enter a period new capacity investments as the economy approached full utilization of existing capacity.[3]

IMPACT OF ECONOMIC DOWNTURN

Beginning in the second quarter of 2008, however, manufacturing output in the U.S. began to decline as the economy began to slow, as can be seen in Figure 1.* Initially the downturn hit the building and automotive-related manufacturing industries, with some energy-intensive primary manufacturing industries such as steel and chemicals continuing to experience robust production. This picture changed dramatically during the fourth quarter of 2008, when almost all industries experienced a sharp drop in production as demand for manufactured goods dropped precipitously. As Figure 1 shows, this manufacturing crisis is global, and U.S. manufacturers are actually fairing far better than the rest of the world.[4]

ACEEE's recent conversations with companies and trade associations across the entire range of manufacturing industries indicate that firms are now in survival mode, conserving cash in hopes of weathering the current economic downturn. Without demand for manufactured products, companies are shutting down plants to minimize the rate at which they use their cash. It may be useful to think of these firms as hibernating in an attempt to survive an economic winter, with cash reserves analogous to stored calories. They need the cash to preserve their manufacturing capacity and to retain the trained workforce necessary for a future return to operation. They are hoarding their reserves so that when the economic "spring" comes,

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[1] N.D. Swartz, "Rapid Declines ion Manufacturing Spread Global Anxiety," N.Y Times, March 20, 2009, http://www.nytimes.com/2009/03/20/business/worldbusiness/20shrink.html.

[2] Energy Information Administration, Annual Energy Outlook 2009 Early Release, December 2008, http://www.eia.doe.gov/oiaf/aeo/index.html.

[3] R.N. Elliott, A.M. Shipley and V. McKinney, Trends in Industrial Investment Decision Making, August 2008, http://aceee.org/pubs/ie081.pdf.

* Figures 1–2 have been retained in committee files.

[4] Swartz, op cit.

companies are ready to emerge to take advantage of a resurgent demand for manufactured goods. Unfortunately, firms that don't have sufficient reserves may not be able to survive this economic winter, and unlike in more prosperous times, the manufacturing capacity of the failed firms will often not be acquired by healthy competitors and will instead be lost.

Some may ask why industry does not invest in energy efficiency now since their plants are shut down and staff are not otherwise occupied. The reality is that if plants shut down, firms stop generating cash flow, and in the current economic environment, no one knows when consumer demand for manufactured goods will return. Because of this uncertainty, most firms are in no position to invest.

When the economy recovers, the manufacturing sector will find itself in even greater need of investment in new manufacturing capacity, and will face the need for a trained workforce as identified in ACEEE's 2008 study.[5] This renewed investment in expanded and modernized manufacturing capacity will represent a unique opportunity not seen in over a generation. This will be the opportunity to rebuild the U.S. industrial base into a more efficient, productive and sustainable sector that will allow it to be competitive in a resource-and carbon-constrained global market. To accomplish this, however, the necessary infrastructure to support a more sustainable industrial base must be built now, before industry is fully ready to invest. This infrastructure will take several years to implement fully, but it will be needed in order for manufacturing companies to modernize, especially since we have underinvested in this infrastructure over the past decade.

Over the past sixteen years, ACEEE has built an understanding of the manufacturing sector's needs to invest in a more sustainable future. Industry indicates that its needs from the public sector fall into five key categories:

1. New technologies, products and processes
2. Access to industry-specific technical expertise
3. Access to assessment and training services for workers
4. Availability of a trained and capable workforce, ranging from operators to senior engineering and management
5. Access to capital to make needed investments

The coming economic recovery will likely occur quite rapidly, since inventories are being drawn down. Once demand for manufactured goods recovers, industry will need to rapidly return to production. Firms will then need to invest in new capacity to meet increased market demands. This situation dictates that now is the time to invest in new sustainable capacity for these key resources and not wait till the recovery actually begins. If we are not prepared, we run the risks of locking in less efficient capacity for decades or losing manufacturing capacity and jobs to other parts of the world.

AWARENESS OF AND SUPPORT FOR THE MANUFACTURING SECTOR

Much of the manufacturing sector is largely invisible to outsiders. This is due to the interconnected nature of the sector and its supply chains. ACEEE estimates that five out of six business transactions occur as business-to-business transactions in these interconnected supply chains while only 15% of the total transactions occur with end-users.

There exists a misperception that the U.S. is a "post-industrial" country. Over the past 15 years, federal policy makers have largely ignored the manufacturing sector at best, and actively worked to undermine the programs intended to serve this sector at worst. This has occurred all while the sector has experienced an unprecedented series of challenges: the globalization of markets, energy price instabilities and global competition for resources, including both feedstocks and trained workforce. Funding for manufacturing programs by the federal government has fallen dramatically, with the Advanced Technology Program at the National Institute of Standards and Technology now effectively eliminated and the highly successful industrial programs at U.S. Department of Energy (DOE) now shadows of what they were a decade ago.

DOE's Industrial Technologies Program (ITP) represents one of the only remaining federal programs focused on meeting the technology and energy needs of the manufacturing sector in the United States. The program has achieved an impressive track record, offering some of the most effective federal energy efficiency programs

[5] Elliott, et al., op. cit.

available, and recognized by the National Academies as one of the most effective federally funded technology and process application programs.[6]

Over the past decade, ITP has experienced significant reductions in funding (see Figure 2) and the attrition of experienced staff, seriously compromising its efficacy. In particular, the funding for industry-specific research has declined 84% since 2001, leaving the pipeline for new technologies and innovative practices empty. Concurrently, clarity of the program's goals and mission has been lost due to lack of senior leadership within the agency and in the prior administration. In spite of these challenges, the program has achieved continued success with Save Energy Now (SEN)—its response to the natural gas crisis triggered by Hurricanes Katrina and Rita—and with long-running efforts such as the industry co-funded research and education initiatives under the Industries of the Future (IOF) and the Industrial Assessment Centers (IAC) programs. As can be seen in Figure 2, SEN and other deployment-related activities have grown to take a larger share of the program's budget in recent years, though they still are only funded at about half of their 1999 funding levels at a time they are most needed in the US.

One of the under-appreciated successes of ITP has been the synergies between the IAC, IOF and SEN programs. The IAC program has been among the most successful of these federal programs, and has operated continuously since 1976. The program contributes to three goals:

1. It provides energy assessment to small and medium-sized manufacturing facilities, many of which do not have internal energy management capability, by sending in teams of engineering students and faculty from 26 universities across the country;
2. It provides hands-on training for engineering students in manufacturing engineering and energy efficiency, creating an important pool of trained energy engineers who are in demand by manufacturing companies, energy programs and energy consulting firms; and
3. It provides a source of support for university professors-who serve as IAC directors-to focus on manufacturing energy engineering, developing courses and research programs that reach many more students beyond just those who are part of the IACs.

Many of the IAC directors are also principle investigators on IOF research projects, further supporting their manufacturing engineering academic programs, and providing important support for graduate students who can fill the ranks of future research positions in academia and industry. These directors also represent an important pool of certified experts in manufacturing energy efficiency, as they hone their research in their roles managing both IAC-and sometimes SEN-assessments. These three programs combined provide the only significant source of federal support for manufacturing-focused energy engineering at the university level.

RECENT DEVELOPMENTS AND NEEDED ACTION

In the past few years, we have seen a growing awareness of the imperative to address the needs of the manufacturing sector. The 110th Congress stepped up and passed an important legislative provision to re-engage government to meet the needs of the manufacturing sector. Sec. 452 of the Energy Independence and Security Act of 2007 (EISA) reauthorized and expanded the industry-specific research and development activities of ITP and reauthorized the IAC program, though funding under this new authorization is only just beginning to flow to DOE.

The new Administration and Congress have continued to show support for the manufacturing sector. We are encouraged to hear that Secretary Chu has increased funding for fiscal year 2009 to $90 million under the recent omnibus budget act, and that he has directed that $50 million of the funding authorized by the American Recovery and Restoration Act of 2009 to DOE be used to support existing, unfunded research commitments.

We hope that the Secretary and the Obama Administration will continue this renewed support for ITP, and provide DOE the leadership necessary to rebuild the program and its staff so that it can meet the current needs of our domestic manufacturers. ACEEE suggests several important areas that should receive attention:

- Coordination—ITP should better coordinate with other market players to develop the most useful programs and deploy them in an effective way.

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[6] National Research Council, Energy Research at DOE: Was It Worth It? Energy Efficiency and Fossil Energy Research 1978 to 2000, 2001, http://www.nap.edu/catalog/10165.html, and Prospective Evaluation of Applied Energy Research and Development at DOE (Phase Two), 2007, http://www.nap.edu/catalog/11806.html.

—Major stakeholders (e.g. manufacturing companies and trade associations, electric and natural gas utilities and state energy offices) and other internal ITP programs (e.g. Distributed Energy Resource activities that have recently returned to ITP from DOE's Office of Electricity) should be integrated with the existing manufacturing R&D and deployment activities of the program (e.g. IACs and industry-specific research projects);
—In the past, a Federal Advisory Committee, representing key stakeholders, reviewed program plans and advised ITP on strategic directions. This advice helped the program adapt to the changing needs of the manufacturing sector—something that has been lost in recent years. This FAC should be reinstated.
—Internal programs should strive to meet the strategic goals of ITP and the Office of Energy Efficiency and Renewable Energy (EERE). One area where this is crucial is the Distributed Energy Resources (DER) activities. This program has several components, many of which do not focus on industrial technologies. While ACEEE does not think this is a problem, we feel that more resources should be given to industrial waste energy recovery and combined heat and power (CHP) application work, as authorized by EISA Sec. 451.

- Fluidity and Flexibility—ITP should recognize that program goals must be aligned with the goals of the changing manufacturing sector, and should embrace change when a specific need arises. The current SEN program is a good example of how this flexibility might occur. This program was a successful ad-hoc response to the natural gas crisis precipitated by the hurricanes of 2005. As such, it temporarily diverted resources from other ITP areas to quickly address a pressing unmet need. It was never intended to be a sustained initiative, so it was never given a dedicated funding stream. It has therefore been difficult for the program to transition to a more sustainable model, though its existing model has been very effective. The flexibility leveraged to create SEN was not matched with an internal flexibility of budget to allow for the identification and support of programs that prove themselves worthy. It will be important to retaining ITP's ability to be fluid and flexible will be important, so the program can respond to other crises as it did to the natural gas crisis. However, developing a structure that allows proven programs to grow and mature is also necessary. ITP's Superior Energy Performance initiative, focused on standardizing energy management, energy assessment, and measurement and verification methodologies, is another example of ITP responding appropriately to the manufacturing sector's needs.
- Staffing—ITP is understaffed, and the current mix of skills does not reflect the range of activities the program needs future, long-term success. In particular, the existing staff is predominately focused on research management, while many of the needs are in the areas of communication, market analysis, environmental and utility regulation/policy, project financing, and project implementation. It will be important to bring in fresh staff from the private sector to complement the existing staff, and to acquire a staff with the suite of skills needed for an effective program.

PROVISIONS IN THE PROPOSED LEGISLATION

ACEEE commends Senator Bingaman and his colleagues for introducing the Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009 (S. 661). We feel this bill complements the industry-specific research and development activities authorized in EISA Sec. 452, and it will begin to address many of the needs we have identified for the support of greater energy efficiency and economic competitiveness of the U.S. manufacturing sector. In this section, I will discuss how ACEEE sees the provisions of the Act responding to the needs of manufacturing sector and enhancing the effectiveness of the operation of ITP at DOE.

The Industrial Energy Efficiency Grant Program (Sec. 2), Small Business Loans (Sec. 5), and Innovation in Industry Grants (Sec. 7) all address the current challenge facing manufacturing industries: a lack of access to capital. The energy efficiency grant program in particular will address the most pressing hurdle of lack of available credit currently facing manufacturers who want to make investments in energy efficiency and capacity to manufacture innovative, new technologies. By using existing commercial and state funding entities in a timely manner, this provision avoids the delays that have, in the past, affected lending programs administered directly by DOE. The one potential shortcoming of this provision may be that its benefits for larger manufacturing firms will be limited because of the relative modest size of the funding for the provision. These firms are currently experiencing challenges to their access to capital, so expanding this provision so that larger firms

can benefit would be ideal, at least for the next few year until credit markets return to normal.

The other funding provisions in the Act will address a longstanding challenge of access to capital for innovative and small businesses. These companies are important sources of innovation that can transform the future of manufacturing by providing new technologies, processes, and products that address consumers' needs—some of which they don't even realize that they can benefit from, such as solid-state lighting and advanced sensors and controls that will facilitate the Smart Grid. We hope that Congress will pass this provision and appropriate funding for its enactment.

The Coordination of Research and Development of Energy Efficient Technologies for Industry (Sec. 3), Energy-Efficient Technologies Assessment (Sec. 4), Industry-Specific Roadmaps (Sec. 5) and Study of Advanced Energy Technology Manufacturing Capabilities (Sec. 8), are all excellent complements to the industry-specific research activities authorized by EISA Sec. 452. While some of these provisions were in place when the IOF program was robustly funded a decade ago, ITP has always been less effective at coordinating with other agencies and outside parties in its research activities. Directing external coordination by the program will provide an important incentive to reach out to other groups.

We are particularly excited to see the inclusion of the Industrial Research and Assessment Centers (Sec. 5) provision. This proposal expands and enhances the aforementioned Industrial Assessment Center (IAC) program. As noted earlier, the 26 university-based IACs play the role of providing access to expertise for small and medium-sized manufacturing facilities while also providing invaluable experience to students who participate in the plant assessments and supporting their faculty's interest in manufacturing energy efficiency. The proposals in this section expand and enhance the IAC program while maintaining the elements that have made the program so successful over its 33 year history. By expanding the number of centers, the benefits of assessments will become available to many industrial facilities not currently located near an existing IAC, and the number of graduates from the centers will increase significantly, helping to meet the trained workforce needs that have been identified by manufacturers as a key challenge facing the manufacturing sector. This workforce development aspect of the program is further enhanced by establishing an internship program for students at the centers. Industrial firms have indicated to ACEEE that they would enthusiastically provide co-funding for these internships to assist in meeting current workforce needs and in attracting new talent to their firms.

Among the enhancements to the existing IAC program is the establishment of Centers of Excellence (CoE), which would receive additional funding to develop in-depth expertise that the current program does not provide. This provision encourages each CoE to support other IACs so that more customers across the county can benefit from industry-specific expertise. The inclusion of an explicit requirement and provision of resources to the CoE for greater coordination with other manufacturing energy efficiency activities in the centers' service regions provides an opportunity for coordinated follow-up and implementation assistance for energy efficiency and productivity opportunities identified by the centers' assessments. Further, the provision that the Small Business Administration would give preference to projects identified by the centers would help address the barrier of access to capital that challenges many smaller manufacturing firms.

With respect to DOE's operation of ITP, we endorse the creation of an Industrial Technologies Steering Committee (Sec. 9) for ITP. The past effectiveness of the program was in large part a result of its strong working relationship with private manufacturing companies. These relationships allow the program's activities to be tailored to address the actual technology and market needs of industry, enabling manufacturers to become more efficient and competitive. Over the past eight years, we have seen this close communication erode, and we feel that the creation of this committee will address indications from current ITP leadership of their interest to better coordinate with their customer base.

ADDITIONAL RECOMMENDATIONS

The provisions in this act add important new elements to the ITP program and provide a renewed focus to the program's activities. For this program to be most effective, it needs better data on manufacturing economic activity and energy use. The primary source of economic information has been the Census of Manufacturing and the Annual Survey of Manufacturing, both prepared by the Census Bureau. These important data sources have seen their depth and the speed with which they are released adversely impacted by significant budget cuts at the Bureau. Similarly, the

Manufacturing Energy Consumption Survey issued by the Energy Information Administration has, due to budget cuts, seen its sample size and depth of questions shrink, its frequency reduced to every four years, and its preparation time drag out such that we are currently waiting for the release of the 2006 data. These two agencies need more resources so that more in-depth and timely data can be made available to inform ITP program operators and policymakers how best to meet the energy needs of the manufacturing sector.

CONCLUSION

Thank you for the opportunity to testify in support of the Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009. ACEEE feels that this bill represents an important complement to existing law. The timing of this bill is particularly important, as our country needs to prepare now if we are to be ready to seize a once-in-a-generation opportunity to influence the energy efficiency and sustainability of the manufacturing sector once it emerges from the current economic downturn. The manufacturing sector and its contributions to the nation's economy and jobs have been ignored for far too many years, and it is important that this neglect be reversed. This bill will make significant progress if all of its provisions are enacted and funded. We encourage Congress to pass this bill expeditiously. ACEEE stands ready to assist the Committee and Congress in addressing any questions or concerns with respect to this legislation.

The CHAIRMAN. Thank you very much.

Dr. Savitz, go right ahead.

STATEMENT OF MAXINE SAVITZ, PH.D., HONEYWELL, INC. (RET.), LOS ANGELES, CA

Ms. SAVITZ. Good morning. I'm pleased to be here, Mr. Chairman, Senator Murkowski and other members of the committee. I retired from Honeywell several years ago and prior to that joining them 20 years ago, I was in Washington at the Department of Energy and its predecessor agencies.

It's a pleasure that to see you introduce this bill and the emphasis on energy efficiency that is long needed. I also would like to submit for the record in addition to my testimony a recent peer review of the Department of Energy's industrial technology program which I co-chaired.* I will give you some summary of some of our results from that review and they tie directly into the legislation that you are supporting.

In that panel we found that they effectively use their resources to achieve significant results despite a continuing decline in the budget. Up until recently the budget in 2008 was $65 million down from $100 million in fiscal year 2002. They had achieved several successes.

They were also looking at some potentially transformative technologies such as nano-technology. They've had several innovative energy efficient technologies enter the marketplace in the aluminum industry, the steel industry, the metal casting industry, heavy users of energy. The technology delivery program which Dave Rodgers and Mr. Elliott also mentioned was particularly praised by the committee and it's a strategic investment in manpower as well as infrastructure by getting these undergraduates involved in assessments and also helping small and medium size business.

The panel observed that the program has strong stakeholder support in both the R and D and the technology needs. We heard from customers in our deliberations on their program. There has been

*Report has been retained in committee files.

some concern. There's always been good cost sharing. But there's been concern recently as a result of the declining budget, industry less willing to participate not knowing whether their programs were going to be continued.

We also want to give the industrial program praise for collecting very good metrics on what has been the result of their programs. How many have entered into the marketplace? What kind of energy is being saved? Probably do one of the best examples of that in the Department.

We had a number of recommendations for making the program more effective. One is the current goal is to reduce energy efficiency 25 percent in 10 years in helping industry. We thought that was unrealistic given that the budgets are too low to achieve that goal. So either the budgets need to be increased or the goals need to be revisited.

Goals should be expanded not only to look at energy efficiency but greenhouse gas emissions. These are things that are also in your bill which we're pleased to see. Within DOE itself there's a common problem of the budget and the goals being consistent.

There is some very good R and D at the early stage, but for the heavy energy users of industry they were really at the last stages of development and demonstration. There needs to be a more full pipeline of applied research and demonstration for the heavy energy users. There's a cross cutting initiative for heat processing materials and like. Those are very good, but they don't substitute for working directly with industry doing no road maps.

We feel that they needed to expand their expertise in the policy area. Both in regard to climate change with interfacing with utilities who can be a very good deliverer of the technologies and also financing. Again these are issues that are addressed in your bill which really will make the industrial program a much broader and more balanced program.

Portfolio maps should be developed to assist in project selection and build a robust program. They'll be both technical and market. Show the benefits of the program, the timeframe, the total cost and then a strong connection between the R and D programs and the technology delivery programs.

The technology delivery programs have an opportunity to identify what are some of the longer term research needs that the industry needs that they could then enter cost share programs with. It's also an opportunity for the people who are going out to give the assessments to tell about the DOE's results. It can work both ways.

We're pleased that the legislation incorporated many of our recommendations. Regular assessments, including greenhouse gas, road mapping of specific industries, financial mechanisms to help provide the capital needed, interactions with other programs within DOE and the formation of an advisory group, which Dr. Elliott also mentioned.

I'll mention a couple of the sections that we'd like to see some expansion on, particularly in the financial institutions. Utilities have been very active in many states at providing audits and incentives to the industrial sector. They could also be a source of funding for them, so to consider them in section two.

Looking at the comparison of the U.S. technology adoption rates with those in Europe, Japan and other countries, it would also be useful to find out if they're different. Why are they different? Is it because of pricing policies, economic policies, other, age of equipment and the like and not just reporting? We want to endorse the fact that appropriate to have the National Academy to evaluate the critical manufacturing capabilities and supply chain to capture the development of advanced energy technologies in the United States.

Then would like you to consider adding a data section for the fact that EIA collects data on manufacturing. It used to be done every 4 years. It is now done only every 3 years.

People need that data on how is energy used. What technologies are being used? In order to develop policies and see how the country is progressing.

There needs a sustained level of a balanced Federal program both as a portfolio of R and D and policies and strongly endorse this legislation that along with EISA will go a long way to providing that. Thank you.

[The prepared statement of Ms. Savitz follows:]

PREPARED STATEMENT OF MAXINE SAVITZ, PH.D., HONEYWELL, INC. (RET.), LOS ANGELES, CA, AND JAMES L. WOLF, ENERGY & ENVIRONMENTAL CONSULTANT AND FORMER EXECUTIVE DIRECTOR, ALLIANCE TO SAVE ENERGY

We are pleased to present our views on S. 661, Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009, legislation proposed to strengthen American manufacturing through improved industrial energy efficiency. The U.S. industrial sector is composed of a diverse set of businesses, products and processes with a broad range of opportunities for improved energy efficiency. In 2008, industry accounted for 33 percent of energy used in the U.S. and 28 percent of carbon dioxide emissions. (Energy Information Administration, Annual Energy Outlook 2008) If we are to achieve our national economic, energy, environmental and security goals, U.S. industrial energy use needs to be addressed by federal policy and programs in a sustained effort.

While industry does respond to price signals for their investments, and there are somewhat less market barriers than in many other sectors, federal policy and programs are needed to address the many barriers that still exist. In today's financial climate, industry does not have the available capital to invest in developing and testing new technologies—or even deploying all the known proven existing technologies—that will increase their energy productivity. Opportunities are being missed to simultaneously address environmental and climate concerns, to make our industry more productive in hard economic times, as well as to make the nation more secure. The proposed legislation takes major steps to rectify these problems, and we have suggestions for refinements to it.

Prior to commenting on some of the specific suggestions of the legislation, we will summarize the findings and recommendations of a recent peer review of the Department of Energy (DOE) Industrial Technology Program (ITP), which we co-chaired. Attached for the record is a copy of the peer review report.*

The DOE Office of Energy Efficiency and Renewable Energy (EERE) requires each program to conduct periodic peer reviews to enhance EERE program planning. The EERE ITP program held a corporate peer review in Washington, DC on October 28-30, 2008. The purpose of the peer review was to evaluate the program's effectiveness, management, productivity and relevance to EERE programmatic goals. An independent panel of ten experts from industry, academia, and government provided comments on the ITP mission and goals, program areas, and management.

The review panel found that ITP effectively uses its resources to achieve significant results, despite its recent continually declining budget. The program had a budget of $65 million in FY 2008, down from $100 million in FY 2002. The program has achieved several key successes in R&D and is working on some potentially transformative technologies in areas such as nanotechnology. There have been several innovative, energy-efficiency technologies that have entered or are nearly ready

*Report has been retained in committee files.

to enter the market, including the Isothermal Melting (aluminum), Mesabi Nugget next generation cokeless ironmaking process (steel) and Lost Foam Casting (metal casting).

The ITP program was praised by the panel for its involvement in developing transformational technologies that could have a very large impact on the future of manufacturing. ITP's new emphasis on supply chains was considered a wise strategic direction. The panel felt that the program would find even more opportunities in the near term as U.S. industrial competitiveness becomes more critical.

The Technology Delivery program was found to be deserving of high praise. Through its Save Energy Now (SEN) initiative, Technology Delivery conducts a plant assessment program that helps manufacturing facilities save an average of $1.l million, or 8 percent of their energy costs. The reviewers were impressed that the initiative had been so productive and generated such good results in such a short period of time. It was striking that even "sophisticated" large energy users, including some on the review panel, found the program to be very valuable. The panel also praised the ITP university—based Industrial Assessment Centers (IAC), which train undergraduate students and offer technical assistance to small-and medium-sized plants. The IAC is a strategic investment in manpower as well as infrastructure and noted the program's importance in training the future workforce and developing the next generation of industrial professionals.

The review panel observed ITP's strong stakeholder support in both the R&D and Technology Delivery areas. Partnerships with companies and trade associations have produced several industry-specific technology roadmaps that identify top research needs and priorities. These roadmaps have helped ITP set an R&D agenda that fits industry's needs and produces technologies that are eventually adopted by industry. The program's cost-sharing with industry is also good, although the continued funding uncertainty in the future that has been the hallmark of the past several years makes it more difficult to involve industry partners. We are pleased that the Energy Independence and Security Act (EISA) did authorize higher funding levels and we understand that some of the EERE R&D stimulus money will be used by ITP.

The review panel also noted that ITP maintains a convincing metrics collection process to document its achievements. Reviewers noted that ITP's metrics and evaluation are some of the "best in class" in the federal government because they measure achievements with a high level of detail and precision. The program's "Impacts" report is very good. It does take resources to make this commitment and the panel encouraged ITP to continue the effort. Their work on both retrospective impacts and prospective benefits should be more widely shared with policy makers as well as industry.

The review panel made a number of recommendations to ITP for addressing its weaknesses, which included specific suggestions on refining the program strategy and goals:

- The review panel found that the credibility of ITP's goals were suspect given its current budget. For example, the panel found that ITP's budget is too small for its stated mission of helping to reduce industry's energy intensity by 25 percent over ten years. To achieve such a goal would require both new and improved technologies with high returns for industry adoption and utilization in this short time frame. More funding and an articulated long term commitment to the program are needed from the Administration and Congress to achieve the current goals. ITP's goals should be expanded to include a specific connection to climate change and carbon emissions, and improving industry's use of alternative feedstocks in addition to fuel flexibility. Goals should be achievable within the budget allocated and they need to be updated on a regular basis, at least every two years, to be consistent with the budgets and progress made on projects.
- ITP needs to undertake more early stage R&D projects to improve the availability of projects across timeframes for implementation by industry. The pipeline of R&D projects appears to be running dry, particularly in the industry specific areas.
- Industry-specific R&D needs to be emphasized and budgets increased. While the cross-cutting energy intensive industrial work is commendable, it is not an adequate substitute for industry specific R&D. A clearer rationale for how the programs are balanced and complement each other to meet overall ITP program goals is required.
- ITP would benefit from increasing its policy expertise at the federal and state levels, which will help achieve its mission and engage new stakeholder groups, utilities, states and other entities. In particular, ITP needs to strengthen its

outreach to utilities to help industry overcome barriers to implement energy efficiency projects and new technologies. ITP has begun building partnerships with utilities, but also needs to strengthen its ties with public service commissions and states that are resistant to utility "decoupling" of revenues from profits and other load-reducing strategies. Understanding the policy issues and a careful outreach strategy will help ITP communicate with these entities, advance the program's mission and present industry with options to reduce energy intensity. ITP should develop a strategy to assist industry identify financing opportunities for the adoption of technology.

- Portfolio maps that reflect risk (technical and market), benefit, total projected cost and timeframe need to be developed to assist in project selection, better present and explain the overall program and justify the need for any portfolio balancing decisions to meet program goals.
- The panel also recommended that ITP establish a stronger connection between its Technology Delivery and R&D programs. The Save Energy Now (SEN) program could provide feedback on some of the industry longer term R&D needs and the auditors in both SEN and IAC could inform the industry managers about the technologies ITP is developing or has developed.

We are pleased that the legislation being discussed today has incorporated many of the peer committee recommendations mentioned above. These include regular assessments including greenhouse gas emissions in addition to energy efficiency, roadmapping of specific industries, financial mechanisms, interaction with other programs in DOE, and the formation of an advisory group.

The following are suggestions to consider for modifications to the proposed legislation:

- Sec. 2 (h) (2) (B) (ii), we recommend adding utilities after financial institutions. Although they could be considered as "other provider of loan capital", utilities in some states such as California have been proactive in providing financing for energy efficiency. They could participate as funders or co-funders.
- Sec. 3: We suggest adding a sentence requiring a brief letter or report be sent to Congress every other year on the efforts of coordination and results. This will help prompt more consistent coordination.
- Sec. 4 (b): As part of the report, we recommend there be an assessment of how much energy intensity and greenhouse gas emissions could be reduced at different budget levels for ITP. For example, if the budget of ITP were to double, what would be the impact on energy intensity and greenhouse gas emissions in 2020? The report should state at a minimum what could realistically be accomplished regarding energy intensity and greenhouse gas reductions at the current budget level. This recommendation is derived from the IPT Peer Review report which found that the current goals are not consistent with the budget.
- The report in Section 4 (b) (4) on comparison of U.S. technology adoption rates with those in the European Union, Japan, and other appropriate countries, should include "an assessment of the reasons for any differences in adoption rates considering at a minimum both economic (including price) and policy reasons in the U.S. and countries considered." Understanding the reasons for any differences in adoption rates can help formulate better policy.
- Sec. 8 (b) Since the National Academy report is due to the Congress within two years from enactment, add a phrase "within 60 days of enactment of the act" the Secretary enters into the agreement with the Academy. Getting the study underway promptly will allow sufficient time for a rigorous study to be conducted. Also, add a phrase that the Academy shall decide which industries to focus on and supply chains to be analyzed so that not all industries are expected to be analyzed and the study can be of sufficient depth.
- Adding a new Section on data gathering. More detailed data, and data collected more frequently, are needed to better assess the status and prospects for energy efficiency and greenhouse gas emission reductions. The Energy Information Administration (EIA) publishes and analyzes data about energy use in the U.S. An important part of that portfolio is the Manufacturing Energy Consumption Survey (MECS). The public products of the survey include data, by industry and region of total energy use, types of energy (coal, electricity, natural gas, LPG, residual fuel oil, other fuels etc.), the cost of energy and technological features of industry related to current and potential pattern of energy use. Based on the data, the EIA produces critical analyses that address issues such as demand within specific industries for different forms of energy. These in turn allow for projections of energy use and the impact of energy price changes on manufacturing output and employment in the U.S. Timely collection and publication of

consistent, comprehensive surveys are necessary to understanding trends in energy use and the impact of existing and proposed public policies.

Between 1978 and 1981, the EIA funded the Annual Survey of Manufacturers, which included information on industrial energy consumption. The survey was discontinued in 1981 due to budget reductions. MECS started in 1985 and was repeated every three years up to 1994, when it was put on a four-year schedule for 1998, 2002, and 2006. Information about the 2006 Survey is still not available. Thus, the detailed information currently available about energy use in industry and emissions of carbon dioxide is over seven years old, missing a period of dramatic changes in energy technology and industry structure in the U.S.

We suggest adding a section that "EIA conduct MECS on a three year schedule. It should be coordinated with any GHG reporting requirement that is established pursuant to statute or regulatory authority."

In the near term, the U.S. industrial sector can improve its energy efficiency and reduce its greenhouse gas emissions through the adoption of cost-effective energy efficient technologies and processes. In the longer term, the development and implementation of additional technologies and processes will further improve its efficiency, environmental performance, productivity and competitiveness. The targeted greenhouse gas emission reductions being considered in many pieces of proposed legislation can only be met with the nation and industry greatly accelerating its rate of adoption of existing energy efficient technologies and deploying very rapidly new ones that are developed.

There needs to be a sustained level of effort of a Federal research, development, demonstration and deployment program with a balanced portfolio and appropriate policies. This proposed legislation, along with EISA will make progress toward reaching these goals. We strongly endorse it and look forward to continue to work with you and your staff.

The CHAIRMAN. Thank you very much.

Mr. Zepponi, go right ahead.

STATEMENT OF DAVID ZEPPONI, PRESIDENT, NORTHWEST FOOD PROCESSORS ASSOCIATION, PORTLAND, OR

Mr. ZEPPONI. Good morning, Mr. Chairman and members of the committee. Thank you for inviting me to testify before this committee today. My name is David Zepponi. I'm the President of the Northwest Food Processors Association. I would like to submit my testimony for the record and provide the committee with a summary now.

Established in 1914, NWFPA is a regional trade association representing food processing industry in Idaho, Oregon and Washington. NWFPA members comprise the third largest manufacturing employment sector in the Northwest and add value over $20 billion to our economic value in the region's economy.

NWFPA welcomes this opportunity to provide testimony on the Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009. We believe that the programs and resources provided by this legislation will promote significant improvement of energy efficiency by industry, contribute to reductions in greenhouse gas and assure the U.S. industries remain competitive in a global environment.

My testimony today provides an outline of the approach NWFPA used to establish the energy efficiency goal and the plan to achieve that goal. I will also tell you why we believe this proposed legislation will help food processors and other industries implement energy efficiency in their activities. NWFPA's energy efficiency of goal.

The food processing industry is facing dramatic changes forcing critical strategic adjustments in the way business is conducted. In

response to these forces NWFPA established the Northwest Food Processor's Cluster initiative with the goal to reposition the three State food processing industry to compete globally through dramatically increased innovation in productivity. The key concept is local competitors working together along with cluster partners, Federal and State agencies, the National Laboratories, educators and suppliers, toward a common goal.

In May 2008, NWFPA invited Doug Kaempf, Program Manager of the Industrial Technologies Program of DOE to attend our annual executive business summit. We asked him to discuss how we could collaborate to achieve energy objectives of our member companies. The food processing industry is the second largest user of energy in the Northwest behind the pulp and paper industry.

Mr. Kaempf and the ITP challenged the food processors to adopt an aggressive approach to energy savings. We decided to use energy efficiency as our focal point to improve the industry's competitiveness. NWFPA, ITP and the Northwest Energy Efficiency Alliance developed a strategy to meet the challenge.

Last fall NWFPA member executives established the following audacious and aggressive goal to accelerate the implementation of energy efficiency strategies to reduce member wide energy intensity by 25 percent in 10 years and through innovation and new technologies and new resources achieve a reduction of 50 percent in 20 years. Food processing executives recognize that the most effective way to manage energy costs, reduce greenhouse gas emission and at the same time increase productivity and economic growth was through greater implementation of energy efficiency.

Energy needed to be viewed beyond a line item in the operational cost. Energy must be viewed as a holistic management opportunity. Subsequently food processors and the cluster partners participated in a workshop to identify the key technologies and actions, research, partnerships and resources that could be integrated into the NWFPA energy road map.

Most recently on February 17, 2009, NWFPA and the U.S. Department of Energy signed a memorandum of understanding to work collaboratively to achieve these goals. The MOU sets the foundation for a partnership to identify and pursue a diverse range of opportunities for energy efficiency within the Northwest food processing industry. ITP has been an important NWFPA partner for many years. In fact in 2003, we received a modest grant from the industries of the future to begin our entire program.

Another example of an affiliation that will help us to achieve our goal is with the Northwest Energy Efficiency Alliance. In 2005 Northwest Food Processors Association has been partnering with NEEA on their industrial initiative which focuses on making energy efficiency an integral part of both corporate and plant business practices. Thirty Northwest Food Processor Association member companies are participating in NEEA's continuous energy improvement program. We're implementing energy management strategies and energy efficiency measures that are achieving significant results.

Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009, S. 661 is critical because it supports ITP's industrial efficiency efforts and provides a framework for the indus-

try and its partners with ITP. As I have just indicated these partnerships are critical for industry to achieve a meaningful reductions in energy intensity. NWFPA thanks Chairman Bingaman, Senator Murkowski and the co-sponsors for introducing this bill and for recognizing the importance of energy efficiency for the competitiveness of U.S. industries.

A couple of sections. Industrial energy efficiency grant program, NWFPA supports the creation of a revolving loan program to provide funds to the industrial manufacturers for implementation of commercially available energy efficient technologies and processes. The lack of capital and resources are significant barriers to implementation particularly for a small- and medium-sized manufacturing companies.

Many States and Federal energy programs provide tax incentives for implementation of energy efficiency programs. But they aren't being used. We noticed that we did an assessment through the Innovation Productivity Center and evaluated 20 years of ITP funded industrial assessment center audits. Only about 30 percent of the recommendations were actually implemented.

The industry specific road maps. Earlier I outlined our process to establish a goal and develop an energy road map. We believe that the road map process is critical to:

One, coalesce the industry around a goal.

Two, to identify energy efficiency opportunities within the context of business operations and strategies.

Three, to expand the range of partners in the processes, our cluster partners.

Four, creating critical public/private partnerships that will result in collaborative and actual plans.

The industry research and assessment centers. NWFPA supports the concept of the industrial research and assessment centers as institutions of higher education as provided by the Energy Independence Acts of 2007 and establishing Centers of Excellence as provided in this bill.

Innovation and industry grants. NWFPA supports inclusion of Federal funding for State industry partnerships to develop, demonstrate and commercialize new technologies or processes to achieve NWFPA's industry wide goal of an additional 25 percent increment reduction in energy intensity by 2029. A lack of prompt funding is a primary barrier to development and demonstration of new innovation technologies and processes are essential for us to achieve our goal.

In conclusion NWFPA is very supportive of S. 661 because our experience indicates that the programs and resources provided by this legislation will promote significant implementation of energy efficiency by industry, will assure industry and its partners have the resources to achieve these ends and will ensure that U.S. industries remain competitive in a global marketplace.

Mr. Chairman, thank you for the opportunity. I'm happy to answer questions.

[The prepared statement of Mr. Zepponi follows:]

PREPARED STATEMENT OF DAVID ZEPPONI, PRESIDENT, NORTHWEST FOOD PROCESSORS ASSOCIATION, PORTLAND, OR

INTRODUCTION

My name is David Zepponi and I am the President of Northwest Food Processors Association (NWFPA). Established in 1914, NWFPA is a regional trade association representing the food processing industry in Idaho, Oregon, and Washington. NWFPA members range in size from mom and pops to multinationals, although most are medium-size companies. NWFPA members comprise the third largest manufacturing employment sector in the Northwest and add over $20 billion of economic value to the region's economy.

NWFPA focuses on issues facing the food processing industry including food safety and security, environment, transportation, productivity, innovation and energy. Our mission is to serve as an advocate for the common interests of our members and a resource to enhance the industry's competitive capabilities.

NWFPA welcomes this opportunity to provide testimony on the Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009 (S.661). In fact, we are extremely pleased that this bill has been introduced. We believe that the programs and resources provided by this legislation will promote significant implementation of energy efficiency by industry, contribute to reductions in greenhouse gas emissions, and assure that US industries remain competitive in the global marketplace.

Today, I will discuss the importance of energy efficiency to food processors and how NWFPA's collaboration with its key partners led to the setting of an aggressive energy efficiency goal. I will also tell you why we believe the proposed legislation provides an approach that will help food processors and U.S. industries implement energy efficiency.

NWFPA'S ENERGY EFFICIENCY GOAL

The food processing industry is facing dramatic changes, forcing critical strategic adjustments in the way business is conducted. Changes in market, consumer demands, environmental regulation, energy supply, security, trade practices coupled with increasing costs of energy, commodities, transportation, labor, water treatment and regulatory compliance are squeezing profit margins and increasing the cost of the food supply for American consumers. In response to these forces, NWFPA established the Northwest Food Processors Cluster Initiative with the goal to reposition the three-state food processing industry to compete globally through dramatically increased innovation and productivity.

Products of this effort include the Northwest Food Processors Association's 2006 Cluster Assessment and Roadmap and establishment of the Northwest Food Processors Innovation Productivity Center. The Cluster Initiative spurred the industry to embrace the concept of local competitors working collectively along with other cluster partners—the federal government, the states, suppliers, educators, and regional and local agencies—sharing ideas and actions to improve the position of the cluster to compete in the global marketplace.

Energy and the environment were identified as strategic issues by the Cluster Assessment. Significant energy price increases, climate change, greenhouse gas emissions regulations, and water issues have brought additional challenges for food processors. Again, NWFPA looked to a collaborative approach to guide the industry through these challenges and assure a sustainable and competitive food processing industry.

In May 2008, NWFPA invited Doug Kaempf, Program Manager of the Industrial Technologies Program of the US Department of Energy (US DOE) to attend NWFPA's annual Executive Business Summit to talk to food processing executives about how we could collaborate to achieve the energy objectives of our organizations. The food processing industry is the second largest user of energy in the Northwest, after the pulp and paper industry. Doug challenged the food processors to adopt an aggressive approach to energy savings.

Over the summer, NWFPA, DOE Industrial Technology Program and the Northwest Energy Efficiency Alliance (NEEA) worked on a strategy to meet Doug's challenge. In October, 2008, NWFPA member executives gathered at the NWFPA Energy Vision Workshop and created the following energy vision and goals for the industry:

> NWFPA Energy Vision.—To enhance the competitiveness and economic growth of NWFPA members through development and implementation of a sustainable energy strategy to increase energy productivity and promote innovation.

NWFPA Energy Goal.—To accelerate the implementation of energy efficiency strategies to reduce member-wide energy intensity (energy use per unit of output) by 25% in 10 years and through innovation, new technologies and new resources achieve a total reduction of 50% in 20 years.

Food processing executives recognized that the most effective way to manage energy costs, reduce greenhouse gas emissions, and at the same time increase the productivity and economic growth of NWFPA members was through greater implementation of energy efficiency. Energy needed to be viewed beyond line-item operational costs and more as a holistic management opportunity.

NWFPA, ITP and NEEA continued joint efforts and in December 2008, NWFPA members, state energy offices, energy utilities, educators, suppliers and other partners convened at the NWFPA Energy Roadmap Workshop. The objective of the workshop was to identify the key technologies and actions, research, partnerships and resources that could be integrated into a "roadmap" to help the industry reach its goals. Facilitated breakout sessions of workshop participants resulted in over 500 energy efficiency ideas. NWFPA staff and Innovation Productivity Center staff analyzed these ideas and are preparing the NWFPA Energy Roadmap document. Key areas of focus have been identified and highest priority projects have been developed and are ready for implementation.

On February 17, 2009, as evidence of commitment and support of NWFPA's energy efficiency goals, NWFPA and US DOE signed a Memorandum of Understanding (MOU) to work collaboratively to achieve the goals. The MOU was also signed by the Bonneville Power Administration, Pacific Northwest National Lab, Idaho National Lab and several individual NWFPA member companies who were present for the signing ceremony. The MOU sets the foundation for a partnership to identify and pursue a diverse range of opportunities for energy efficiency within the Northwest food processing industry. A copy of the MOU has been provided with this testimony.*

ITP has been an important partner in coalescing NWFPA's energy efforts into a vision and roadmap. ITP was also instrumental in the original launch of NWFPA's energy efficiency efforts in 2003. With a very small grant from ITP's Industries of the Future, bridge funds were available for NWFPA to hire an energy staff person and develop the foundations of our energy program. With another very small US DOE grant in 2005, and with the assistance from ITP staff, NWFPA developed a web-based Energy Portal to provide food-processing specific information on energy efficiency best practices and emerging technologies. In addition, training seminars and a national energy efficiency satellite teleconference were conducted and energy assessment software and process control technology specifications were developed.

NWFPA now has the most significant and effective energy efficiency program of any trade association in the U.S. In 2007, the American Council for an Energy-Efficient Economy (ACEEE) recognized NWFPA's efforts with an Energy Efficiency Champion of the Year Award.

I'd like to highlight a few of NWFPA's energy programs and projects:

Water and wastewater discharge are ongoing challenges for food processors and many processors are significant users of water. Water supply and availability are becoming major concerns and climate change impacts add uncertainty. Wastewater is considered a key environmental concern and many food processors must treat wastewater prior to discharge.

The energy costs of wastewater treatment can be significant. NWFPA is addressing these issues in a variety of ways.

Since 2005, NWFPA has been partnering with the Northwest Energy Efficiency Alliance (NEEA) on NEEA's Industrial Initiative, which focuses on making energy efficiency an integral part of both corporate and plant business practices. Thirty NWFPA-member companies are participating in NEEA's Continuous Energy Improvement Program and are implementing energy management strategies and energy efficiency measures that are achieving significant energy savings.

Since 2004, NWFPA has been working with Glen Lewis, formerly of Del Monte Foods, to develop an energy management software program we call the Green Energy Management System or GEMS. GEMS provides real-time tracking of water, air, gas, electricity and steam use and associated costs as well as resource use per unit of production and associated greenhouse gas emissions. NWFPA and NEEA are completing a pilot study of GEMS implementation in

* Document has been retained in committee files.

food processing plants in the Northwest and we are about to take GEMS member-wide.

A NWFPA associate has just completed a case study on the integration of energy and environmental management technologies at the wastewater operations of a major food processor in California. The case study was sponsored and funded by the California Energy Commission, Public Interest Energy Research (PIER) program and Lawrence Berkeley National Laboratory-Demand Research Center. The objective was to integrate and maximize demand response opportunities, energy efficiency, and reduce carbon emissions while meeting wastewater environmental regulations.

A significant amount of energy is used to run motors and pumps for aeration and aspiration systems in food processing, municipal, and other industrial wastewater lagoons. These systems maintain dissolved oxygen levels that are required for microbiological degradation of waste, odor control, and water discharge. To assure regulatory compliance, most systems run continuously—24/7/365.

When an energy tracking system (GEMS) was integrated with real time dissolved oxygen (DO) measurements, it showed that more energy was being used than was necessary to maintain DO levels. Further, when this monitoring information was coupled with weather and temperature data (DO is reduced with high temperatures), operations could be fine-tuned to achieve even more significant reductions in energy use. These significant reductions in energy use also produced significant, real-time, measureable reductions in CO_2 emissions.

Energy efficient-wastewater treatment is a top priority for food processors. NWFPA and its partner, NEEA, plan to conduct a pilot study of this technology at food processing plants in the Northwest.

NWFPA is currently working with the Gas Technology Institute on the field demonstration of a new ultra-efficient industrial boiler technology at a food processing plant in the Northwest. This "Super Boiler" has a 95% fuel to steam efficiency (about 20% more efficient than standard technology), results in huge savings in natural gas, as well as significant reductions in NOx and greenhouse gas emissions.

I will discuss additional activities and programs of NWFPA as they relate to specific sections of the proposed legislation.

RESTORING AMERICA'S MANUFACTURING LEADERSHIP THROUGH ENERGY EFFICIENCY ACT OF 2009

The proposed legislation is critical because it supports ITP's industrial energy efficiency efforts and provides a framework for industry partnerships with ITP. As I have just indicated, these partnerships are instrumental to assisting industry achieve significant reductions in energy intensity.

NWFPA thanks Chairman Bingaman, Senator Murkowski and the co-sponsors for introducing this bill and for recognizing the importance of energy efficiency to the competitiveness of U.S. industries. We are very pleased at how consistent this bill is with NWFPA members' objectives, and with our approach to achieving industrial energy efficiency, which has evolved through our experience pursuing energy efficiency through partnerships and collaboration. In the sections below, we comment on several of the bill's provisions and also recommend some additional provisions that we believe will assure program and project success.

Section 2. Industrial Energy Efficiency Grant Program

NWFPA supports the creation of a revolving loan program to provide funds to industrial manufacturers for implementation of commercially available energy efficient technologies and processes. Lack of capital and resources are significant barriers to implementation, particularly for small to medium-sized companies. For these companies, capital is in short-supply, especially during this economic downturn. Energy efficiency capital projects must compete with all other business priorities and obligations.

Many state and federal energy programs provide tax incentives for implementation of energy efficiency technologies and processes. However, interviews with NWFPA member food processors conducted by both NWFPA and NEEA indicate that while tax incentives do promote implementation, many companies are not able to use these incentives because they just don't have the up-front funds to install the energy efficiency technology. NWFPA's Innovation Productivity Center evaluation of 20 years of ITP-funded Industrial Assessment Center audits in the Northwest reveals that only about 30% of the energy efficiency opportunities identified by these audits are implemented. We found that lack of up-front funds is key to these lost

opportunities. The proposed loan program will help remove such barriers to energy efficiency implementation.

Section 4. Energy Efficient Technologies Assessment

NWFPA appreciates the inclusion of food processing in the list of industries for which assessments of commercially available energy efficient technologies will be specifically conducted. NWFPA's goal to achieve a 25% reduction in energy intensity in 10 years is to be accomplished through the implementation of commercially available energy efficient technologies.

In 2005, with US DOE support, NWFPA developed an inventory of existing energy efficiency technologies for food processing for posting on our web-based Energy Portal. This inventory proved to be an excellent resource for our members and, as indicated by our site visit tracking, was extensively used by others as well. However, NWFPA has not had the resources to update this inventory. From our experience, we know that the assessments conducted under this provision of the bill will meet an important need for food processing as well as other U.S. industries.

Section 5. Future of Industry Program

NWFPA was delighted to discover the approach that we have been developing in collaboration with ITP, NEEA and our other cluster partners has essentially been included as Section 5 of the bill. This approach has worked extremely well for Northwest food processors and has produced a solid goal and pathway to achieve that goal. NWFPA welcomes the opportunity to serve as a model for f the Energy Roadmap approach to be used with food processors in other regions of the country as well as with other industries.

Industry-specific Road Maps

NWFPA established a road map process and is currently developing an industry-wide road map document for its members in Idaho, Oregon, and Washington. Just as provided in this bill, NWFPA's road map identifies near-, mid-, and long-term targets of opportunity and provides actionable public/private plans to achieve the roadmap goals. Likewise, NWFPA has designed studies to determine the baseline energy intensity of the industry, its greenhouse gas emissions levels, and process and sub-process operating costs and opportunities.

We believe the road map process is critical to (1) coalescing industry support around the goals; (2) identifying energy efficiency opportunities within the context of business operations and strategies; (3) expanding the range of identified opportunities by allowing cluster partner input; and, (4) creating critical public/private partnerships that will result in collaborative actionable plans.

Industrial Research and Assessment Centers

NWFPA generally supports the concept of industrial research and assessment centers at institutions of higher education as provided by the Energy Independence and Security Act of 2007 and the establishment of Centers of Excellence as provided in this bill. We believe this will provide important educational opportunities, training, experience and financial support for students and researchers. However, we believe that industry input and participation is critical to the ultimate success of these Centers.

Our experience with such centers in areas other than energy efficiency has shown that the products of research conducted in a vacuum, absent industry input, do not meet industry needs and are difficult to incorporate into industry processes and business planning. Often, the research focuses on the institution's or the researcher's interests and not on industry's needs. Thus, little of this research produces value to industry.

To assure that the recommendations of the Centers of Excellence and Industrial Research and Assessment Centers result in implementable and implemented energy efficiency technologies and strategies, the input of and coordination with industry must be incorporated throughout this subsection.

Section 6. Sustainable Manufacturing Initiative

NWFPA supports inclusion of a Sustainable Manufacturing Initiative in this bill. We believe that sustainability is a key principal of smart business management and that energy efficiency is a key element of sustainability. A sustainable strategy will contribute to industry's competitive advantage. NWFPA and the Innovation Productivity Center are developing a sustainability template and metrics for use by the NWFPA membership to implement sustainable practices. These metrics include energy, greenhouse gas emissions, water and waste.

NWFPA applauds the establishment of a joint industry-government partnership program to conduct research and development of new sustainable manufacturing and industrial technologies and processes.

Section 7. Innovation in Industry Grants

NWFPA supports inclusion of federal funding for State-industry partnerships to develop, demonstrate, and commercialize new technologies or processes. To achieve NWFPA's industry-wide goal of an additional 25% increment reduction in energy intensity by 2029, the industry is relying on implementation of innovative energy technologies and processes. Therefore, innovation is a priority element of NWFPA's Energy Roadmap. Our Innovation Productivity Center has established a Technology Transfer/Commercialization Initiative and an Advisory Task Force made up of food processors. Working with the states and the USDOE national laboratories, we have identified a number of promising innovative technologies. Several projects have been developed and a few demonstrations are currently underway.

Lack of funding is the primary barrier to development and demonstration of new innovative technologies and processes. Most food processors lack sufficient resources for research and development, especially in areas outside new product R & D. Federal funds are critical to moving technologies and processes forward.

NWFPA suggests that provisions be added to this section to include industry-USDOE national laboratory partnerships. The national laboratories have developed a wealth of technologies and processes that, with further development in partnership with industry, could produce innovative energy efficient applications for many industries. Our Innovation Productivity Center and Advisory Task Force are exploring opportunities with Pacific Northwest National Lab and Idaho National Lab, as well as seeking funding for RD & D projects with these organizations.

Section 9. Industrial Technologies Steering Committee

NWFPA supports the establishment of an advisory steering committee and would be pleased to participate and contribute recommendations and lessons learned.

CONCLUSION

In conclusion, NWFPA is very supportive of S. 661 because our experience indicates that the programs and resources provided by this legislation will promote significant implementation of energy efficiency by industry, will assure industry and its partners have the resources to achieve these ends, and will assure that US industries remain competitive in the global marketplace.

Again, Mr. Chairman, thank you for this opportunity.

The CHAIRMAN. Thank you very much.

Mr. Harper, go right ahead.

STATEMENT OF STEPHEN HARPER, GLOBAL DIRECTOR, ENVIRONMENT AND ENERGY POLICY, INTEL CORPORATION

Mr. HARPER. Yes. Thank you, Chairman Bingaman, Senator Murkowski and Senators. I'm here representing both Intel Corporation.

I direct our Global Energy and Environmental Policy activities. But I'm also here as co-chair of a new group called the Digital Energy Solutions Campaign which I'll talk about shortly. We think that this program, the bill, S. 661 can play a big role in helping to improve the efficiency, the energy efficiency of industry as well as the competitiveness.

First a few words about Intel. We're a fairly well known company. We're the largest semiconductor manufacturer in the world.

Our industry is now the second largest exporting industry in the U.S. after airlines. Intel is a very big part of that overall picture. Within the U.S. we have major manufacturing operations in New Mexico, Oregon, Arizona, and Massachusetts. We have research and development in other facilities in a number of other States around the country.

Our presence in the U.S. is obviously very significant. While about 75 and almost close to 80 percent going forward of our revenue is a gain from the sale of products overseas. More than half of our employees live and work in the United States.

This historical investment continues today. Our chairman, rather our CEO, Paul Otellini, just announced here in Washington a $7 billion, 2-year investment in retrofitting our existing facilities. Particularly in Oregon, New Mexico, and Arizona with the latest production equipment to continue down the road of Moore's Law to make smaller and smaller chips and more energy efficient chips to boot.

At a time when many, if not most companies in our industry are offshoring, many of them are outsourcing. We've actually made the commitment to increase our presence in the United States and increase our manufacturing presence. In fact if you look at the total value, about three quarters of all of our microprocessors are made here in the United States.

We spent a good deal of time looking at the energy consumed in our manufacturing process and by our products as they're used out in the marketplace. It turns out there's quite a bit more energy used in the use of the product than the manufacturing of the product. But we still spend about $225 million here in the U.S. every year on energy. About $200 million of that is electricity alone.

So, you know, it's part of our ongoing effort to try and improve our competitiveness. We look at our energy expenditures seriously and look for ways to reduce them.

We've had since 2001 what we call a cross functional team. Every company has its terminology. That's looked very thoroughly across the company for what we also call "best known methods" for reducing energy efficiency because we like to find good ideas and then replicate them throughout our manufacturing process in what we call copy exactly.

We've undertaken a number of projects. Since 2001 we've invested more than $23 million in projects specifically focused on energy efficiency. The return on that has been in excess of $50 million, but I must say that we've made a much bigger amount of investment in our manufacturing infrastructure in the U.S. and globally that's had energy efficiency as an element. Because we try to design energy efficiency into everything we do.

We've also had a fruitful recent relationship with the industrial technology program and one of the reasons why we support the strengthening of that program under S. 661. Working with DOE we've had four energy audits completed at our U.S. facilities. We're currently undertaking an assessment of which of the improvements we've identified in those audits we're going to implement. Scheduling those is part of our engineering activity. But it's been very good, very fruitful experience over the last 3 years.

It's also convinced us, this experience with the ITP, that the funding and research and development programs that S. 661 would either expand or create are really critical in terms of the competitiveness particularly of small- and medium-sized companies. We're a big company. We have lots of staff.

We can analyze these projects. We can self fund the projects. We don't have to go out of the capital market for the most part. But that's a fairly unusual situation.

Small- and medium-sized companies typically don't have the expertise to go look for these advantages or benefits. We do. So S. 661 will be very useful there.

I think the Centers of Excellence Program actually will also be one of the more beneficial aspects of S. 661. In fact in our industry we've created Centers of Excellence working with DOD and DOE in other respects to focus on what we call precompetitive research in the semiconductor manufacturing technology. Some of that has big energy efficiency component through SEMATECH and the Semiconductor Research Corporation which are cross industry platforms.

I think there'd be a great opportunity in the future for SEMATECH and the SRC to work with DOE through the programs, the Center of Excellence Program. I think the industry road mapping idea is a great one because in our industry we're often breaking up against the boundaries of physics. We have industry road maps for all kinds of things that are precompetitive. We've had experience with the value of that going forward.

I'd like to just finish quickly by saying that I think the element of this bill that focuses on climate change and looking for technologies will help us create the breakthrough technologies that are going to be necessary to meet the challenge of climate change are especially valuable. In that regard we have created a group called the Digital Energy Solutions Campaign. It's a bunch of IT companies, ACEEE, the Alliance to Save Energy, a number of other environmental groups and energy groups. We've actually had some very fruitful meetings with David Rodgers and his staff.

Going forward we very much would like to tell the story and get the story of the role of IT in improving energy efficiency and providing climate solutions. We'd like that story incorporated in some of the work that's done under the programs in this bill assuming the bill passes.

Thank you and I'd be glad to answer any questions.

[The prepared statement of Mr. Harper follows:]

PREPARED STATEMENT OF STEPHEN HARPER, GLOBAL DIRECTOR, ENVIRONMENT AND ENERGY POLICY, INTEL CORPORATION

Thank you, Chairman Bingaman and Senators, for the opportunity to participate in this hearing considering S 661, the recently introduced "Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009." My name is Stephen Harper. I serve as the Global Director of Environment and Energy Policy for the Intel Corporation. I also am the co-Chairman of the Digital Energy Solutions Campaign (DESC), a newly-formed coalition of companies, associations, and environmental and energy NGOs dedicated to supporting the role of information and communications technology (ICT) as part of the solution set in addressing our nation's energy and climate change challenges. I am here today to speak in support of the ideas embedded in S 661 and to relate Intel's own experience in working to improve its own energy efficiency.

First, a few words about Intel. We are the world's largest semiconductor manufacturer. The semiconductor industry is the second-leading exporting industry in the US, with Intel a major part of that picture. Within the US, we have a major manufacturing presence in New Mexico, Oregon, Arizona and Massachusetts.

Our presence in the US is significant. While we generate approximately 75% of our revenue from abroad, more than half of our employees live and work in the US. Our historical investment in the US continues today. Our CEO, Paul Otellini, re-

cently made an important announcement here in Washington, namely that we will be spending approximately $7 billion over the next two years to equip our manufacturing facilities in New Mexico, Arizona, and Oregon for our next-generation 32nm manufacturing technology. Making microchips is an expensive process. At a time when many other companies in our industry are off-shoring, out-sourcing, or both, Intel has made a significant commitment to manufacturing here at home. In fact, nearly three-quarters of our microprocessor manufacturing is done in the US.

We have spent a good deal of time analyzing the energy it takes to make our products and the energy those products consume as they are embedded in computers and other IT equipment. While we continue to turn out ever more efficient silicon products (measured on a work performed per unit of energy consumed basis), it turns out that the use of our products consumes more energy than does manufacturing those products. Nonetheless, our US energy bill is approximately $225 million, with approximately $200 million of that amount spent on electricity. Increasing our efficiency—both to reduce our environmental footprint and to reduce our costs—is a priority for us.

We have done a lot in recent years to reduce our direct energy footprint. Since 2001 we have had a world-wide cross-functional team charged with identifying and implementing a wide variety of retrofit energy efficiency projects and sharing so-called "best known methods" (BKMs) throughout the company. Among the types of projects we have undertaken are heat recovery on our facility boilers, installation of smart controls on lighting and facility heating ventilation and air conditioning (HVAC) systems, and using computerized building management systems to operate facilities in their most efficient range. In addition, we have worked closely with the suppliers who manufacture our fab "tools," the typically very expensive machines that run the different parts of the semiconductor manufacturing process, to maximize their energy efficiency. Overall, since 2001, Intel has invested more than $23 million in hundreds of energy efficiency projects, saving more than $50 million.

In addition to our focus on improving the energy efficiency of our existing facilities, efficiency also is a priority in the design of our new production facilities globally. For example, Intel's most recent new US fab in Chandler, Arizona has been certified under the "LEED" program administered by the US Green Buildings Council. Internationally, we have obtained LEED certification for design center in Israel and are pursuing LEED-certification for our new chip-set fab in Dalian, China.

Intel's facility energy efficiency team has had a fruitful relationship with the US Department of Energy, including the Industrial Technologies Program (ITP), a program which would be strengthened by S 661. Under the ITP, DOE has completed four energy efficiency savings assessments (ESA) audits at Intel sites in New Mexico, Arizona, and Oregon, with the earliest completed in 2006. These audits focused on the efficiency of pumping systems, compressed air systems and fan systems, and were conducted by DOE contractors. These audits produced a number of potential efficiency projects that currently are being evaluated against our internal criteria for capital investments. In addition to these audits, the ITP makes available to Intel a variety of programs, models and other analytical tools for our use.

Our experience with DOE's industrial energy efficiency programs has convinced us of the importance of the funding and research and development programs that would be authorized or expanded by S 661. While Intel has benefitted from working with DOE's ITP, the potential benefits of additional grant funding and the expansion of the Industrial Research and Assessment Centers would especially benefit smaller- and medium-sized industrial companies which, collectively, comprise the bulk of US manufacturing. Smaller companies often do not have the internal resources to identify and seize many of the available energy efficiency opportunities and stand to benefit significantly.

We particularly like the concept of creating Centers of Excellence within the Industrial Research and Assessment Centers. We would welcome the creation of such a center focused on energy efficiency in semiconductor manufacturing. This would create potential opportunities for collaboration with SEMATECH and the Semiconductor Research Corporation, our industry's leading platforms for path-finding research partnerships.

One concern we have entails funding. Although the recently-passed "American Recovery and Reinvestment Act of 2009"—the stimulus package—included funding for a number of excellent energy efficiency and renewable energy initiatives, advancing industrial energy efficiency received little support. Moreover, there were several excellent provisions of the Energy Independence and Security Act of 2007 (EISA) that did not get funded. So we urge Congress to "complete the circuit" that would be started by S 661 and provide the funding to make these programs work.

In addition, while we understand that the focus of S 661 is on creating and supporting "advanced technologies," there are some "ready to go" technologies that Con-

gress should support as well. A good example is combined heat and power (CHP). EISA provided grant-making authority for CHP projects, a program that never got funded.

Other features of S 661—including additional support for the Future of Industry Program and creating the Innovation in Industry Grants—should help create the technological leap-frog that will be required to address our climate challenge. While estimates vary somewhat, increasingly scientists and politicians alike are converging on a goal of reducing global carbon emissions by something like 80 percent by 2050. Achieving that level of deep emissions reductions will require development of breakthrough technologies. That will require government support and the type of public/private partnerships the bill provides.

Going forward, concerns about climate change will make these types of programs even more important to the competitiveness of US manufacturing. Whatever form it takes—cap-and-trade, carbon tax or regulation under the existing Clean Air Act—the US will have a Federal climate policy in the foreseeable future. While Europe already has a program in place, and while some developing countries are likely to undertake some form of climate change commitment as part of the current post-Kyoto Protocol negotiations, it is clear that passage of a US program will create an un-level "playing field" for those US companies that compete with other enterprises in the developing world. That clearly will be the case for Intel and the US semiconductor industry. I do not say that as a critique of the US implementing its own program—Intel in fact supports a Federal climate program. It is simply a fact of economic reality. Domestic climate regulations will impose manufacturing costs that competitors in the developing world will not face, at least to the same extent, in the immediate future.

But increasing the energy efficiency of manufacturing can help re-level the industrial playing field. The 2007 McKinsey report, "Reducing US Greenhouse Gas Emissions: How Much At What Cost?", documents that energy efficiency in many different manifestations is generally the least expensive way for companies and economies to reduce their climate emissions. Indeed, as the McKinsey report indicates, and Intel's own experience validates, investments in energy efficiency often create positive economic returns independent of their effect on climate emissions.

Many of the societal wealth-creating energy efficiency options analyzed in the McKinsey study entail some form of information and communications technology (ICT). Subsequent studies have fleshed-out the contribution ICT can make to improve energy efficiency and reduce climate emissions. Most recently, The Climate Group, a leading environmental NGO, released two successive "Smart 2020" reports. The most recent—"Smart 2020: Enabling the Low Carbon Economy in the Information Age: US Report Addendum"—estimates that ICT could reduce US climate emissions by 22% by 2020. This is a huge number compared to other available options.

What's missing? What is standing in the way of our realizing this significant potential? The answer is "smart" public policies—policies that enable, encourage, and expand the energy, environmental and economic role of ICT. Smart policies are needed to overcome a number of market failures and other barriers to realizing the full energy efficiency potential.

Intel is leading the way in trying to close the policy gap. We have joined with technology leaders like AT&T, Dell, EMC, HP, Infineon Technologies, Microsoft, National Semiconductor, Nokia, Philips Electronics North America, Sony, Sun Microsystems, Telvent, Texas Instruments and Verizon to form the Digital Energy Solutions Campaign (DESC). Non-governmental organization affiliated with DESC include the Alliance to Save Energy, the American Council on an Energy-Efficient Economy (ACEEE), the Energy Future Coalition, The Climate Group, the GridWise Alliance, the Intelligent Transportation Society of America (ITSA), the Technology CEO Council, and the Telework Coalition. Additional affiliates include the Technology CEO Council, the Semiconductor Industry Association, the Information Technology Industry Council and TechNet.

The mission of DESC is to expand policymakers' understanding of the role of ICT in improving the energy efficiency of the broader economy. The coalition is committed to advancing public policies that promote the use of ICT solutions as a means of solving our nation's energy challenge, spur innovation and economic opportunity, and contribute to practical strategies for mitigating climate change. By "ICT solutions," DESC means the full suite of hardware, software, and broadband technologies that can increase the energy efficiency of society.

What does DESC have to do with the programs authorized and expanded in the proposed S 661? Intel believes that these programs create a number of potentially powerful leverage points for applying ICT to advance industrial energy efficiency, realizing the potential identified in the Smart 2020 reports and elsewhere. I think

I can speak for my colleagues in the DESC endeavor in saying we would welcome the chance to work with DOE to make this happen should S 661 be enacted.

Thank you again for this opportunity.

The CHAIRMAN. Thank you very much.

Mr. Metts, go right ahead.

STATEMENT OF JEFF METTS, PRESIDENT, DOWDING MACHINE, EATON RAPIDS, MI

Mr. METTS. Thank you for inviting me, Mr. Chairman. Thank you, Senator Stabenow for your comments. I appreciate yours, Senator Murkowski.

I heard you all speak and what you want to accomplish here. It gives me goose bumps because I know I'm here to bring solutions. Real solutions that we can make things happen, make/create jobs, create new technologies and drive it right now.

I know what it's like now to be on deck in the major leagues also. So this is a unique experience.

When you come from Michigan jobs are important. I mean, we're at 12 percent unemployment. Every day when we get up as a manufacturer we think about how do we become world class? How do we get better?

It's nothing that ever leaves. It never will change. It is what it is. We compete around the world with the best minds you can imagine. We have some of the best minds in the world right here in Michigan to be able to do these things.

We looked at the renewable energy program about 2 or 3 years ago. We started thinking how do we get involved in this? We think it is something that's going to go somewhere. It can create jobs, create opportunity for us.

We looked at what was happening in that marketplace. When you come to renewable energy and the types of volumes that you talk about here, you can begin to think totally different from a manufacturing sector. I think that they came to the country so far and they've tried to do things on a, we're going to make one. We're going to make 10. We're going to make 50. We're going to make 1,000.

So you're manufacturing processes have been set up around that. We saw where we could make dramatic changes and bring automotive type technology to this industry. That's where it has to go.

The President has asked for 20 percent renewable energy by 2025. I don't think we can meet it with the technology we have today. I don't think we can meet it with what we have in place today.

Last year we produced 4,000 turbines in this country. The problems in trying to produce 4,000 turbines for these manufacturers or assemblers was huge. Some of them had to carry up to 90 days worth of inventory because they couldn't get parts in, the quality issues that were taking place. To carry that kind of an inventory at those types of product is not how you want to do this business.

The President's goal wants to 10,000 of these a year. If we can't do it well at 4, we've got to find a way to do it well at 10. We think we've come up with some of those solutions. By the innovative technologies that have already been here from automotive industries.

We're being able to make those technology transfers into this type of equipment.

I don't think people realize what we're talking about here. Most parts that you make you can pick up and put them on something. Pick them up and take them off.

These parts weigh 20 tons. So it's not an easy thing to just say we're going to take this technology forward or we're going to do this type of thing. We're not set up to do that.

When you buy a machine that can handle those kinds of parts, you already have it full of work. You're not out looking for work to put on it. So when somebody comes in and says we're going to add all of this work into this country. Where are you going to put it?

So we began to look at those processes and how do we take this and make this transfer? I've got some charts behind me or some pictures behind me that can show some of the things that can bring you up to speed on really what it is in the manufacturing process that makes this difference. One of the most common ones is a hub. This is where the blades attach to that spin and make the power.

Today's technology, a hub, is manufactured with basically legacy equipment. This equipment has been around since World War II. There's 120 holes on each side of this that have to be machined. To pick this up and to turn it or to turn it on a turntable or to move it or whatever it becomes a real process in trying to do.

We approached one of the larger wind manufacturing companies in the world. We said we'd like to bid on your hub business. We think we can do it better than anybody. They said, please try.

We think we're the best in the world. We can do a hub in 24 hours. We approached MAG and we said, we think that we see this opportunity. We want to do it.

We want to go forward. How do we bring this process from the process of the legacy type process? I can do one-one machine, one part in 24 hours. If I want to do 100 of them, I have to have 100 machines if I have to do this in 24 hours.

We came up with a concept that we can take 24-hour machining process and bring it down to 3½ hours. I can take 50 percent of the cost out of this part. I can begin to drive wind turbines technologies where kilowatt hours begin to reduce dramatically because of the cost of what's taking place in these turbines.

There are four major parts in a turbine that we're attacking. I've just brought one today because it gets kind of long when I go through all of them. But these are very large parts. They're very difficult to do. The capacity is not here to get these done.

We can solve this issue and in solving this issue because these jobs, this capacity is not here. It creates jobs. This is something new. It has to be done. We're going to invent a new industry. We can become world class in this basically overnight.

This will be the standard throughout the world. When somebody tells me that they are the best at 24 hours on this part and I can say I can reduce it to 3½. This is American technology. This is American ingenuity and thinking. This is what we do well.

I love this country. It's an honor to be a part of this process and to transfer what we're doing to you is very, very important today.

The bottlenecks that are in this area have got to be dealt with. This is, I think if you look at what people, at what the European manufacturers have tried to do by coming to this country. They looked at what's available. What kind of machines are available?

When you do a part that's this large, you normally might do 50 or 100 of them a year, maybe 200 a year. That is a big job. But these companies are coming to you saying we want 1,000 a year. Where do you put this work? Where does the work go that was already on that machine? It has to go somewhere else.

Wow. I'm out of time.

Blades, we saw a huge problem. The blade manufacturer today, the best blade technology in the world is handmade boat technology. It's as old as plastic boats.

It's laid up by hand. Blade problems are becoming an issue. Blades have gone from 70 feet to 150 feet to 180 feet and they've now put up blades that are 400 feet long. The weight that comes on these blades that lays on the nose of that turbine is causing problems with the gears, the augers and all inside internal things.

We have come up with a process. This shows these guys putting this on by hand. They're laying down this fiberglass and putting the resin on by hand with a scraper.

We need to move this along. Just to give you one example of what's happening. Suzlon just set aside $139 million to fix blades that are already in the field for John Deere. It's in this country.

One of the companies we work with has to touch every single blade that they work with, de-lamination, splits, cracks, coming apart. So we said, how do we? We went back to MAG, who has made the wings for Air Bus and they work on the F22. They're very, very strong in this carbon fiber industry. They're moving us in too.

We can take this technology. We already know how to do this and transfer this right into this blade technology. We can automate and make it the world's best process out there. This is a machine type. You can see the difference as we show you of laying this out by hand where we do it all through C and C.

One of the things that makes processes good, it makes you world class. It makes you better and brings in quality and reduce costs and brings up delivery is that I have a stable process that's the same every single time. That's what I can do with this type of machinery.

The blades are going to give me 10 percent more energy efficiency, 30 percent less weight, superior strength, all of these problems that you're seeing in this type. If I can go to Suzlon and say, guess what we no longer have to pay out $139 million in warranty costs because you've got blades cracking. I'm going to get their attention.

We can make smart blades. We can put sensors all along this thing that says there's stresses on this or this is happening to it. We can read it in real time. We can look at it every 10 minutes. We can look at every 10 days. We can look at it every 10 months and know the condition of that blade.

That blade can begin to speak back to us. We can put de-icing on these blades so that we don't have ice throws and things like

this. We can take this technology and begin to move it forward. We can move this technology into the automotive sector.

I know I'm out of time. I'm sorry. But we can build so many jobs and so much opportunity through the things that we're going to do that are going to transfer into other units and other ways of doing things that aren't being done today.

We're like Japan after World War II that we can look back and they can see the United States how we do things. They can say those are the problems they could have. We're not going to carry over those problems into this. We're going to start afresh and anew. We have that opportunity right now.

I'm sorry that I've gone so long. But I appreciate you allowing me to speak today.

[The prepared statement of Mr. Metts follows:]

PREPARED STATEMENT OF JEFF METTS, PRESIDENT, DOWDING MACHINE, EATON RAPIDS, MI

Mr. Chairman, my name is Jeff Metts and I serve as President of Dowding Machining, a manufacturing company founded in 1965 and located in the great state of Michigan. On behalf my colleagues at Dowding/MAG, thank you for holding this hearing today to discuss a path forward in the new energy economy and the role that wind manufacturers can play in building a world class industry through a needed transformation of the American industrial base. We are particularly grateful to Senator Stabenow for helping make possible our participation today, and I want to recognize the assistance of her staff.

In 1962, President Kennedy stood before a stadium full of students at Rice University. He described to them a vision; that the United States would begin a project to reach the Moon. I know he did not tell them it would cost more than the Panama Canal. I am also sure the President had no idea the technology advances and discoveries would touch every area of human life. Nobody could know what technology would be birthed from his reaching this unimaginable goal.

To the students, it must have seemed impossible, we had only gone 162 miles into space. The President told them we would go 240,000 miles from the Earth, in a 300-foot spaceship that had not yet been invented, made from metals that had not yet been discovered. Guided by a system that had not yet been developed, land them on the Moon and then return them safely to the Earth, and do it before the end of the decade.

He also said to accomplish this "We must be bold". Kennedy changed the world and our lives, forever. We are once again at a turning point in our Nation's history, we can and will change the lives of our children and grandchildren, and once again, we must be bold.

The United States may be in the perfect storm. Though it is a time of great trial, it is also a time of unparalleled opportunity. This economic downturn has put job creation on the mind of every citizen in this America. Today, this nation is in need of solutions that empower entrepreneurs and create new employment opportunities in our communities.

We are confident, as Americans, we can solve this crisis better than anyone in the world. This nation will respond with the same innovation, ingenuity and excellence that put America in space. As part of our recovery effort, the President is calling for 20% of our energy needs to come from renewable sources by 2025. As a business owner, as a citizen, I am here today to support the effort to grow the renewable energy industry.

As never before, there is now a public will to wean ourselves from foreign oil. "Green" has become as common a word as the "Hot Dog". As the nation searches for solutions and employment opportunities, the President has answered, and as part of the recovery plan, is calling for 20% of our energy needs to come from renewable sources by 2025. For once, we have immediate answers that seriously address the issues of less oil and the growth of our carbon footprint; that answer is renewable clean energy. Within that solution is the by-product of the creation of good high paying jobs.

We are here with solutions, but like everyone else, we have a similar problem, there are no funds available. Our core business is off 50%; we have gone from 250 employees to 147 in 6 months. We are not just positioning ourselves to ride out this

storm. We are not quitters! We are not depressed or hunkered down waiting for this economy to turn around.

We have invested millions of dollars into an idea that is now exploding into technology advances that are providing us a competitive edge in global clean energy markets. However, the current economic conditions make tax abatements, guaranteed loans and bank financing an unusable formula to leverage private investments. We are asking for grant money that will allow a real opportunity for unprecedented success in this industry.

American innovators have designed energy technologies that will be the envy of the world. We will create tens of thousands of high paying permanent jobs here in the U.S. and deliver hope that there is a future with immediate employment opportunities and real solutions in renewable energy. Buildings will be built, employees will be hired, machines will be constructed and the spin-off from these technologies will create thousands of jobs in industries that haven't been invented yet.

With a lack of oil and gas resources, Europe has been far in front of the U.S. in renewable energy for decades. In spite of our late start, we have become the world's largest installers of wind turbines in just a few short years. However, to meet the President's aggressive agenda, we will need to make fundamental changes in manufacturing processes. The United States installed approximately 4,000 wind turbines in 2008. During this same period, the European OEMs found it difficult to maintain supply flow to meet demand. In order to reach the goal of 20% renewable energy production by 2025, we need to increase the number of turbines installed from 4,000 to over 10,000 annually. Current production rates and serious quality issues must be addressed or we will fall short of the President's goal.

Because demand is outrunning production, the European manufacturers are getting components from overseas. It is not the best choice, by any means, for delivery, cost or quality. The United States has some of the best engineering and manufacturing minds in the world. These individuals have cut their teeth in the most fertile, advanced engineering market in the world, the automotive industry. The material advances we are introducing to energy components can only help revitalize the ailing auto companies. Bringing them into the future of strong, light weight and low cost components. These advancements can help reduce that industry's tooling costs by 70%.

These ideas will catapult the United States into this new energy market and immediately make us the energy standard in this major global market. Is there anything as powerful as the scientist, the engineer, and the entrepreneur all focused on the same motivation and goal? It is critical that we energize and involve them in this equation.

Dowding Machining entered the renewable market two years ago; we quickly identified the problems in the supply chain and began transferring the automotive production model into wind energy. The U.S. suppliers seemed unwilling to consider anything outside of the current European model, even though it utilized sixty-year-old technology. The United States is in a position much like Germany and Japan after World War II. We have the opportunity to develop a new industry with advanced engineering technologies. We knew we could lower cost and improve quality and increase throughput by moving beyond legacy methods and developing state of the art machines and processes.

The size of these structures has grown dramatically, from Kilowatt outputs to now Megawatt. Machines have also grown to accommodate these significantly larger parts. The skill level of the worker is also at a high level. Michigan and the automotive community are ripe with a workforce able to easily step in and make wind turbine production parts utilizing world class automotive standards. The average wind turbine contains over 8,500 separate components. With volumes approaching 10,000 units a year, it only makes sense to adapt automotive and aerospace technologies to the manufacturing process of these parts.

Dowding Industries has been in manufacturing since 1965. We have re-invented ourselves several times over the years as the economic conditions and part processes changed. We made a conscious decision 10 years ago to find parts that would continue to be manufactured in the United States. We developed customers like Caterpillar, Cummins Engine, Borg Warner and others. Two years ago we invested 10 million dollars in a facility dedicated to renewable energy. We immediately advanced the thought process on manufacturing large components and brought it to an automotive mindset.

We chose MAG as our exclusive machine tool supplier. We chose them because of their understanding of the large machine tool business and the character of the company. Now we have partnered with MAG, the largest builder in America and third largest in the world for machine tool development. We are jointly designing specialized machinery for the wind turbine market. Dowding/MAG of Michigan has

an incredible, game-changing opportunity to become the first in the world to introduce advanced manufacturing techniques to the fabrication of wind turbine components.

Our plan to modernize the machining of metal components will decrease machine time of wind turbine hubs from 24 hours to 3 hours and 20 minutes, this 70% reduction in machining time will cut the cost of production up to 50%. We are developing this technology in the four largest components, weighing from 10,000lbs to 40,000lbs, and expect similar improvements in all four machining processes. Machining capacity and quality issues for these large components are a major constraint for this industry. This is a real solution that advances the U.S. and positions us to export this "made in America" competitive technology around the world.

Our second area of improvement is the manufacture of the turbine blades. Blade failures have increased dramatically as turbines have increased in size. Until recently, turbine blades were 90 feet in length. Today, many blades will exceed 150' and offshore installations are expected to grow to 200' and beyond. A recent article on Suzlon, an Indian wind turbine manufacturer, states they will set aside $139 million for warranty payouts on cracked blades which resulted in a 46% drop in stock share price this year. These type of failures are devastating to the growth of this industry. The technology advancement we are proposing, will eliminate these issues.

Blade manufacturing today is as old as the fiberglass boat business. All over the world these blades are made by hand. The use of hand layup methods has resulted in extensive field failures. Blades are separating (de-bonding) at the adhesive joint due to improper application of adhesive. Misalignment of blade skins and delaminating between layers of the fiberglass composite are major failure modes. This is not a world class process and demands efficiency and improvement. This "hand made" process is currently the most advanced technology available world wide, until now.

Continuous fiber materials as used in aerospace designs provide significant improvements in strength and durability. These high performance materials cannot be applied by hand. The key technology enabler that allowed today's aircraft builders to change from aluminum and metal structures to composites lies in the ability to precisely align a continuous fiber to meet structural load requirements. Once again, this cannot be done by hand.

We are developing a fully automated process. This process will introduce the same carbon fiber technology used in the manufacture of modern aircraft. MAG pioneered the continuous carbon fiber placement technology and as a result of twenty-five years of research and development, they now lead the world in the aerospace composites market.

MAG machines are currently used to manufacture many different components in the aircraft industry. For example, the majority of the Boeing 787 fuselage, a major section of the A380 fuselage, portions of the F-35, the A400M, the C-17, the F-18 E/F, the Eurofighter, the V-22, the F-22, the Ariane 5, and the A350, among others.

Weight has become a major issue, affecting not only blade life and efficiency but also the ability of the structure to remain intact under increased stresses. The high weight of currently manufactured blades will shorten the useful life of yaw gears and other components. Repairs to wind turbines in the field are an extremely expensive proposition. We feel we can reduce the blade weight factor by 30%. This dramatically changes the life cycle cost of the entire turbine and lowers Kilowatt per hour cost.

Our blade manufacturing technology will give us the flexibility to incorporate innovative design architecture such as the "Twist Bend Coupling" (TBC) that can improve the turbine wind capture efficiency up to 10% over today's blade capability. We will embed part health monitoring sensor technology, giving the turbine OEM and the wind farm operator real time feedback on blade stress currently being experienced. This same technology can also enable "Smart Turbine" feedback which allows the turbine to react to adverse spikes in the operating environment, such as high wind gusts. The ability to incorporate de-icing technology is enabled through the utilization of our advanced manufacturing techniques.

The United States can and must be the birthplace of the lightest, strongest, lowest cost and most efficient wind turbine components in the world. These technology advancements will drive costs down, drive energy output up, improve quality, public safety and create excellent high paying American jobs.

It will take 10 to 14 blade plants to meet the 20% renewable energy goal. Each plant will create 1,400 jobs plus an additional 1,400 construction jobs, if new plants are built. The four machine metal components will need 9 to 12 facilities, each creating 150 jobs. We can manufacture the other 8,494 components in the existing automotive supply base already in place in the United States.

But, all of these technology upgrades, all of the advancements lowering cost per Kilowatt hour, all of the warranty cost reductions, all of the productivity advances, all of the capacity advances, all of the thousands of high paying jobs, will remain just an idea if grant funding can not be acquired. The realization that the United States can become the world standard in wind turbine technology, outpacing the closest competitor by a decade of advances, again will remain just an idea if grant funding can not be acquired. For this to succeed we need the help of the government. NASA would have never happened without Federal dollars leading the way. Our military superiority would not exist if not for government intervention. The US will remain stagnant and follow other nations in the advancement of clean energy technology if additional federal funding is not quickly approved to leverage our technical and manufacturing capabilities. We have the drive, the ability, the technology and the passion to see this through.

We appreciate your time and support in our nation's search for solutions. We are poised to assume the role that manufacturers can play in re-building a world class industry through a needed transformation of the American industrial base. We believe we can bring relief to Michigan, a state which unfortunately has been at the leading edge of the economic calamity ravaging our nation.

[Attached graphics have been retained in committee files.]

The CHAIRMAN. Thank you very much. That's very, very useful testimony from all of you. It's great to see your enthusiasm as Senator Stabenow indicated when she introduced you that you think we can make real progress here. That's what we're about.

Let me just, before I start questions, just indicate Alicia Jackson is the person here on our staff who has done all the work on developing this. She deserves great credit for that.

Let me ask a few questions starting with David Rodgers. I don't know if you're far enough into the new administration to really speak with a great deal of authority as to what is planned ahead. But a major thrust of this legislation is to dramatically increase the emphasis in this area, upgrade staffing, increase staffing, upgrade the funding, have a broader mix of skill sets that we make available here.

Is that in the plans of the Department at this point or is it just too early in the administration to say with any conviction what's planned?

Mr. RODGERS. Thank you, Mr. Chairman. We still are at a very early stage. As you know Secretary Chu still has a very slim team supporting him.

But I think what we can tell you is that this is going to be a very important area. The Secretary has identified investments in energy efficiency as one of his top priorities. Bridging the linkages between basic science and applied R & D to develop new energy efficiency technologies will be a priority.

You're going to see investments of the Recovery Act funding going into industrial efficiency technologies. So I think that the signals and the direction are very consistent with what you are proposing.

The CHAIRMAN. Let me ask on international comparisons. I mean we are competing. Our manufacturing sector is competing with manufacturers worldwide. My impression is that we have given less attention to this issue of energy efficiency in manufacturing than some that we compete against and that we are behind some other countries in this regard.

I guess I'd ask anyone on the panel whether or not that impression is accurate. Then second, what explains that? I mean is this something that the government has been asleep at the switch or

is industry been asleep at the switch or why are our manufacturers behind the curve on giving attention to the problem?

Dr. Savitz, maybe you could start out.

Ms. SAVITZ. Yes. I think you can compare the steel industry, the energy used to produce a ton of steel here verses say, Japan or Korea or Germany. They are more efficient than we are.

We've improved our——

The CHAIRMAN. Are they just marginally more efficient or substantially more?

Ms. SAVITZ. Ten to 15 percent. But we've increased. We've been closing that gap better over time.

Part of it was that a lot of their steel mills aren't much newer. We've been taking and retrofitting our mills. When we do retrofit them we do put in energy efficient equipment, just as Mr. Harper talked about what Intel has been doing in theirs.

U.S. steel industry has a goal, 40 percent reduction in energy use from 2003 and by 2025. So it's a matter of what natural resources. We also tend to make a lot more of our steel from scrap which is more efficient than started pure from iron ore. So that has helped us.

So I think if you look at each industry in general as we've turned over our capital stock in the industry we are getting more efficient and closing that gap between the two. I think it's good that your bill, as I mentioned, has that comparison. We can then see is it matter of price of energy is higher in other countries than here until recently. That drives how you make your decisions.

Then are there other policies and finances. I think part of your bill will be able to find that out and make the changes.

The CHAIRMAN. Mr. Harper.

Mr. HARPER. Yes, a couple of comparisons. When we set about to create the digital energy solutions campaign, which is primarily focused in the U.S. but we've also got some activities in India and China and Japan and potentially in Europe as well. You know, just focusing on knowledge of and appreciation of the role of IT embedded in other technologies, embedded in other industry's products because that's what I know the best.

There is a much greater appreciation of that in Europe and Japan than in the United States. I think a lot of it has to do with energy prices. Those two governments are much farther along in developing public policies to support IT as an infrastructural item in an energy efficiency strategy.

But even in China where I spend some of my time, you know the Chinese economy is generally speaking much less efficient than even the U.S. economy. But probably for that reason and because of energy security concerns and air pollution and a lot of other factors the Chinese government is tremendously focused on the energy efficiency and driving the energy efficiency of their industries as a competitive differentiator through programs like the top 1,000 program that we've been somewhat involved in. So, you know, they reached out to us.

They've reached out to a largely American dominated, Japanese dominated industry and asked for help in incorporating the ICT component of their energy efficiency activities. You know I think this bill and there obviously are a lot of fine programs already in

existence to build on. But I think we do have lessons to learn from other countries, even as to say China which is less energy efficient than we are.

The CHAIRMAN. Why don't you go ahead Mr. Zepponi and then my time will be up here. It already is. Go ahead.

Mr. ZEPPONI. I'll just be very brief then. Food processors and I'd say this is true about manufacturing. Energy efficiency has two components. One is its productivity and productivity improvement. I think that American manufacturers and especially food processors have really focused in and honed in on leaning out their processes.

But innovation is also a critical part of remaining competitive and looking to the future and an investment in innovation, innovative processes, in the manufacturing of new products, especially in an industry group like ours, food processing, a basic industry in the United States. We have focused our attentions on productivity improvements and improving and reducing waste.

The issue that we need to be looking at right now is an investment in innovation so that we can continue to improve over the long term. This is about sustainability of our industries, not just focusing on reducing and reducing and reducing and leaning it out. We're investing.

The CHAIRMAN. Alright.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman. Boy, Mr. Metts, I love your enthusiasm. You know, we can demonstrate to the rest of the world that we take the ideas that you have taken and used to build your competitive manufacturing strength. Then we're going to come back and do it twice as good. I appreciate that.

Mr. Rodgers, I want to ask you very briefly about nuclear manufacturing. At one point in time we did pretty well here in this country. Now I think we look to Japan, quite honestly, for most of the component parts within that industry.

Is there anything that you see encouraging that would suggest we might/may see a resurgence in the manufacturing of certain parts when it comes to the nuclear industry?

Mr. RODGERS. I appreciate that. I think you've identified a critical issue that applies not only in nuclear, but in many of our other sectors where we have lost expertise overseas. We do not make enough of the technologies that we need here, batteries, biofuels, nuclear. These are all great examples.

We would like to rebuild that workforce. We would like to extend the connections between basic science and applied science. I think that the policies that the Congress is establishing that point us toward emphasizing manufacturing are going to be critical to that.

Senator MURKOWSKI [presiding]. I appreciate that. Let me ask a question. I'll direct it to all of you.

We had a hearing a few weeks ago looking at the nexus between water and our renewable energy sources and a recognition that with some generation of energy. Solar is one example. We actually use more water than we are able to create. These are in parts of the country, where we have real issues with water.

Talk to me a little bit about the nexus of water to energy efficiency as it relates to the manufacturing. Dr. Savitz, I don't know whether that was addressed in the report that you prepared. Mr.

Zepponi, I'd be curious to know within food processing how big of an issue is this?

I'm trying to understand how we, when we look to the accounting for energy efficiency are we also making sure that we're not over utilizing another one of our resources, very precious water. Who wants to answer first?

Dr. Savitz.

Ms. SAVITZ. my report did not address water specifically. But what we did do is in our recommendations suggest that DOE look at portfolio mapping consider a greenhouse gas emissions and also other resources, water being one of them depending on the manufacturing process. As you get more efficient in any process the water you should decrease.

I think we'll turn to food processing which does use a fair amount of water.

Mr. ZEPPONI. Thank you very much for the question. It's a wonderful question. I think it's quintessential to our industry the nexus between energy efficiency and the use of water.

Food processing and I'll extend that to agriculture, uses a lot of water. I'm going to use the term use as opposed to actually consuming that water. We don't consume as much as you would think. But we do use a lot.

It's important. There's an indirect component and a direct component of water use. Of course you put water in products to move the product along, put it in the jars. That's a very small part of it.

But in the area of waste water treatment for example, when the product comes off of the line we use a lot of water in the processing of our products. We reuse that by pumping it into a system, aerating it. We have systems in place that are these huge pumps that move that product around, the water around.

Now we re-characterized a few years ago, actually I was part of legislation in Washington State that re-characterized that stream from waste water to actually it's not waste water. It's just nutrient water. It's water that we can use in the fields again.

So we take that water and move it into the fields. That process actually helps us to re-grow and grow our products. So we're looking at the use of moving the water around. We're using variable frequency drive motors. We've replaced some of the single drive motors that we've had in the plants. That's a huge savings to us.

We're looking at a super boiler for example. This super boiler has new technologies that actually captures the condensate of water in the boiler process. We use a lot of steam in a plant. Actually captures that condensate and reuses it more efficiently.

So when you look at energy the biggest place, the most important place for energy efficiency is going to be in the movement of our water in our systems and actually application and distribution of that water throughout the plant.

Senator MURKOWSKI. Can I ask you, Mr. Rodgers. Within the Department then as you look to those energy efficient technologies, do you take into consideration water use as opposed to consumption?

Mr. RODGERS. Yes, it is a very important part of our analysis. In general, energy efficiency is going to improve water utilization both directly and indirectly. In fact, when you reduce electricity consumption through energy efficiency you can directly save water at

utility generation facilities. We have compiled a road map on the use of water and the nexus between water and energy. I'd be happy to provide that for the record.

Senator MURKOWSKI. I'd appreciate that. Thank you. Thank you, Mr. Chairman.

[The information referred to follows:]

The roadmap for the energy and water nexus has not yet been released. However, as soon as it is released we will be sure to provide it to the Committee.

The CHAIRMAN [presiding]. Thank you very much.

Senator Stabenow.

Senator STABENOW. Thank you, Mr. Chairman. If I might just add my opinion, Mr. Chairman to your very important question about where we are in terms of what's happened in terms of our country or other private sector. I would just share one example where in the area of batteries, which we're not talking about specifically this morning but where every other country in the world decided a number of years ago, decade or more ago, to focus on public funding for battery technology for automobiles.

So we see Japan and China and Korea and Germany has a great battery alliance. You go on and on and we chose not to do that and instead left all the innovation to industry in this country. Competing against the country's investments around the world which certainly has put us at a disadvantage in terms of where battery cells come from right now.

So the good news is, is we've put $2 billion into the recovery package. This committee has been at the forefront of supporting the efforts to the loan programs and so on. So hopefully we can begin to get some of that back. But we, I believe our companies have been competing against countries. Hopefully now with the right policies we can change that.

Thank you to all of you again. Mr. Metts, I wanted to ask a question related to your comments about the auto industry and wind industry. The fact that your engineering experiences from the auto industry have transferred into what you are now doing. I wondered if you could talk a little bit more about how the two industries relate and whether the auto industry could benefit from the new technologies that you're developing in wind turbines?

Mr. METTS. It's interesting you asked that because exactly where we came from in this large machining, you know, I think people think that these kinds of things are all around the country. They're not. Michigan, Ohio, Indiana, Pennsylvania, we're set up to do this kind of work.

We had a company that was an automotive company that went out of business and we hired all of their machinists. Excuse me, not all of them, we hired everyone that could handle our machines because we bought these large machines. They're, I mean, there's 106 feet long, this machine. It manufactures and makes parts as big as the center of this room.

You don't just turn that over to anybody and that technology that they worked in for many, many years was a direct link. We hired the whole group of them.

We didn't have to go through the learning curve of them learning how to do this process. They moved right in. On the other side when we come into this carbon fiber technology.

When we put factories together like on Mound Road we've got a factory that we'd like to do this in. As they come in, all the automotive companies will come see what's going on. It's too big. When you start making something that's 150 feet long out of carbon fiber, they want to know what does it do? Can we do it here? Can we do it there?

MAG is, right now, working with companies in Europe on this type of technology. It needs to be brought here. You're absolutely right there are so many of these technologies we think about here and somebody else does them. We need to do them.

The types of things that we're talking about right now are game changing. They're not just small improvements. These are game changing improvements. We will be the standard around the world overnight.

So those technologies will come in. Yet we've got some great ideas that we'd like to talk to them about. How do you do that transfer?

With 8,500 part numbers in these turbines, automotive has a hard time letting go of automotive. But once you convince them to let go of automotive. This is the same technologies you're using. It's cutting metal. It's working with plastics.

It's the same things you're putting in an automobile. It may be a little bit bigger. But this transfer is direct. We can put many, many people back to work in Michigan that are looking for another avenue to go in.

Senator STABENOW. Thank you. When you're talking about other countries, I know one of the things that we've worked on with the recovery plan was a manufacturing credit which the chairman led and was pleased to partner in. In our efforts to get a 30 percent manufacturing credit on the books, this bill that we have in front of us will address financing through a clean energy fund which we're also putting into the budget resolution.

I have that committee happening as well. I have to leave to go to in a moment. But I'm wondering if you might talk about, from a financing standpoint, why it's so important to have these mechanisms in place in order for manufacturers to be able to get the capital they need and be able to do what you're talking about.

Mr. METTS. You can't get funding today. We can talk about this for hours. You just can't get it.

If I go to the bank and ask them for the kind of funding that I need right now they're going to ask me to take a drug test. It just isn't working. Where do you go do this? How do you get the funding for the original set up?

It's like McDonald's. How do you make the first one? You've got to get the first one. Now we can go back to that market and copy this and copy this and copy this. But it's creating that first one.

I'm telling you we have international pressure on who is going to be first. Don't think that people aren't sitting around desks and offices with these kind of volumes looking at it and thinking they're not.

We're going to put 300 mega watts in this country. They're going to 600 mega watts in China, Europe and this country. Giga watts, excuse me, a little bit bigger. That's a lot of turbines. That's in just wind.

So the funding availability, it's almost like an automotive company saying we want to make a minor change to an automobile. It takes $150 million to do that. But look what you get from that. Look what comes out of that.

For us to go find that funding is not available and to go and sell that technology, if you're working on loans, it takes it out of the marketplace. We have to look at this as how do we set up this process, No. 1? How do we get it in place that allows us to sell this in the marketplace? The second, the third, the fourth, the fifth, I know I can get private money that will want to do this.

This is the first one is going to be the tough one. That's where we need your help. We need to find rent money to do this.

Senator STABENOW. Thanks very much. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Udall.

Senator UDALL. Thank you, Mr. Chairman. I'm going to express an opinion. But as the saying goes, I want to be clear that the opinion I'm about to express does not represent the views of the ranking member or necessarily the chairman.

But when I hear Mr. Metts and others speak here about the supply chain potential it strikes me that this is the reason once again to seriously consider a renewable electricity standard for the country. Even if your State doesn't have abundant wind or sun, it may have abundant biomass. It may have abundant manufacturing capability and it will lift all of us. So thank you for indulging me with that point of view.

If I might I'd like to turn to Mr. Harper for a question on a different, but it's a related topic I believe and that's energy use by the Federal Government, specifically in regards to IT, information technology. From what I've learned despite this committee's efforts and despite the administration's commitment to energy efficiency I keep hearing comments that the CIO is the Chief Information Officers, who make decisions about IT purchases, may still not consider energy efficiency and therefore the long term energy costs in their procurement decisions.

Why don't they do this? It's my belief that it's because the energy cost of their systems aren't their responsibility. They get no carrot. There's no stick, no impact at all from these energy costs.

I think to make real progress in this the CIOs will need to have some mix of accountability and responsibility for the energy costs of their systems. Would you comment and what are your views on this? If others on the panel would like to comment as well. I'd like to hear what they have to say.

Mr. HARPER. Thank you, Senator. I should say at the outset that I'm not an expert on the procurement process. But I have seen it a little bit up close and personal as a former Federal employee and a contractor at one point to the Federal Government. It's an imperfect process.

I actually think in the case of IT and the energy component of IT that the situation isn't all that different in the Federal Government than it is in the private sector. You know, the focus today is mostly on the data center. The data center means different things in different agencies.

It can be everything from a closet that serves a few offices, you know, with a couple of servers to, you know, the more traditional industrial scale data center that people generally have in mind. Just like in the private sector we found in the Federal Government, State governments as well, the CIO is responsible for specifying what equipment he or she needs and managing that equipment. Reliability is king when it comes to data centers.

But they're typically not the ones who pay or see the electricity bill. So, I mean, this is a classic market failure that you see all over the economy when it comes to energy efficiency. It's why, for example, we believe you need some minimum appliance standards and other kinds of requirements like that even if you have a price for carbon or you have some other market pricing signal. You've got to somehow get around these barriers.

I don't know exactly how you fix that in the Federal Government. I think in the private sector, I think increasingly, just CFOs being aware of this issue and being able to connect, you know and look under the rock so to speak as to where this expense is coming from and see the potential is key. You know, part of it is procuring more efficient servers. Our industry is turning out much more energy efficient technology, generation on generation.

But with the data centers, again, where much of the energy is consumed it's not just about the individual pieces of equipment. It's about the architecture of the structure. It's how the equipment is cooled. You know, it's a systems issue.

But somehow getting, closing the link between the CFO or the finance side of an agency and the IT side of the agency, whatever you could do would be helpful there.

Senator UDALL. Mr. Zepponi.

Mr. ZEPPONI. I thank you very much for the question. Supply chain management is an absolutely critical part of energy efficiency. I mentioned in the testimony that management has a tremendous opportunity to approach energy efficiency as the metric in which to develop management systems to improve the entire production operations, including the supply chain.

In food processing it's particularly important because we're carrying around bulky products and we need from the agricultural, from the farm, all the way through the system to Walmart. It's particularly important for us to pay attention to that supply chain. What we're really talking about is a change management question. It's not an engineering question. This is a change management question.

When we signed on to the memorandum of understanding with the Department of Energy and the National Laboratories what we were saying is that these executives signed this document that said we make a commitment in our organizations to improve energy efficiency. They have made a commitment to improve energy intensity by 25 percent in 10 years and 50 percent with the investment of innovation technologies over the next 20 years. That's what you need.

You need to have top-down leadership and then training and process and empowerment within the organizations along with the other partners, with the private/public/quasi public entities in our

regions to make this come to bear. That's how we're going to improve energy efficiency.

Senator UDALL. Mr. Chairman, are we going to have another round?

The CHAIRMAN. We sure can. Yes.

Senator UDALL. That would be prudent.

The CHAIRMAN. Let me ask a couple questions. See if Senator Murkowski has questions and then go back to you here.

I wanted to ask Mr. Rodgers this issue about having this goal of a 25 percent improvement, a reduction in energy intensity in the next 10 years. That seems to be something everyone is sort of aware of that. Dr. Savitz, as I understand it, in the report that she just co-authored. They've concluded that that's not going to happen given the amount of resources we're committed in this area, given the way things are now proceeding.

Mr. Zepponi, I guess your organization has independently endorsed the same objective for your organization. I'm just wondering how real is this? I mean we give a lot of speeches around the Congress here about how we're going to reduce energy dependence on foreign oil and all that by X amount, by such and such a date.

Then there's when you get behind it and ask. I mean this happened in last couple, 3 years. I mean we see these statements coming out of the administration.

I remember writing letters to Secretary Bodman and saying is there anybody who has a plan for how we get from here to achievement of this goal or is this just sort of a thrown out number? Do you have any ideas? Is there any plan for getting this 25 percent reduction in energy intensity in 10 years?

Mr. RODGERS. Thank you very much, Senator. I think Dr. Savitz did summarize this very appropriately. Unless we have the right mixture of appropriations that leads to research and development and new technologies in the pipeline, unless we have the right combination of market-based policies and government policies, it's unlikely that our industrial partners can reach that goal.

We do, however, have road maps for specific industrial sectors that show the capability, the potential to achieve the goals. We're working very hard to do that. We are signing up CEOs who want to make a commitment as indicated to achieve these goals.

So I think the opportunity is there. I think you're taking a very important step by identifying the additional pieces that we need in terms of authorization, but the other pieces will also be needed.

The CHAIRMAN. To the extent that changes in policy are required then Congress is required to weigh in on that. I certainly hope you'll advise us as to what those are so we don't wind up passing this bill and then coming back and having another hearing in 5 years or something. People say if you just would adopt the right policies we could do these things.

Mr. RODGERS. Yes, sir.

The CHAIRMAN. I don't know. Mr. Zepponi, do you have a real, in addition to having endorsed this ambitious goal of 25 percent reduction in energy intensity in 10 years, 50 percent in 20 years, do you have a plan to get there or is this just sort of a notional idea in your organization?

Mr. ZEPPONI. Mr. Chairman, again, I appreciate this question because yes, indeed we do have a plan. It's in the development stages. I think it's going to, we're going to adopt it.

But before we agree to the 25 percent reduction in 10 years, we actually did some background research. our staff felt that 20 percent was clearly reasonable just by using new technologies. Now remember the food processing industry has been around for a long time.

There are many areas where we can improve. We have retorques that are the canning equipment that have been in place for 25, 30 years with very little improvement because they've been depreciated. They stay in place.

When you compare that project change, if you will, to, you know, the energy efficiency gains that you'll get in replacing that piece of equipment to developing a new market for example or another capital investment internally it becomes a bit of a challenge. But we do have a plan. We have identified projects and processes.

It's important to note that we feel that many of the advances we can get in energy efficiency are going to be in process improvements, the supply chain improvements that we discussed briefly earlier as well as using technologies. many of those new technologies are not new to other industries. For example we have rapid battery recharge in our forklifts. this is an important new technology that we're using.

That was technology that was developed in the airline industry in order to allow those planes to be up in the air more frequently. They developed it because they had huge assets at hand. We took that technology and put it into our cold storage and in our warehousing facilities in order to make sure that we don't have to have these huge fleets creating this huge overhead for our company. So we're using those technologies from other industries that are out there we just need to bring them over into the industry.

So we think we can do it. We do need to have an institution. We need to have an organization like an NWFPA that represents the industry and pulls them all together so that we have a cluster that's working toward that end. Thank you.

The CHAIRMAN. Dr. Elliott, did you want to make a comment?

Dr. ELLIOTT. Yes, sir. Thank you, Senator Bingaman. One of the things I think that's important to understand is the issue of investment. We have not been investing in our manufacturing sector. You've heard this sort of all up and down.

We're still using technologies we were using in factories that have been around for decades to manufacture products out there. We have stated the art of manufacturing in this country that is efficient. Dr. Savitz mentioned that in the steel industry.

Some of the steel mills that are being constructed today are among the most efficient in the world. The problem we've got is again, this is depreciated. We're going to continue to run that plant until there is some incentive that is brought by the policy to basically make those new investments.

Part of this actually has a hangover from the investments in the 1950s and 1960s and 1970s and when we changed the tax policies to discourage the investment in capital assets, we've seen a major

reduction in that. In many cases we're just living off the depreciation of those investments in the past.

What I think we need to do is go into a new period of investment if we want to change the future of the energy and competitiveness of the manufacturing sector.

The CHAIRMAN. Very good.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman. Not a question, just a comment to follow up. Several of you, at least several of you have mentioned the fiscal environment that we're in. This is a time of tight credit markets.

Dr. Elliott you point out that you haven't had the investment over a period of time. I think we recognize that we might be able to enhance budgets a little. We certainly can look at tax policies that encourage the manufacturing or re-growth of manufacturing in this country, which is key to us.

But I think we have gotten a little pragmatic about where we are right now and the fact that the capital markets are not conducive to doing what we're trying to do and meet these aggressive goals. I'm not suggesting that we pull back. But I think the Chairman's questions are very important.

There has to be a level of pragmatism about where we are. Our financial markets are not where we want them to be right now. But I appreciate the comments and the testimony from all the witnesses today.

The CHAIRMAN. Senator Udall.

Senator UDALL. Thank you, Mr. Chairman. Again, I want to acknowledge the panel. The time you took to come to Washington and share a lot of good news and a lot of exciting potential.

Dr. Savitz, I wanted to direct a question to you and also extend an invitation to the rest of the panel to respond once I share my question with you. It's important, of course, that we focus on improving end use efficiency which is the amount of energy that a product or a device consumes to produce heat, light or some other benefit. But I think there's some other efficiencies as well that we could focus on improving. I'm particularly thinking of distributed generation and storage technology.

This could save manufacturers and residential and commercial buildings and other end users the need to purchase energy at peak load times. It could also help the grid, I think, be more secure and more stable. You mentioned in your report a few recommendations. If you wanted to elaborate I'd like you to do so and then extend the invitation to the rest of the panel.

I would note that, for example, it has come to my attention there's a company in Colorado that and I'm not an engineer. I'll show you that very quickly when I describe what they do. But in effect at night when base load power sometimes goes wanting, but certainly there isn't a demand for peak power, they will freeze 500 gallon tanks of water which then during the daytime heat are used to cool buildings by the use of small, very efficient electric motors as opposed to the compressors and pumps and all that goes into a full scale air conditioning system.

It's an exciting product and exciting concept. One that I want to see driven more into the marketplace. Would you comment and others.

Dr. SAVITZ. Yes, I mean there are lots of technologies that like that. The whole distributed energy combined heat and power just can raise the efficiency from, you know a 35 percent turbine or to 70, 80 percent because you take that heat and you recover it either for your water which can be used for an industry process. It can be used for the heating in a McDonald's to do their cooking and their cleaning or you can use it for commercial buildings, as you say.

That's a lot. I mean these are opportunities. Sometimes the distributed energy market at the smaller systems, these are in the hundreds of kilowatts rather than mega watts.

There's a disincentive if you have to hook up the utility. They make it as hard so that you need those standards and you need, you know, interconnects. In some way to buy back the power.

So this is type of thing that needs to be addressed across all of the sectors to really encourage more combined heat and power. That will make them economical for companies to do it. We've had the experience of Honeywell, very good micro turbines, but can't have different standards in every State to do that.

Senator UDALL. You are describing a variation of the net metering debate, I believe. Is that accurate?

Ms. SAVITZ. That is feeding power in. But the whole net metering and I think some of the states are experimenting, just like you say. If you generate your use of power off peak your rates will be lower and so there's an incentive along that way. This is actually being able to hook the equipment up.

Renewables will have some of the same problem. As you get smaller systems to connect into the grid you want to make sure that they're not disincentives and have some standardization. I think the looking at grid activities that the Stimulus package puts in and that the DOE is taking more aggressively should help that.

Senator UDALL. Dr. Elliott and then we'll go to Mr. Harper.

Mr. ELLIOTT. Thank you, Senator. This is something near and dear to my heart.

Senator UDALL. Good.

Mr. ELLIOTT. As the founding Director—founding President of the U.S. Combined Heat and Power Association a dozen or more years ago. So this is, as I said, something near and dear to my heart. I think this is an important thing to look at. One of the things that is the opportunity, as Dr. Savitz said, is to look at the efficiencies we can get through distributed energy.

What is does is really require us to rethink the model of our electric utility system out there. Today we have a grid where we have generation, transmission, distribution and consumption. What we need to do is rethink that where we can have generation distributed near the point of use.

We take the grid and the grid becomes a leveling system, the net metering idea. You take when you need. You give back when you have more than you have.

I think that's one of the things that really is potentially very exciting about the whole smart grid concept. One of the problems

that we have at ACEEE with the smart grid is it's currently looking at making the existing grid smart. What we think we need to do is also think about how do we make the existing grid smart so that both the power can flow from the generator to the consumer, but if you have distributed resources where the power can flow back.

This is really important for intermittent resources like many renewables. So we need to think about how we use technology. To my colleague from Intel, one of the things that's important to understand is smart is going to be very important because information and communication technologies are the technologies that are really going to be able to transform our energy use.

Many of the technologies we're looking at in food products, in the wind turbine manufacturing or any of the sectors that I work with. The most important thing that has transformed manufacturing in this country and globally has been the application of what we call sensors and controls. It's intelligence.

Bringing smarts to the manufacturing plant because that new manufacturing plant, using CNC controls, using PLC systems, using the adjustable speed drives. That's really where the technology and intelligence are going to allow us to work smarter and work more efficiently. Part of that clearly is going to be that distributed aspect.

Senator UDALL. Has not the IT network itself undergone this same evolution?

Mr. ELLIOTT. Absolutely.

Senator UDALL. So there's an analog here that we and we know better where every bit and byte is. We can also begin to know where every electron is and where every wasted BTU is and put them to work in a real time way.

Mr. ELLIOTT. You are absolutely correct, Senator. I think what we want to do is when we smarten the grid we want to look to the experience that you mentioned with ICT. Because what we want to do is move from a grid that Thomas Edison would have been very comfortable with a century ago to a grid that is much more analogous to the internet.

Senator UDALL. Mr. Harper, did you want to comment?

Mr. HARPER. Yes. I mean——

Senator UDALL. I think the terminal bill should be for a little longer.

Mr. HARPER. This is right down the alley of our digital energy group. You know, we were basically created to increase the awareness of the role of ICT as part of a solution set for energy efficiency in climate. There's been a lot of focus, I mean going back to your original question, Senator.

There's been a lot of focus in improving the energy efficiency of individual devices. Energy Star program is the best example of that. There's been tremendous progress in terms of the amount of work per unit of energy input that a microprocessor now exhibits compared to 5, 10, 15 years ago.

But there's a much bigger leverage in—that's what we call the micro story. There's a much bigger leverage to be had in the so-called macro story. ACEEE did a report a little over a year, 15, 16 months ago that showed on average in the U.S. economy for every

additional kilowatt hour consumed by a new ICT device everything from sensors to servers an average of ten kilowatt hours was saved in the broader economy through the energy productivity services of ICT.

A lot of that, I mean, some of that is computers. But a lot of that is sensors and variable speed motors and you know, the equipment that the IT is embedded in. There's a much greater appreciation, as I alluded to earlier.

In Japan for example where industry and the government have something called the Green IT Promotion Council. Which is both trying to improve the energy efficiency of the IT devices, but also trying to embed more intelligence, more smarts in the grid and in other parts of the Japanese industry and economy to further improve the overall energy efficiency. There's a huge amount of gain to be had there.

The last thing I'll say is McKinsey did a report that's fairly famous showing the marginal cost of abating carbon emissions for different things you could do. You know, some are very expensive like carbon capture and storage. Some are actually cheap, free or save or create wealth for society.

Most of the things on the curve that were either free or created wealth were energy efficiency activities or energy efficiency policies. A lot of those had an IT component. Again, it's not in my industry. It's the stuff my industry makes embedded in, you know, industries represented at this table that's the real story.

Senator UDALL. Thank you. I know others wanted to respond. I think my time is probably expired. But I——

The CHAIRMAN. Go ahead if anyone else has——

Senator UDALL. I know Mr. Rodgers looked like——

Mr. RODGERS. Senator, I think the technologies you described for distributed generation are really a win-win for industry and the utilities. Rightfully so—as this committee has looked at our power policy, which is set primarily at the State and local level—the focus has been on consumers building efficiency and encouraging utilities to promote efficiency.

Too often industrial and manufacturing needs for power policy reform are neglected. I think distributed generation is the answer to how our manufacturing sector can help the utility sector promote energy efficiency. I think it's a very important area. I thank you for identifying that.

Senator UDALL. Mr. Metts, you had the last word last round. Do you want to have it again?

Mr. METTS. Oh, dear. It's interesting the conversations because we see it. We're using it.

You know when I was a kid if you got 70,000 miles out of your engine you felt pretty good. Today you'll drive it for 300,000. This is all technology improvements and CNC type machine processes.

You know we look today at what we want to do. If I told you in most of your manufacturing processes you're going to get a 10-percent improvement. You'd jump up and down. That's a huge improvement.

Because of technologies we can now take what is old boat manufacturing for a blade, bring it into. For instance, we think that we're pretty strong when we have a five axis machine which means

I can operate that machine head on five different axes. What we're talking about machines that have 50 axes that operate.

I mean this is stuff that humans can't even—it has to be done with this type of intelligence. But it's allowed us to move from a hand laid fiberglass now to a machine laid, perfectly laid, perfectly done, sensored system that gives us a 10-percent improvement in energy production. These are the type of technology advancements that need to get here.

They're not being done around the world. We don't take a step forward. We take a leap forward in world technology. We become the standard that needs to come here to get this done around the world.

I'm tired of chasing the Japanese and the Germans. I want someone to chase us for a while.

Senator UDALL. We all are. We want them to eat our—instead of having our lunch eaten. We want to eat their lunch.

[Laughter.]

Senator UDALL. But thank you. I would note too the important role that aerospace and aeronautics have played in the development of some of these materials and these processes. It speaks to the need to have a robust investment in those areas. I say that as a former chair in the House side of the Space and Aeronautics Subcommittee and a big proponent of NASA.

But thank you all for being here. Two quick comments. In the sense I hear the potential for almost a self firming role that the grid could play. We hear a lot about, Mr. Chairman that the need to firm solar and wind and other renewables. But if you have a grid that's this smart you actually add that capacity, I think in that regard.

Again I want to thank the panelists. It's been very crucial. In the end we want to make energy efficiency the sexiest thing around, don't we?

We're still looking to make that case in a way. But Americans are frugal. We also can be profit good at the same time, but I think there's a way to make the sale here particularly when we see the advantages and the outcomes and the profit and the wealth creation that will evolve from all of this.

Finally this is what we need to support the chairman and the ranking member is a very comprehensive approach on a new grid system and that will be a key part of the bill that we send to the floor.

The CHAIRMAN. Thank you all. I think it's been very useful testimony. We will take it to heart and try to make some improvements on the legislation that we're moving ahead with. I appreciate your coming to testify today. That will conclude our hearing.

[Whereupon, at 11:17 a.m. the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSES OF R. NEAL ELLIOTT TO QUESTIONS FROM SENATOR BINGAMAN

Thank you for the opportunity to testify and to respond to your questions. I would like to offer one clarification and amplification to my testimony. I neglected to mention the industrial efforts that have been ongoing at the Environmental Protection Agency (EPA) in the policy and voluntary programs offices. These activities, which have also experience funding constraints represent important parts of an overall government response to energy efficiency and sustainability of our manufacturing sector and should be receiving additional funding, as well as the activities at Commerce and Energy.

I look forward to the opportunity to respond to any addition questions or amplifications that the committee may have.

Question 1. Dr. Elliot, in your testimony you state that the pipeline of R&D projects is running dry. What do you see as the immediate steps that should be taken to refill this pipeline? Are there specific industries that we should be focusing on?

Answer. The Department has already taken an important first step by allocating $50 million of American Recovery and Restoration Act of 2009 (ARRA) funding to existing, unfunded research agreements. It is important that funding continue to be provided for research in future as was envisioned by the provisions in Sec. 452 of the Independence and Security Act of 2007 (EISA). The industries that have existing cooperative research agreements with DOE's Industrial Technology Program (ITP) represent the first place that funding should be directed because they have the research roadmaps in place that can make best use of the funding immediately. Other industries can be added as funding becomes available and the industries can be engaged by the Department.

Question 2. Dr. Elliot, what industries do you believe have the most to gain from energy efficiency improvements? What industries will need technological breakthroughs to reach significant energy savings and greenhouse gas reduction targets?

Answer. The energy-intensive industries that the ITP program has historically worked with represent among the biggest opportunities for energy efficiency, and could the ones that will be most adversely impacted by climate policies. There are a few energy intensive industries that have not historically participated in the ITP program, including petroleum refining, cement and food processing that might also benefit from support from the ITP program. As was noted at the hearing, food products has begun to receive attention from the Program at the regional level, which ACEEE believes is the appropriate point of engagement because of the diversity of the food products industry between regions. With respect to the other two industries, I know that ITP has reached out to these industries in the past, but has not found them disinterested. The EPA Energy Star Manufacturing program has been more successful in engaging them, which suggests that different industries may require different program approaches to meet their needs.

Question 3. In your opinion, what do believe are the biggest roadblocks to achieving significant increases in industrial energy efficiency? What does this bill do or not do that could help remove some of those roadblocks?

Answer. The most significant challenge to making major increases in industrial energy efficiency is our aging industrial infrastructure. Much of our existing infrastructure was built before the 1980s, and is now nearing the end of it technical life. Many of our economic competitors have encouraged investment over the past decade

in their manufacturing sectors so their more-modern manufacturing infrastructure provides them an energy efficiency and productivity advantage over our domestic industry. While we can make important incremental improvements in our existing infrastructure, we will never be able to realize the efficiency opportunities that would results from rebuilding our manufacturing using the most current and efficient technologies and practices. As an example of this vintaging challenge, the average industrial boiler is over 50 years old with an efficiency of less than 70%, while the advanced "super boiler" is approaching 90%, as are the most current combined heat and power (CHP) systems.

The challenge for domestic manufacturing is that they need to be assured that they will have a robust marketplace for their products in the coming decades since the investments in new infrastructure is paid back over decades not quarters. Certainly the current financial crisis has impacted their ability to invest by removing demand for manufactured goods as well as access to capital. In the short-run the access to financing provide by S. 661 will provide an important bridge until the financial markets can recover, and provides the workforce and net technologies that represent critical building block for the new infrastructure. What is needed in addition is a change in investment policies that encourages the replacement of existing vintage manufacturing capacity with new state of the art capacity. This investment can occur at both new "green-field" and existing "brown-field" sites.

Question 4. S. 661 directs DOE to complete an assessment of industrial energy efficiency technologies that are not widely implemented within the U.S. and to compare adoption rates to those of other countries. Could you speak to the main reasons that certain technologies are widespread in industry elsewhere, but not within the U.S.? Is it simply a matter of higher energy prices in other countries?

Answer. The proposed global assessment of available manufacturing technologies represents an important contribution to the discussion of how to make our domestic manufacturers more efficient and competitive. The reasons that these technologies are not more fully implemented are complex, and to some extent industry specific. Among the major reasons however are the vintaging of our manufacturing capacity as discussed above, where the manufacturing stock of many our economic competitors is much more modern and has been better able to implement the most current technologies.. This aging infrastructure is complicated by volatile energy prices, particularly for natural gas in this country that make energy savings investments difficult to commit to. While energy efficiency investments do reduce the exposure of companies to energy price volatility, uncertainty discourages investments by industry for the long-term when companies must consider whether they will continue operate a particular domestic facility or shift production to another, more modern domestic or foreign facility. This lack of investment is not so much motivated by higher energy prices in other countries, but rather more stable prices.

Question 5. It is clear that if the U.S. is going to be committed to reducing its energy consumption and meeting greenhouse gas reduction targets, industry will have to play a large role in meeting those goals. What is the level of effort that we are going to need to transform our industry to use less energy and reduce emissions, while increasing its competitiveness? How far does S. 661 go in meeting these goals? And what other steps are needed?

Answer. As is noted in my response to question 3, a rebuilding of the domestic manufacturing infrastructure will be critical to achieving our climate goals as well as insuring the long-term health of the manufacturing sector. As noted, S. 661 begins to assemble the critical building blocks that are necessary to effect this change. Climate legislation may represent the second part of the puzzle by creating the mechanisms necessary to start our manufacturing sector on an investment path that will provide us with a manufacturing infrastructure for a 21st century world where energy productivity and sustainability will be needed to compete globally while meeting our ambitious climate goals. It is important to remember that we will need a healthy manufacturing sector to produce the sustainable energy products and materials that we will need to improve global energy efficiency and empower our next generation of energy supply technologies including renewable, clean-fossil fuel and nuclear.

RESPONSE OF R. NEAL ELLIOTT TO QUESTION FROM SENATOR LINCOLN

Question 6. I appreciate your optimistic outlook for the manufacturing sector and agree that we should be forward-thinking about this industry's recovery and use this economic downturn as an opportunity for improvement. You state in your testimony that a more sustainable industrial base must be built now, but at the same time we recognize that credit is limited. How do you believe that the access to capital granted in this manufacturing efficiency legislation will help incentivize the

kind of growth you would like to see occur? How do you think that this legislation will help eliminate the uncertainty that is currently preventing firms from investing in energy efficiency?

Answer. I feel that the access to funding provided by this legislation represents a bridge for manufacturing until the private financing market recovers. What ultimately will be needed are complementary measures to those provided in S. 661 that develop new technology and human capital develop that will encourage large, long-term investments in our manufacturing sector that will ensure its economic competitiveness in a carbon constrained global economy.

RESPONSES OF R. NEAL ELLIOTT TO QUESTIONS FROM SENATOR MURKOWSKI

Question 7. Please describe whether water conservation and less energy intensive water measures should be funded through the Department of the Energy, in particular programs that promote energy efficiency.

Answer. Water efficiency is a critical aspect of industrial energy efficiency for a number of reasons. Water is increasing the most limited resource that is required for the manufacturing sector, and competitions between manufacturing, power generation, agriculture and domestic consumption. Manufacturing water efficiency has the potential to reduce water use by both greater water efficiency in manufacturing processes and by reducing demand for electricity associated with water and wastewater treatment, which further reduces demand for water in the power generation sector. It is thus important that ITP consider water efficiency as an important category of energy efficiency measures.

Question 8. Is there a cost-effectiveness methodology for water measures comparable to that employed for the consideration of other energy efficiency measures?

Answer. As noted in my response to question 7, the estimation of the impacts from water efficiency and energy efficiency are somewhat more complex than for straight energy efficiency. My colleagues at Lawrence Berkeley National Laboratory (LBNL) have done some work on exploring this water-energy "nexus" that the ITP program can draw upon.

Question 9. Please describe the programs and measures currently in place that are likely to save water and energy.

Answer. The ITP program has had a low-level effort on manufacturing water efficiency for several years. A more concerted focus on this topic would likely yield significant benefits. At this point the technical leadership in this area has come from state efforts in New York and California in concern with the national labs that could be leveraged to build a more robust national effort. Similarly, on-going, low-level efforts at EPA could complement the efforts from DOE.

Question 10. Please describe opportunities that you have pursued to save energy or water. Such measures could include, conserving water; switching to less energy-intensive water sources, or increasing the energy efficiency of current water deliver or treatment processes.

Answer. Several years ago, ACEEE lead a road-mapping exercise funded by a range of interests including, CEC, EPA and NYSERDA to identify opportunities for cooperation and coordination between the energy efficiency and water communities. These efforts have lost much of their momentum as other water related issues such as security of water supply have attracted the attention of the experts. The primary focus of these efforts have devolved into a focus on the energy efficiency of wastewater treatment, focusing particularly on pump system efficiency, rather than on the overall water-energy nexus.

Question 11. Please describe briefly how, in your opinion, this bill best improves upon the industrial sector and how it will work toward our overall goal of being more energy efficient.

Answer. As noted in my testimony, ACEEE feels that S. 661 provides important new strategic direction to the ITP program, address some of the existing short-comings in existing program authorization that have existed for decades, and provide important new focus on what is needed by the manufacturing sector to position itself for responding to opportunities for new investment that are likely to present themselves in coming years. What this bill does not do is remove the structural disincentives to investment in new manufacturing capacity as was discussed in my response to question 3.

Question 12. You cite numbers from the National Association of Manufacturers that the U.S. share of global manufacturing output has remained constant over the past decade. Why is there a perception that U.S. manufacturing has been in decline?

Answer. Over the past three decades we have seen a dramatic expansion of the share of the U.S. GDP coming from finance. Until 1985, finance never accounted for more than 16% of the corporate profits. By 2007 the finance accounted for more

than 41%. As a result of the rapid increase in finance activity, the relative share of domestic activity from manufacturing decreased, even as the actual level of activity in manufacturing remained relatively constant. In addition, as labor productivity in manufactured increased dramatically over the same period, the share of the workforce employed by manufacturing declined even as production increased.

Question 13. You testified that clarity of the DOE's Industrial Technologies Program's goals and missions have been lost due to lack of senior leadership. How can this framework be restored?

Answer. We already have seen a shift in the leadership and its willingness to allocate both ARRA funds and FY 2009 funding to ITP is an important first step. I feel that the re-establishment of an external advisory committee for the program as is proposed in S. 661 will also be an important step in institutionalizing a new direction for the program, as will regular oversight by the Committee.

RESPONSES OF DAVID ZEPPONI TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. In your opinion, what do you believe are the biggest roadblocks to achieving significant increases in industrial energy efficiency? What does this bill do or not do that could help remove some of these roadblocks?

Answer. I believe the single biggest roadblock to achieving significant increases in industrial energy efficiency is the economics of implementing energy efficiency. Access to capital, the cost of capital, and risk tolerance influence a company's willingness to invest in energy efficiency measures. Investments in energy efficiency need to come close to the payback thresholds or hurdle rates of other projects and priorities competing for scarce capital. Thus, many companies will only invest in energy efficiency measures that have a payback period of one to one-and-a-half years.

To achieve significant increases in industrial energy efficiency, this economic roadblock must be overcome, which means we need to impact the economics of energy efficiency. The best solution is to provide financial incentives that improve the economics of investment in energy efficiency. Incentives could take several forms and a portfolio approach, rather than one-size-fits-all, would allow companies to select those that best fit their individual circumstances. This portfolio could include grants, loans, and tax credits which will all favorably impact the economics of energy efficiency by reducing the cost to industry. Further, companies should be able to combine incentives to further improve economics.

Section 2 of S.661 creates a revolving loan program for implementation of commercially available energy efficiency technologies and processes. We believe this loan program could help remove the economic roadblock for many companies. For some companies, up-front funding is critical and will make the difference whether energy efficiency is implemented or not.

For many more companies, tax incentives provide the impetus to overcome the economic hurdle. The potential savings from the tax credit are included in the project cost calculations, reducing overall project costs and/or payback periods. S.661 does not include a recommendation for a tax credit program. We would like to see the Senate Energy and Natural Resources Committee work with the committee of jurisdiction on tax incentives for industrial energy efficiency. I believe federal tax credits for industrial energy efficiency would provide needed incentive to significantly increase industrial energy efficiency. Federal tax credits are available for renewable energy and vehicles but not for industrial energy efficiency. A program that NWFPA members have found to work very well is Oregon's Business Energy Tax Credit (BETC), which provides a 35% tax credit for industrial energy efficiency. An increase of this credit to 50% is currently being considered by the Oregon legislature.

Some have suggested that the way to promote energy efficiency would be to dramatically increase the cost of energy. This would improve the economics of energy efficiency investments. But, it would also have more immediate and adverse impacts on company economics that I believe would result in production cut-backs and employee lay-offs at best and at worst a substantial number of plant closures. Limited capital would not be spent on energy efficiency. This approach of increased energy prices would cause U.S. manufacturers to become less competitive and would not result in increased energy efficiency.

Lack of corporate-level understanding and awareness of the benefits of energy efficiency and support for implementation of energy efficiency projects in their plants is another key roadblock. NWFPA's experience has shown that without corporate-level commitment, energy efficiency is not implemented or sustained. Further, when energy efficiency is seen as an end unto itself, other business needs often take priority. The fact is that implementation of energy efficiency can improve plant produc-

tivity, product quality, reliability and safety and reduce greenhouse gas emissions. I believe a company's commitment to energy efficiency is a good indicator of the "health" of the company. The issue is then, how do we convince corporate executives that energy efficiency makes good business sense?

Education and outreach targeted at industry executives will be key to overcoming this roadblock. We have found that communications among industry executives are most influential. S.661 sets up a framework within which an executive education and outreach program could be developed and implemented.

A third roadblock is shortage of trained technical personnel that focus on energy efficiency. The cause of this shortage is two-fold. First, skilled and knowledgeable workers are in short supply. Fewer students are graduating with engineering degrees and fewer engineering students are attracted to manufacturing. In addition, skilled operators and maintenance workers are necessary to keep plants operating efficiently. Plants have become automated and equipment is now driven by electronic systems and advanced technologies that require advanced skills. Too few technical programs and too few trained workers are available to supply industry's needs.

The second cause is that even if skilled and knowledgeable personnel are available, most personnel at manufacturing plants are busy maintaining production. Few plants have the financial resources to devote personnel to energy efficiency. Energy efficiency becomes a low priority in the hierarchy of plant production concerns. We have found that when personnel are designated to address energy efficiency, energy savings are achieved and sustained.

The funding provided in S.661 for the internship programs of the Industrial Assessment Centers will provide a pool of trained engineers in industrial energy efficiency that will become available for employment by industry. It will also directly expose students to manufacturers and the manufacturing industry. The expansion of the Industrial Assessment Centers is also critical. These centers provide the technical resources that many small to medium-sized companies cannot provide through their own personnel for the reasons I discussed above. Continued support for existing Industrial Technologies Program energy efficiency training and information and technical resources is also critical.

Question 2. S.661 directs DOE to complete an assessment of industrial energy efficiency technologies that are not widely implemented within the U.S. and to compare adoption rates to those of other countries. Could you speak to the main reasons that certain technologies are widespread in industry elsewhere, but not within the U.S.? Is it simply a matter of higher energy prices in other countries?

Answer. Higher energy prices in other countries clearly have been a factor in broad implementation of energy efficiency technologies. It is not the only factor, however. Other countries have been more highly regulated. However, government subsidies, incentives and programs to promote industrial energy efficiency have been more readily available in other countries for quite some time. The roadblocks I discussed in my response to question number one are key factors. Cultural differences are another factor. For example, in Europe, low grade heat (100-120 °F) produced by industrial plants is typically recovered to provide heating for residential housing. Such opportunities are not available in the U.S. because most Americans prefer not to live next to industrial plants.

Question 3. It is clear that if the U.S. is going to be committed to reducing its energy consumption and meeting greenhouse gas reduction targets, industry will have to play a larger role in meeting those goals. What level of effort are we going to need to transform our industry to use less energy and reduce emissions, while increasing its competitiveness? How far does S.661 go in meeting those goals? And what other steps are needed?

Answer. A considerable level of effort will be needed to transform industry to use less energy and reduce emissions, while increasing competitiveness. The global playing field is not level. Environmental and other regulations, employee wages, healthcare costs, and production costs may be significantly lower in other countries. The result for U.S. companies is lower prices for American goods and reduced profit margins. Available capital will be allocated to the most critical needs.

Many individual companies have adopted energy efficiency goals and implemented programs. However, to transform industry, industry-wide approaches and aggressive steps to overcome the economic roadblocks I discussed in my response to question number one must be taken. Government financial and technical assistance to support these efforts is crucial.

NWFPA has the most significant energy efficiency initiative of any trade association in the U.S. In January of this year, our members adopted an industry-wide goal to reduce energy intensity by 25% in 10 years. It took us five years of intensive effort and an important partnership with the Northwest Energy Efficiency Alliance

(NEEA) to bring us to this point. The roadblocks I discussed earlier are very real. Although Northwest food processors have come a long way as an industry, we will need assistance to achieve our energy intensity goal.

Section 5 of S.661 calls for research to establish an industry-specific road map process. NWFPA, with the support of NEEA and U.S. Department of Energy completed a road map process and is currently preparing a road map document that includes actionable plans to achieve our energy intensity goal. Northwest food processors are unique in that they have the NWFPA organization as the focus for development of an energy efficiency goal and road map. Most industries lack this infrastructure. The road map process, coupled with financial and technical support, could provide the necessary infrastructure to move regional industry sectors in this direction and contribute to transformation.

In addition, to transform industry, industry leaders and executives must be committed to energy efficiency. They must recognize that energy efficiency makes good business sense. The roadmap process also could be an opportunity for outreach to and networking among industry leaders.

RESPONSES OF DAVID ZEPPONI TO QUESTIONS FROM SENATOR MURKOWSKI

Question 4. Please describe whether water conservation and less energy intensive water measures should be funded through the Department of Energy, in particular programs that promote energy efficiency.

Answer. I understand that the Environmental Protection Agency's Energy Star program includes some information on water/energy efficiency improvements and technologies and that the EPA also has water conservation programs. Significant water savings can be realized as a result of energy efficiency efforts. The Alliance to Save Energy coined the term "watergy" to describe the strong link between water and energy in municipal water systems. I think this term could be applied to food processing systems as well, since many food processors use very large amounts of water (100s of millions of gallons) in their processing.

I think it makes sense to fund industrial water conservation through the U.S. Department of Energy. The major water uses in food processing are for washing, conveying (using a moving stream of water instead of a conveyer belt), blanching or cooking, and cooling the raw material. High temperature and/or high pressure water is also used in cleaning and sanitation of equipment and facilities as well as product. Motors, pumps and boilers are used to heat or distribute this water. And, since motors, pumps and boilers are the major energy users in the processing facility, they are the prime targets for energy efficiency. Actions and technologies that will increase energy efficiency will also increase water efficiency. A water efficiency program could very easily be incorporated into an energy efficiency program since the skills, knowledge and solutions are essentially the same.

Question 5. Is there a cost-effectiveness methodology for water measures comparable to that employed for the consideration of other energy efficiency programs?

Answer. Yes, the methodology is essentially the same, a cost-benefit analysis and an estimated payback period for implementing efficiency. An additional cost consideration for water is the cost for its disposal. In most food processing plants (non-beverage processors), water is used in the process but not consumed. Therefore, this "process-water" must be disposed. Many Northwest food processors discharge their process water to publicly operated treatment works. Others pre-treat and land apply the process water, while others treat and discharge directly to waterways. All of these disposal methods are regulated and include stringent conditions, permit fees, and penalties for noncompliance.

Question 6. Please describe the programs and measures currently in place that are likely to save water and energy.

Answer. Clearly, programs and measures that focus on the big energy users—motors, pumps and boilers—are likely to save water and energy. The U.S. Department of Energy's Industrial Technologies Program has information, training and online software tools for motors, pumps, boilers and other key systems.

Question 7. Please describe opportunities that you have pursued to save energy or water. Such measures could include, conserving water; switching to less-energy intensive water sources, or increasing the energy efficiency of current water delivery or treatment processes. Please describe briefly how, in your opinion, this bill best improves upon the industrial sector and how it will work toward our overall goal of being more energy efficient.

Answer. The following are a few of the broad categories of measures that our members have pursued to save energy and/or water:

a. Optimize operation and maintenance—this can have a radical impact on energy and water savings.

b. Install energy efficient motors—applies to both energy and water (motors run pumps).

c. Install efficient pumps (about 75% of the life-time cost of a pump is energy).

d. Optimize compressed air systems (right-sized compressors, right-sized air pressure, and repair all leaks).

e. Optimize water systems (right-sized pumps, right-sized pressure, and repair all leaks).

f. Optimize refrigeration systems (optimize compressor, evaporator and condenser efficiencies, repair all leaks, reduce refrigeration loads through building insulation and efficient lighting).

g. Optimize energy systems (power factor improvements, gear boxes, reduce transformer and cable losses).

h. Utilize heat recovery devices whenever possible (e.g., use waste heat to heat water or reuse hot water).

i. Optimize boiler systems (insulate, reuse steam condensate and boiler blowdown water, reuse hot water where feasible).

j. Use of high efficiency boiler technology (NWFPA is working with US Department of Energy and the Gas Technology Institute on demonstrations of this new technology in our member plants).

k. Use of direct fire heat sources where practical (e.g., using natural gas to directly heat a dryer instead of using natural gas to heat water to produce steam to heat the dryer, which is much less efficient).

l. Use metering and automation controls to adjust scheduling and operations to optimize systems and to meet compliance or operational targets.

m. Use cooling towers to recycle non-contact cooling water.

n. Make energy efficiency and water efficiency criteria when purchasing new equipment.

o. Develop and implement a continuous energy improvement plan.

In addition, NWFPA is currently working with Portland General Electric to develop an Energy and Water Efficiency seminar for food processors that will stress the synergy between energy efficiency and water efficiency and present measures and technologies that apply to both.

In my opinion, S661 best improves upon the industrial sector and promotes energy efficiency by providing information and technical support as well as financial support for the industrial sector.

Question 8. Please describe recent and proposed changes to federal law that are likely to impact the way your members conduct their business.

Answer. National subsidies and tax credits for corn ethanol production have adversely impacted many food processors. Diversion of cropland and corn for ethanol production has increased the cost of raw product to food processors. This has reduced profit margins and increased food costs to consumers.

The legislative directive to the Environmental Protection Agency to develop a greenhouse gas reporting rule has resulted in a lengthy and detailed proposed rule, which was published on April 10. NWFPA is currently reviewing the rule and assessing its impacts to our members. The rule will impose new record-keeping, data collection and reporting requirements on food processors that could be extremely costly and resource intensive. As I pointed out in my response to question number one, lack of personnel is a roadblock to energy efficiency. Personnel will need to be allocated to this reporting, since it will be a mandatory requirement.

National emissions caps and an emissions trading mechanism could have significant impacts on NWFPA members. We believe that such a system could result in significant increases in energy prices and competitive disadvantages to U.S. manufacturing. If not properly structured with safeguards against manipulation, this market could also produce economic winners and losers.

NWFPA supports efforts to reduce greenhouse gas emissions levels. We believe the focus must be on measureable and attainable carbon reduction strategies, such as increased energy efficiency and energy conservation that will provide real results and benefits. We advise that other strategies to reduce greenhouse gas emissions, such as cap and trade or carbon taxes be thoroughly evaluated for their costs, benefits, and unintended consequences.

Question 9. Please describe the financing you believe is needed to meet your goal to reduce member-wide energy intensity by 25% in 10 years.

Answer. At this point, we don't have an estimate for the cost to achieve the 25% reduction goal. We are only beginning to investigate the actions and technologies that would be required to achieve our goal. We have begun a project, which will be completed this summer, to determine our current member-wide energy intensity. This will be the baseline against which we will reduce our intensity. We will then

have an energy intensity target (25% below the baseline) upon which we can design a long-term energy efficiency implementation plan. We are also developing a project to conduct an energy audit at every member plant, which will produce a list of energy efficiency opportunities for each plant. These opportunities will be incorporated into the implementation plan. At this time, we will have good data to use in determining the cost to achieve the energy intensity goal.

What I do know with certainty is that it will be very costly. I have heard from some energy managers at plants that costs to implement this level of energy efficiency could cost on average at least as much as the annual cost of energy. Depending on the intensity of individual energy use, the costs could be considerably higher. Costs could be in the hundreds of thousands or millions of dollars. This is why federal financial assistance in the form of loans, grants, tax incentives, etc. is so critical if industry is to achieve significant levels of energy efficiency and improve global competitiveness at the same time.

Question 10. Please further elaborate on the different ways your members have addressed the energy costs associated with waste-water treatment.

Answer. The following are a few of the broad categories of measures that our members have pursued to reduce energy costs associated with wastewater (processwater) treatment.

a. Install meters and monitors on wastewater treatment systems and set control limits and alarms when limits are exceeded. Members are exploring more sophisticated automated systems, including the system I described in my testimony currently studied by the California Energy Commission.

b. Use land application of wastewater for organic waste treatment, rather than waste treatment systems that require pumping and aeration. This approach reuses the nutrients in the discharge to fertilize the land and avoids use of commercial fertilizer which requires a lot of energy to produce.

c. Use anaerobic digesters with biogas recovery to obtain energy benefits.

d. Minimize waste; separate low and high strength waste streams.

e. Recover waste materials and reprocess into a valuable product.

f. Reduce amount of water used in cleaning (hi pressure-low flow hoses with correct spray nozzles and automatic shut off when not in use).

g. Reuse process water where feasible.

Question 11. Are there ways to assure regulatory compliance without having to run your systems continuously for waste, odor and water discharge?

Answer. I want to stress that for NWFPA members, environmental and safety compliance is not optional. It is of the highest priority. If a plant does not have the means to monitor and control on a real-time basis, it will operate systems continuously to assure compliance.

Metering, monitoring and control systems allow processors to optimize treatment system performance and efficiency while at the same time complying with regulatory standards. A basic, inexpensive monitoring system will indicate when conditions may exceed compliance and sounds an alarm or sends a message to an operator who must take action or it triggers a shut-off valve. A relatively expensive system, which includes meters, monitors, telemetry and controls not only monitors for compliance, but operates the treatment system in such a way that maximizes energy and water efficiencies, while maintaining compliance.

Responses of Maxine Savitz to Questions From Senator Bingaman

Question 1. Dr. Savitz, in your testimony you state that to achieve a goal of 25% saving in 10 years will require both new and improved technologies with high rates of return for industry adoption. What specific areas of technology development do you believe have the most promise for yielding high returns and achieving widespread industry adoption?

Answer. Most of the gains would occur in pulp and paper, iron and steel, cement, chemicals and petroleum refining. The pulp and paper industry could use more waste heat for drying, advanced water-removal technologies; advanced filtration methods; high-efficiency pulping technology, and modern line kilns. Promising technologies for iron and steel are advances in electric arc furnaces (EAF) melting, blast furnace slag heat recovery, integration of refining functions, and heat capture from EAF waste gas. In cement, major energy savings would require a significant upgrade to an advanced dry-kiln process. Efficiency could also be enhanced with advanced control systems, combustion improvements, indirect firing and optimization of certain components. In the chemicals and petroleum industry, technologies for im-

proving energy efficiency include high temperature reactors, corrosion resistant metal and ceramic lined reactors, and sophisticated process controls.

A set of cross-cutting technologies exist that could improved energy efficiency in a wide range of industrial applications. Most important is the increased implementation of combined heat and power (CHP). The implementation of CHP is not as much a technology development issue as one of deployment, although some technology development could be performed. Other cross cutting technologies are steam and process heating technologies that can improve quality and reduce waste, separation processes that are based on membranes and other porous materials, advanced materials that resist corrosion, degradation and deformation at high temperatures; controls and automation; and sensor technology that reduces waste by improving control.

Question 2. Dr. Savitz, in your testimony you state that the pipeline of R&D projects is running dry. What do you see as the immediate steps that should be taken to refill this pipeline? Are there specific industries that we should be focusing on?

Answer. The ITP program should update the technology roadmaps in partnership with industry. These would be used to identify top industry needs and R&D priorities. ITP could then use these updated roadmaps as input to issue solicitations for industry-specific R&D projects. The portfolio could be balanced with projects that are in various stages of development. In addition to aluminum, chemical, forest products, iron and steel, and metal steel, which ITP is currently focusing on, they should consider a program with the cement industry as it is a heavy user of energy and also large emitter of green house gases. They should also approach the petroleum refining industry to see if they are interested in participating in a collaborative program.

Question 3. Dr. Savitz, what industries do you believe have the most to gain from energy efficiency improvements? What industries will need technological breakthroughs to reach significant energy savings and greenhouse gas reduction targets.

Answer. The industries mentioned in answer to question one have the most to gain from energy efficient improvements. Technologies mentioned in answer one, both for specific technologies and cross-cutting are important to be developed and demonstrated. An area that is not receiving much attention in the current ITP program, as mentioned in our peer review report, are alternative feedstocks that would be very useful for the chemical industry. A program on the use of distressed/non traditional carbon based feedstocks or syngas would be appropriate to investigate. This might also have applicability in the biofuels area.

Question 4. In your opinion, what do you believe are the biggest roadblocks to achieving significant increases in industrial energy efficiency? What does this bill do or not do that could help remove some of those roadblocks?

Answer. Industry does respond to energy price signals for their investments, but energy investments compete with many other industry investment opportunities that are often of higher priority to management. In today's financial climate industry does not have the available capital to invest in developing and testing new technologies—or even deploying all the known proven existing technologies—that will increase their energy productivity. Other barriers to deployment include the technical risks of adopting a new industrial technology; perceived risk of downtime with a new technology; lack of specialized knowledge about energy efficient technologies; and unfavorable fiscal policies as reflected in the tax code. Energy is still not perceived as critical to competitive processes in some industries. Energy is only one of the many challenges that they face.

The bill provides financing mechanisms for industry by establishing DOE grants to community/lender partnerships for regional loan programs for manufacturers and links DOE assessments to SBA loans. It also provides expansion of the Industrial Assessment Centers (IAC), which provide audits to small and medium sized manufacturers. The bill does not address issues regarding tax policies such as depreciation rules that often require firms to depreciate energy efficiency investments over a longer period of time than other investments.

Question 5. S.661 directs DOE to complete an assessment of industrial energy efficiency technologies that are not widely implemented within the U.S. and to compare adoption rates to those of other countries. Could you speak to the main reasons that certain technologies are widespread in industry elsewhere, but not within the U.S.? Is it simply a matter of higher energy prices in other countries?

Answer. In our written testimony, we suggested that Section 4 (b) (4) which requires a comparison of U.S. technology adoption rates with those of the European Union, Japan, and others include "an assessment of the reasons for any differences in adoption rates considering at a minimum both economic (including price) and policy reasons in the U.S. and countries considered."

Question 6. It is clear that if the U.S. is going to be committed to reducing its energy consumption and meeting greenhouse gas reduction targets, industry will have to play a large role in meeting those goals. What is the level of effort that we are going to need to transform out industry to use less energy and reduce emissions, while increasing its competitiveness? How far does S. 661 go in meeting these goals? What other steps are needed?

Answer. Competitiveness includes many factors—from energy costs to labor costs, to tax policy, to proximity to raw materials and markets. S. 661 does a very good job from the energy perspective, but that is only one part of the overall competitive picture. There needs to be a comprehensive approach to ensure that manufacturing jobs will stay here and new ones be placed here. We do not want to import all of our technologies.

RESPONSES OF MAXINE SAVITZ TO QUESTIONS FROM SENATOR MURKOWSKI

Question 7. Please describe briefly how, in your opinion, this bill best improves upon the industrial sector and how it will work toward our overall goal of being more energy efficient.

Answer. The best improvements are the financing mechanisms for industry with the loans and grants program and the expansion of the IAC, which in addition to providing information through audits to small and medium sized businesses provides training for the workforce. The technology assessments required with give attention to energy efficiency and greenhouse gas emissions will provide a good baseline on what technologies are actually being implemented and needed.

Question 8. In addition to the Industrial Technology Program, are there other Federal programs pursuing similar goals to develop more efficient technologies within the industrial sector?

Answer. There are two other Federal programs which are complimentary to DOE's program and focus on deployment. The Manufacturing Extension Program at NIST, which could include energy improvements in their technical assistance, and the EPA Energy Star for industry program.

Question 9. Please describe innovative technologies that have moved from the concept stage to commercialization. What are the major impediments of getting to the commercialization of a new technology?

Answer. Some examples of R&D successes from the ITP program include the Mesabi Nugget next generation cokeless ironmaking process for steel, Lost Foam Casting for metal casting, advanced reciprocating engines for CHP currently in demonstration, and wireless sensors for process control. The impediments are discussed in answer 4.

Question 10. It appears that the Industrial Assessment Centers provide a quick return on investment to industrial users through their reviews and the corresponding actions taken by the users to improve their efficiencies. Please describe the typical rate of return of the Save Energy Now (SEN Initiative).

Answer. We do not know the answer to this question. DOE might be able to supply the answer.

Question 11. Please describe the work that you are undertaking to strengthen your outreach to utilities to help industry overcome barriers to implement energy efficiency projects and new technologies.

Answer. DOE is best suited to respond to this question. The Peer Review Final Report that we co-chaired recommended that DOE increase its efforts with the utilities to assist industry in obtaining financing through utility programs and encouraging appropriate policies with utilities to increase implementation of energy efficient technologies in industry such as decoupling.

RESPONSES OF STEPHEN HARPER TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. In your opinion, what do believe are the biggest roadblocks to achieving significant increases in industrial energy efficiency? What does this bill do or not do that could help remove some of those roadblocks?

Answer. Information, or the lack thereof, is along with financing among the biggest roadblocks. Financing ideally will be addressed through the steps currently being taken to shore up our banking system. This bill addresses this in a number of ways, including establishing a joint industry-government manufacturing partnership program and expanding the regional Industrial Assessment Centers program.

Question 2. S. 661 directs DOE to complete an assessment of industrial energy efficiency technologies that are not widely implemented within the U.S. and to compare adoption rates to those of other countries. Could you speak to the main reasons

that certain technologies are widespread in industry elsewhere, but not within the U.S.? Is it simply a matter of higher energy prices in other countries?

Answer. I am not an expert in this arena, but I suspect that energy prices play a significant role in technology adoption rates. New technologies in the energy and environmental field are adopted typically because they are required by government mandates or are incented via government subsidies or via energy prices.

Question 3. It is clear that if the U.S. is going to be committed to reducing its energy consumption and meeting greenhouse gas reduction targets, industry will have to play a large role in meeting those goals. What is the level of effort that we are going to need to transform our industry to use less energy and reduce emissions, while increasing its competitiveness? How far does S. 661 go in meeting these goals? And what other steps are needed?

Answer. Two things will be required by industry: First, adoption of existing technology to make efficiency gains in the short run. Second, a more radical transformation of technology in the future to dramatically reduce industrial energy demand. This bill addresses the former by expanding the public private partnership program and expanding the regional IAC program. The longer-term need is addressed through the industry roadmapping provision and the Industrial Innovation Grants program. In addition, it would engage the National Academies of Science to asses the critical manufacturing needs for development of advanced energy technologies.

RESPONSES OF STEPHEN HARPER TO QUESTIONS FROM SENATOR MURKOWSKI

Question 4. Please describe whether water conservation and less energy intensive water measures should be funded through the Department of the Energy, in particular programs that promote energy efficiency.

Answer. No expertise or views on this issue.

Question 5. Is there a cost-effectiveness methodology for water measures comparable to that employed for the consideration of other energy efficiency measures?

Answer. No expertise or views on this issue.

Question 6. Please describe the programs and measures currently in place that are likely to save water and energy.

Answer. Intel has a long standing program with funds dedicated to energy conservation projects across the company. We continuously evaluate energy conservation opportunities at all of our facilities and fund a large number of them every year. As a result, the amount of energy we use per unit of product produced has decreased 20% since 2002.

Question 7. Please describe opportunities that you have pursued to save energy or water. Such measures could include, conserving water; switching to less energy-intensive water sources, or increasing the energy efficiency of current water deliver or treatment processes.

Answer. We have used a wide range of measures to conserve energy, including recovering and reusing heat from combustion systems, implementing smart controls on large equipment and systems, utilizing building management systems to maintain equipment in its most efficient operating range and requiring efficiency improvements in new process manufacturing equipment.

Question 8. Please describe briefly how, in your opinion, this bill best improves upon the industrial sector and how it will work toward our overall goal of being more energy efficient.

Answer. See responses to Questions 1-3.

Question 9. Please elaborate on your relationship with DOE's Industrial Technologies Program (ITP) and how Intel has benefitted from the relationship, and also why it is important for smaller companies to have an opportunity to engage in the Program.

Answer. Intel's facility energy efficiency team has had a fruitful relationship with the US Department of Energy, including the Industrial Technologies Program (ITP), a program which would be strengthened by S 661. Under the ITP, DOE has completed four energy efficiency savings assessments (ESA) audits at Intel sites in New Mexico, Arizona, and Oregon, with the earliest completed in 2006. These audits focused on the efficiency of pumping systems, compressed air systems and fan systems, and were conducted by DOE contractors. These audits produced a number of potential efficiency projects that currently are being evaluated against our internal criteria for capital investments. In addition to these audits, the ITP makes available to Intel a variety of programs, models and other analytical tools for our use

Our experience with DOE's industrial energy efficiency programs has convinced us of the importance of the funding and research and development programs that would be authorized or expanded by S 661. While Intel has benefitted from working

with DOE's ITP, the potential benefits of additional grant funding and the expansion of the Industrial Research and Assessment Centers would especially benefit smaller-and medium-sized industrial companies which, collectively, comprise the bulk of US manufacturing. Smaller companies often do not have the internal resources to identify and seize many of the available energy efficiency opportunities and stand to benefit significantly.

Question 10. You mentioned in your testimony that you use "computerized building management systems to operate facilities in their most efficient range." Can you talk a little more about the whole-building approach that you take in your facilities?

Answer. I was referring not so much to Intel's practices specifically but rather to the well-document capabilities of information and communications technology (ICT), applied to improve the energy management of buildings and industrial processes.

RESPONSES OF JEFF METTS TO QUESTIONS FROM SENATOR BINGAMAN

Question 1a. In your opinion, what do believe are the biggest roadblocks to achieving significant increases in industrial energy efficiency?

Answer. The biggest roadblock to significant increases in industrial energy efficiency is concentrated in the cost of renewable energy, particularly wind power. The demand in the United States for wind turbines up until now has been relatively low. Subsequently there was not much need for the Wind Turbine Industry to focus efforts on advancing the manufacturing processes. Processing of wind turbine blades and large component machining has been, and still is, dominated by European manufactures. The United States has a unique opportunity to advance current technology far into the future by adapting aerospace and automotive materials and techniques. Many blade manufacturers still employ fiberglass boat hull manufacturing technologies. Simply put, current methods are not precise or robust enough to withstand today's demand for a larger and heavier blade. This outdated technology consumes extensive amounts of time and labor. Further, it is outdated and inadequate, especially in consideration of U.S. capabilities in development today.

With volume projections on the rise today, the current manufacturing supply base and its capabilities will not be scalable in the timeframe required to meet the United States goal of 20% energy reliance from wind energy by the year 2030. The issue accelerates dramatically, if the President's goals of 25% by 2025 are to be attained. Therefore newer, quicker and less expensive methods must be developed to meet this demand. Blade technology must be advanced to support required production rates. Increased blade length and weight have become additional negative factors that must be addressed.

There are two primary manufacturing roadblocks:

- Wind turbine blade designs—Today's blade designs use lower strength to weight materials and have limited regard to whether the blade can be manufactured consistently and to the geometry intent of the design. By focusing on the blade design itself, Dowding/MAG's objective is to target a design that reduces weight, improves performance and maximizes manufacturability. With such a blade design the turbine OEM's can begin to rethink all design parameters associated with gearboxes, bearings, hubs and even tower designs. Many of these internal components are designed to operate effectively with yesterday's heavy blades at very high cost.
- Manual Manufacturing processes—The manual processes employed today yield limited consistency, varying quality and high cost, unreliable blades. Warranty cost for OEM's is a major issue. Blade failures in the field are one of the biggest problems plaguing the industry today. Many failures can be traced directly back to either the design or manufacture of the blade. Today's highly manual, inconsistent processes are resulting in a 10%-15% reduction in the energy output of a wind turbine system. The varying results of this process increase true lifecycle cost, and present a very different price per blade than originally expected. These inefficiencies deliver an elevated turbine cost and an increase in cost per Kilowatt-hour to the public.

Question 1b. What does this bill do or not do that could help remove some of those roadblocks?

Answer. This bill targets the single biggest roadblock to advancing the industry, which is R&D funding. These types of funds are currently unavailable to private industry to make the necessary advances. By making these investments, the United States will accelerate by several years, a normally slow incremental improvement process. At the same time it will set the stage for United States based companies to participate at a leadership level in the world's alternative energy markets.

Specifically, this bill provides the opportunity for US industry to take the initiative to create revolutionary blade and machine tool designs that enhance and improve manufacturability. These technologies will lower cost, reduce warranty issues, provide higher efficiency performance and, show exceptional durability in the field. Most importantly, the United States will become a showcase to the world for wind turbine manufacturing.

- Heavy emphasis will be placed on optimizing and automating manufacturing processes that will significantly reduce human error and will provide a level of consistency on the manufacturing floor. The manufacturing machinery and processes will support higher performance blades. In addition, the actual geometry of the blade will be optimized, which will provide as much as 10-15% performance improvements in the output efficiency of the wind tower.
- The new blade design would take full advantage of uni-directional materials, like those used in composite aerospace structural parts. Applying new materials will result in lighter, stronger, more durable blades and provide an opportunity for the rest of the wind turbine system, including the hub, tower, and gearbox, to be optimized for the lighter more efficient blades. Ultimately, this will reduce the cost to the consumer.

It is the Dowding/MAG objective to use this project as an opportunity to bring together a strong team of key individual contributors and industry players, with the intent of revolutionizing portions of this industry in under two years. Ultimately, over the next five years, re-engineer the entire turbine, utilizing modern technologies and improving output. This will result in lower energy costs, competitive with other existing sources. We are assembling a strong and experienced manufacturing team, which will utilize the funding from this bill to optimize blade design and machine processes. We will develop manufacturing systems to certify a new blade design, as well as lowing cost and improving throughput in machining of the large components. The players include but are not limited to the following:

- Dowding Industries—a major US Manufacturer that provides machining services, assembly and manufacturing operations expertise to spearhead the physical manufacturing facility which will be located in Michigan.
- MAG Industrial Automation Systems—a major US Manufacturing Solutions company with proven experience combining machine tool expertise, Aerospace composites knowledge/implementation, automation expertise and manufacturing process/assembly optimization.
- Dr. Kyle Wetzel, a PHD Aerospace Engineering major wind industry credentialed blade designer with over 25 years of experience designing airfoils and turbine blades for many of the major OEM's including GE, MFG,
- We have a short list of US based Turbine OEM's that we are approaching one by one to join our team to help us realize our longer term objectives. Ultimately the design of blades, hubs, gear boxes, bearings, etc. all have complementary impact on each other in realizing the long term goal of developing leap frog advances in wind turbine performance, efficiency, weight reduction and longevity.
- We have worked with one U.S. manufacturer, GE, for many years implementing carbon fiber composites in aircraft engine components, so they would be well suited as a team contributor to provide credentialed carbon fiber designers to work with Kyle Wetzel and our staff of carbon fiber application engineers to optimize the usage of conventional blade materials with that of aerospace carbon fiber materials to achieve a revolutionary breakthrough in blade design.

The funding provided by this bill will kick off the proposed Dowding/MAG initiative which has both short term and long term vision. Of course we need to tackle the short term increase in demand for wind turbine components and the limiting equipment/processes required to manufacture the components. However, long term we need to focus on the overall efficiency, weight and reliability of the wind turbine as a whole.

- Short Term (12-24 months)—As explained above, our short term focus is to launch development programs to bring incremental improvements that can be implemented immediately in current wind turbine installations. These improvements include a unique machine tool platform design which will greatly reduce the machining times of large wind turbine bearings, gearbox components, blade hubs, etc. and to optimize the manufacturing processes of blades by strategically adding automation, material design improvements and increased local US based blade production.
- Long Term (2-5 years)—We are working to bring a major U.S. OEM (focus on GE but there are other U.S. manufacturers) with the objective of cross-polli-

nating our years of aerospace know-how with the experience of wind turbine blade designers in order to take advantage of the lighter weight, stronger materials of aerospace without increasing the cost of a blade set. Ultimately, these advances in blade efficiency, weight reduction and performance will allow for the optimization of turbine components to reduce cost, weight and installation costs. All of these factors will result in lower energy costs.

Question 2. S. 661 directs DOE to complete an assessment of industrial energy efficiency technologies that are not widely implemented within the U.S. and to compare adoption rates to those of other countries. Could you speak to the main reasons that certain technologies are widespread in industry elsewhere, but not within the U.S.? Is it simply a matter of higher energy prices in other countries?

Answer. During the early 1970's when the United Sates was experiencing its first energy crisis brought on by a shortage of fossil fuels. This resulted in a heavy reliance on fuel supplied by the Arab nations. The US government invested in a wind energy program through NASA to enhance the development of wind turbine technology. The result was NASA developing the worlds first 3.5 MW wind turbine. As the years went by and the energy crisis subsided, this program was forgotten by most, with the exception of one group of people; the Danish Government. As a result, today Denmark is a global leader in wind technology and production supplying around half the worlds wind turbines.

However, we believe that the project described in this bill is not being duplicated today anywhere in the world. Spain recognizes the importance of wind turbine manufacturing and the government is supporting Gamesa, and to MTorres, in developing an automated manufacturing processes. These two companies have recently issued releases to the general press about working together to develop future wind turbine systems. Funding provided by the Spanish Government has enabled Gamesa to partner with MTorres and greatly accelerate their development process.

Today's blades are being produced primarily by hand with minimum capital investment. Hand layup, while not capital intensive, does not produce defect free blades, nor does it provide a platform to optimize manufacturing efficiencies. Lowest cost material selection fits naturally with today's blade's design and manufacturing processes. This combination of design, process and materials yields a seemingly low cost blade at the expense of quality and durability. These quality problems are now being realized in field failures and increased warranty expense.

Conversely, in the aerospace industry field failures can be catastrophic and designers are willing to buy the highest strength to weight materials. The benefits of these advanced materials can only be realized through highly accurate automated manufacturing process. Our process would take a total cost of ownership perspective, like those of the machine tool or aircraft industry, and apply that perspective from the earliest stages of design through final manufacture. Most of these material and manufacturing advances become exponentially more important as you look at the ramp up in demand for wind turbines now and in the future.

Question 3a. It is clear that if the U.S. is going to be committed to reducing its energy consumption and meeting greenhouse gas reduction targets, industry will have to play a large role in meeting those goals. What is the level of effort that we are going to need to transform our industry to use less energy and reduce emissions, while increasing its competitiveness?

Answer. There are three aspects that must be focused upon by the United States government to effectively make huge advancements in energy consumption reductions in an acceptable amount of time:

- Industrial Consumers—incentives must be focused at the source of energy consumption, the industrial users of energy. Incentives can be focused on the US manufacturing base to promote the acquisition of more energy efficient manufacturing equipment and equipment updates. Tight capital markets and global competition are slowing this improvement in energy efficiency.
- Manufacturers—This bill provides incentives which will spur development of manufacturing capacity and will enhance technology advancement. Wind power generator components tend to be large in nature, thereby requiring investment in large equipment to machine them. Incentives to acquire these larger machines could create more capacity, reduce costs, accelerate development of new manufacturing methods and improve the U.S. competitive position globally.
- Utilities—incentives must also be directed to the utilities to drive them toward the use of alternative energies and away from fossil fuel based energy production.

The level of effort needs to be significantly greater than initiative programs of the past and should be targeted at companies where the impact will be more immediate,

yet long lasting. As we have pointed out, industrial consumers, manufacturers and utilities must all be given an economic incentive they cannot ignore.

Question 3b. How far does S. 661 go in meeting these goals? And what other steps are needed?

Answer. S.661 Provides a very valid foundation to support new materials and manufacturing techniques that can be implemented in the wind energy market. Boeing revolutionized commercial aircraft design by designing an aircraft from ground up that took full advantage of high strength to weight, unidirectional composite materials and the latest manufacturing processes and equipment. Only by taking a total systems approach and leveraging all aspects of implementing composite materials, were the benefits realized to create a revolutionary product that now has sales exceeding all previous new aircraft model introductions. S.661 provides the foundation for a similar revolution in wind turbine system design, manufacture and performance, by introducing new materials, design and manufacturing equipment to the wind market.

RESPONSE OF JEFF METTS TO QUESTION FROM SENATOR LINCOLN

Question 4. In my home state of Arkansas, I am proud that even though wind energy potential is limited, we are contributing to the supply chain for wind energy by manufacturing the blades and turbines for future wind farms. I am interested in your statement that "the U.S. can and must be the birthplace of the lightest, strongest, lowest cost and most efficient wind turbine components in the world." I agree that these advancements in technology will help bring the costs down, and energy input up while also increasing the number of jobs. What steps do you believe that Congress should take that would help the U.S. to set the world standard in wind turbine technology?

Answer. Suggestions:

1. Establish recurring funding source for ongoing research and development so that further reaching manufacturing technologies and materials can be developed over the course of several years. (This one may already be in place via the national labs. If so would there be any benefit of having a source to review and allocate money to non redundant projects to foster some competition amongst emerging technologies and corresponding projects.)
2. Strongly support the United States imitative to obtain a 20% reliance on wind energy by the year 2030. Provide federal funding to entice states to adapt mandates from local power and utility companies to purchase a greater percentage of their energy from renewable sources such as wind energy.
3. Commercialize wind turbine certification to create competition.
4. Provide incentives to re-blade current wind turbines in the field with new significantly improved blades that increase efficiency of older, disabled or damaged units.
5. Recognize the importance of manufacturing automation by establishing a Composite Automation Research and Development Center near a major automation solutions provider, so that manufacturing technologies can be developed under leadership of experienced automation systems designers. Such a center could allow cross pollination of ideas and solutions applied from a variety of disparate industries.

[Responses to the following questions were not received at the time the hearing went to press:]

QUESTIONS FOR DAVID RODGERS FROM SENATOR BINGAMAN

Question 1. Mr. Rodgers, in testimony given at the hearing, it was stated that DOE has allowed its industry specific R&D pipeline to run dry. This is particularly concerning given the energy, climate and competitiveness challenges that our industry is currently facing, and the technological improvements and breakthroughs that will be necessary for our industry to meet these challenges. Do you share this view, and what steps is the Department taking to ensure that this pipeline is quickly refilled?

Question 2. Mr. Rodgers, both Dr. Savitz and Dr. Elliott mention in their testimony the need for better manufacturing data. Specifically, both Dr. Savitz and Dr. Elliott call-out EIA's Manufacturing Energy Consumption Survey (MECS), of which the most recent 2006 survey still has not been released. What has been the delay in releasing the 206 survey, and do you know when this 2006 survey will be re-

leased? Does the Department support the recommendation to conduct the survey on a three year schedule? (as opposed to the current 4 year schedule?)

Question 3. Mr. Rogers, in recent years the industrial technologies program has expanded beyond its focus on traditional energy intensive industries to new industries including food processing and data centers. What other 'emerging' industries are fertile ground for energy efficiency improvements?

Question 4. Mr. Rogers, as Mr. Metts has described, the wind industry is ripe with opportunities for both technological improvements in manufacturing technology as well as technical improvements in the turbine components themselves. Has DOE considered applying the capabilities of the industrial technologies program to its Wind Energy Program? (S. 661 instructs the Sec. of Energy to establish R&D partnerships between the Industrial Technologies Program and other DOE R&D programs.)

Question 5. Mr. Rogers, as Mr. Harper has just described for Intel, there is a significant amount of overlap between buildings energy efficiency and industrial energy efficiency. How does the Department, as it moves forward, plan to leverage and combine the expertise of the both the building technologies program and the industrial technologies program to achieve the greater energy savings?

Question 6. In your opinion, what do believe are the biggest roadblocks to achieving significant increases in industrial energy efficiency? What does this bill do or not do that could help remove some of those roadblocks?

Question 7. S. 661 directs DOE to complete an assessment of industrial energy efficiency technologies that are not widely implemented within the U.S. and to compare adoption rates to those of other countries. Could you speak to the main reasons that certain technologies are widespread in industry elsewhere, but not within the U.S.? Is it simply a matter of higher energy prices in other countries?

Question 8. It is clear that if the U.S. is going to be committed to reducing its energy consumption and meeting greenhouse gas reduction targets, industry will have to play a large role in meeting those goals. What is the level of effort that we are going to need to transform our industry to use less energy and reduce emissions, while increasing its competitiveness? How far does S. 661 go in meeting these goals? And what other steps are needed?

QUESTIONS FOR DAVID RODGERS FROM SENATOR LINCOLN

Question 9. The Restoring America's Manufacturing Leadership Through Energy Efficiency Act of 2009 seeks to improve and encourage energy efficiency in our manufacturing sector. In my state of Arkansas, I have several oil refiners who have all made positive strides in the area of energy efficiency in their refinery operations. I am interested in making certain that these independent refiners are eligible for any grants and other benefits that will provide incentives to continue and expand the energy efficient work they have already done.

Question 10. Is it your understanding that refiners, as part of an energy intensive industry, will be able to take advantage of these opportunities through the manufacturing efficiency legislation? How do you see oil refineries fitting into our overall transition from an old energy economy to a new energy economy?

QUESTIONS FOR DAVID RODGERS FROM SENATOR MURKOWSKI

Question 11. Please describe whether water conservation and less energy intensive water measures should be funded through the Department of the Energy, in particular programs that promote energy efficiency.

Question 12. Is there a cost-effectiveness methodology for water measures comparable to that employed for the consideration of other energy efficiency measures?

Question 13. Please describe the programs and measures currently in place that are likely to save water and energy.

Question 14. Please describe opportunities that you have pursued to save energy or water. Such measures could include, conserving water; switching to less energy-intensive water sources, or increasing the energy efficiency of current water deliver or treatment processes.

Question 15. Please describe briefly how, in your opinion, this bill best improves upon the industrial sector and how it will work toward our overall goal of being more energy efficient.

Question 16. ACEEE testified that the Industrial Technologies Program is understaffed and that the current mix of skills does not reflect the range of activities the program needs for long-term success. What would you do to address this situation?

APPENDIX II

Additional Material Submitted for the Record

STATEMENT OF THE AMERICAN FOREST & PAPER ASSOCIATION

INTRODUCTION

The American Forest & Paper Association (AF&PA) appreciates this opportunity to comment on the Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009 (S. 661). AF&PA is the national trade association of the forest products industry, representing pulp, paper, packaging and wood products manufacturers, and forest landowners. Our companies make products essential for everyday life from renewable and recyclable resources that sustain the environment. The forest products industry accounts for approximately 6 percent of the total U.S. manufacturing GDP, putting it on par with the automotive and plastics industries. Industry companies produce about $200 billion in products annually and employ more than 1 million people earning $54 billion in annual payroll. The industry is among the top 10 manufacturing sector employers in 48 states.

AF&PA MEMBERS' ENERGY PROFILE AND GREENHOUSE GAS REDUCTIONS[1]

Overall Efficiency

AF&PA members have steadily increased their energy efficiency, while also increasing reliance on carbon-neutral renewable biomass power, and reducing fossil fuel use. Overall, total energy use per ton of production at member pulp and paper mills has decreased by 26.6 percent since 1972, and by 11 percent between 1990 and 2006.

Combined Heat and Power

One of the ways in which members have increased their efficiency is through the use of combined heat and power (CHP), which is the practice of using exhaust steam from electrical generators for heat in manufacturing processes or for space heating. Based on U.S. Department of Energy (DOE) data from 2007, the forest products industry is a leader in the use of CHP-generated energy—99 percent of the electricity generated on-site at pulp and paper mills and 95 percent of the electricity generated on-site at wood products facilities was co-generated. The forest products industry represents one third of the industrial CHP-generated energy in the U.S.

Renewable Biomass Energy

The forest products industry also is the leading producer and user of renewable biomass energy in the U.S. In fact, the energy we produce from biomass exceeds the total energy produced from solar, wind, and geothermal sources combined. Sixty-five percent of the energy used at AF&PA member paper and wood products facilities is generated from carbon-neutral renewable biomass.

Fossil Fuel and Purchased Energy

Our increasing efficiency and greater reliance on biomass energy has enabled AF&PA members to significantly reduce the use of fossil fuel and purchased energy, much of which also is generated from fossil fuel. From 1972 to 2006, the fossil fuel component of the AF&PA member mill energy mix decreased by over 55 percent, and the use of both fossil fuel and purchased energy has decreased by 56 percent.

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[1] AF&PA member performance metrics are from 2008 AF&PA Environmental, Health & Safety (EHS) Verification Program Biennial Report, 2008 (http://www.afandpa.org/Content/NavigationMenu/Environment__and__Recycling/Environment,__Health__and__Safety/AF&PA__EHSReport08__final5web.pdf. Industry statistics on cogeneration are from: 2007 energy cogeneration data from the Energy Information Agency (http://www.eia.doe.gov/cneaf/electricity/page/eia906__920.html.)

Greenhouse Gas (GHG) Reductions

Our commitments to energy efficiency, CHP, renewable biomass energy, and other actions have enabled AF&PA members to achieve significant reductions in GHG emissions. Since 2001, working together AF&PA members voluntarily reduced their carbon dioxide (CO_2) emissions intensity by 13 percent. From 2000 to 2006, our members collectively reduced their direct greenhouse gas emissions 34 percent. Approximately half of this reduction can be attributed to improvements in greenhouse gas emissions, such as efficiency improvements or reduced fossil fuel use, and half can be attributed to decreases in production and changes in the baseline from the year 2000.

U.S. Forest Products Industry Competitiveness Pressures

AF&PA applauds the Committee for considering legislation to restore U.S. manufacturing leadership through energy efficiency. U.S. forest products manufacturers face significant competition from global competitors. U.S. imports of forest products have grown for the most part at a faster rate than American exports. These competitive pressures make the U.S. forest products industry (especially the pulp and paper sector) acutely aware of the cost of energy, which, despite our overall reductions in energy use, remains our third highest manufacturing cost. Because the U.S. forest products industry operates in a highly competitive global market, we cannot pass on higher energy costs to consumers and still remain competitive; we strongly support policies to enable us to reduce those costs through energy efficiency improvements.

The recent downturn in the nation's economy, especially the housing market, has only compounded these challenges:

- The declining economy has reduced the demand for consumer goods and advertising products, and therefore their associated packaging and paper products. Production of paper and paperboard packaging plunged 18% percent from January 2008 to January of this year and preliminary data suggest that the February decline was equally sharp.
- Housing starts slumped to a seasonally-adjusted annual rate of 540,000 units during the December-February period, their lowest three-month level since the government began collecting new starts data back in 1959.
- Since early 2006, the industry has lost 190,000 jobs—15 percent of its workforce. Many paper and wood products facilities are in rural areas where they are the economic hub of their communities.

POLICIES TO IMPROVE MANUFACTURING ENERGY EFFICIENCY OVER THE SHORT AND LONG TERM

U.S. manufacturing competitiveness challenges have both short and long term components, and we support S. 661 including provisions that address both time horizons. Many of the provisions of S. 661 are directed at restoring U.S. manufacturing leadership in the long term, through a variety of programs, including a joint industry-government partnership program to conduct research and development of new industrial technologies that maximize system energy efficiency. The forest products industry is currently participating in just such a partnership through the Agenda 2020 Technology Alliance, a Special Project of AF&PA. We anticipate that Agenda 2020 will submit their own comments on the bill.

Our comments below suggest ways in which S. 661 could be revised to more effectively amplify the industry's energy efficiency and improve its competitiveness in the short term. As the statistics above demonstrate, the need for short term action to increase efficiency and competiveness and help retain jobs is particularly urgent. In addition to the devastating impact on industry employment, the other hallmark of the current economic downturn is the virtual elimination of available capital for the kinds of energy efficiency projects contemplated by S. 661.

Congress recognized the need to provide funding on an urgent basis in the recentlypassed American Recovery and Reinvestment Act, which provides DOE with $16.8 billion for energy and conservation, including $3.2 billion for the Conservation Block Grants (EECBG) program and $3.1 billion for State Energy Programs. While some of these funds can and will be used by DOE and States to finance energy efficiency projects at industrial facilities, the Stimulus Bill did not include funding specifically targeted for that purpose. S. 661 can fill that need.

Section 2 would establish a new Industrial Energy Efficient Grant Program, under which DOE would make grants to eligible lenders to provide loans for commercial and industrial manufacturers to implement commercially available technologies or processes to improve energy efficiency. The emphasis on commercially available technologies and processes is important, as many AF&PA members have

undertaken the analysis needed to identify energy efficiency projects that could be implemented rapidly, but for funding barriers. However, the economic condition of the industry makes loans a less effective vehicle to finance such products. Instead, grants to industry facilities would greatly facilitate the ability of AF&PA members to take advantage of the program and implement energy efficiency projects.

The program also would provide a funding priority to partnerships that include a power producer or distributor. It has been AF&PA's experience that these entities are not always the most cooperative partners in advancing energy efficiency projects, and we believe the program would be more effective without this requirement. Instead, priority should be placed on projects that have been identified through the DOE Save Energy Now Assessment program. That program provides DOE resources to undertake comprehensive facility energy assessments and recommend specific measures and projected energy savings for the facilities assessed. Over 100 forest products industry facilities have had assessments under this program, including several in 2009[2].

We note that Section 7 of S. 661 would create an "Innovation in Industry Grants" program which would provide funding to State-industry partnerships to develop new technologies or processes for energy efficiency, pollution reduction and increased competitiveness. Funding is limited to $500,000 per grant. This program was not designed to fulfill the need we have identified above to provide grants for energy efficiency projects in that it is directed at new technologies and each grant cannot exceed $500,000. Nonetheless, a similar grant program without these limitations would more effectively allow the industry to implement energy efficiency projects and improve competitiveness.

We thank the Committee for considering legislation on this critical need for the forest products industry. We look forward to working with the Committee as the legislation is developed. Also, we recognize that the industry may face significant policy approaches in the near future that may further challenge our competitiveness. Such approaches, such as cap-and-trade legislation, are not the objective of this legislation. It should be noted that this legislation should not be viewed as a way by which to mitigate the negative impact of some potential legislation on the forest products industry.

CAPSTONE TURBINE CORPORATION,
Chatsworth, CA, March 25, 2009.

Hon. JEFF BINGAMAN,
Chairman, Energy and Natural Resources Committee, U.S. Senate, 304 Dirksen Senate Building, Washington, DC.

DEAR CHAIRMAN BINGAMAN: On behalf of Capstone Turbine Corporation, I would like to thank the Committee for inviting us to submit testimony in support of the "Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009." This is an important bill with noble and necessary aspirations to support the manufacture of clean and efficient technologies here in the United States.

Capstone Turbine Corporation is a prime example of the type of innovative American manufacturer of clean, efficient technology that this bill seeks to promote. We hold nearly a hundred technology patents on our microturbines. The Capstone microturbine is an ultra low emission, energy efficient power generator that can be installed in a variety of applications. These applications include combined heat and power systems, commonly known as CHP, where the exhaust heat is captured and utilized by the customer. Similarly, exhaust heat can be utilized in an absorption chiller to provide air conditioning or chilled water to a facility, in what is known as combined cooling heat and power, or CCHP. Our microturbines can power batteries in a hybrid electric vehicle, to deliver improved energy efficiency and reduced emissions for buses. In the oil and gas industry, microturbines use flare gas to provide electricity to offshore platforms and provide remote power to pipelines and pumping stations by using associated gases. Microturbines have the capability to run off of renewable fuels such as methane gas, biogas, and biodiesel, allowing us to lower emissions and use waste fuels at landfills, wastewater treatment facilities, and food and agricultural production facilities.

Founded in 1988, Capstone Turbine Corporation spent a decade devoted to the development of microturbine technology. We began commercial production of our first thirty kilowatt microturbine, in 1998. Over the past decade we have worked to gain acceptance for our products in the marketplace while increasing our production ca-

[2] http://apps1.eere.energy.gov/industry/saveenergynow/partners/by__industry__list.cfm/industry=Forest%20Products

pacity. In 2000, Capstone went public and was listed on the NASDAQ, ticker symbol CPST. We are now the world leader in microturbines with over 4,000 units shipped and twenty million operating hours across the fleet. Seeking to expand our target market, in 2008 Capstone developed a two-hundred kilowatt microturbine and a one megawatt package, thereby increasing our addressable market to $4.5 billion annually. The value we provide to our customers is reliability, low maintenance because of our patented air bearing design, low emissions, and high efficiency.

Capstone employs approximately two hundred people in its primary facilities in California and at its sales and service centers worldwide. The employees at our manufacturing and engineering facilities in California are the green collar workers that our country must foster and replicate if the United States is to be competitive in the new economy. All of our microturbines are manufactured in the United States by Capstone employees. We are dedicated to growing our business through the sale of our existing product line and through the development of new and even more efficient technologies in the future. The Capstone microturbine is so clean that it is certified by the California Air Resources Board to meet its strict emission requirements—the only combustion technology outside of fuel cells to earn this certification. Despite our accomplishments in producing the cleanest possible technology, we are not resting on our laurels. Our research and development efforts are geared towards constant improvement so that we can provide our customers the cleanest, most reliable and efficient turbines available.

Capstone is a wholehearted supporter of the Department of Energy Industrial Technologies Program. Our company has been the beneficiary of the DOE's efforts to identify technologies that will improve the energy, environmental, and financial performance of power systems for manufacturing, processing, and other commercial applications. Our new two-hundred kilowatt microturbine, "the C200", was developed in part with support from the DOE under the Advanced Microturbine Systems (AMTS) program. The objectives of that program were to achieve outputs in the two-hundred kilowatt range with electrical efficiency of forty percent and nitrogen oxide (NOx) emissions less than seven parts per million by volume (ppmv). The resulting designs were to be durable and cost effective. The AMTS program awarded grants to five companies, including Capstone. At the conclusion of this program, only Capstone was able to complete a full microturbine design and bring it into commercial production. Demand for the 0200 has been extremely high both in the United States and abroad.

Additional DOE support was provided to Capstone to complete a commercial microturbine design that meets the stringent California Air Resources Board emissions requirements. Our C65 sixty-five kilowatt microturbine has been able to achieve NOx levels as low as four ppmv. The DOE also supported Capstone, and others, to develop packaged cooling, heating and power systems for buildings. This resulted in collaboration between Capstone and United Technologies using a specially designed double-effect absorption chiller from UTC's Carrier division. These integrated packages have proven to be commercially successful, and have been installed in many visible projects—including a 1MW addition to the Ronald Reagan Presidential Library to house its Air Force One exhibit.

Our company's customer list is varied across industries and the country. Here are just a few examples that provide an insight into how Capstone microturbine technology is helping to create a cleaner, more efficient economy:

- In our home state of California, sixteen of our sixty five kilowatt microturbines provide electricity to the Ronald Reagan Presidential Library. The waste heat from the turbines runs through an absorption chiller to provide air conditioning to the Air Force One Pavilion. Installing this CCHP system eliminated the need to construct an additional power line to the site and saves the facility over $300,000 per year in utility bills.
- In Michigan, at the Dulk Dairy in Ravenna, the biogas from cow manure powers a microtubine that creates clean onsite power while the heat is used in the farm's processes. This dairy project and others like it help farmers become cleaner, more efficient, and more productive.
- DesignLine , North Carolina-based company packages our microturbines into hybrid electric buses. New York City has just decided to purchase ninety of these hybrid buses after successful beta testing. The bus's microturbine can run on diesel, biodiesel, or compressed natural gas, and is much more energy efficient and produces significantly less emissions than a traditional bus.
- In Oregon, a microturbine CHP plant provides electricity and hot water to the I,EED Platinum Oregon Health and Science University building. The CHP system helped OHSU to receive all ten LEED energy points. The building is a

showcase on how our technology can interact with other clean and efficient technologies, such as solar energy.

- In New Mexico, fifteen of our units provide remote power to a booster station on an oil pipeline near Ramon, where there is no grid power. The reliability of our technology was the motivation for this customer. Microturbines provide primary power at pumping stations across New Mexico and in other oil and gas producing states.
- In Alaska and the Gulf of Mexico, Capstone has installed dozens of microturbines on offshore oil and gas platforms, where they produce clean electricity from gases that are typically flared and wasted. Producing power from fuel onsite reduces the need to transport diesel fuel to the platforms, while providing reliability to their operations in harsh weather conditions.
- In New York City, we have several microturbine CHP plants located on rooftops and setbacks of skyscraper office buildings. The electricity produced from these systems drastically reduces tenants' energy prices while providing secure power through any sort of blackout. The exhaust heat captured by the system provides heat and in some cases air conditioning to the building.

Our continued success is not guaranteed, and it has often been a bumpy road to get to this point. The growth of companies like Capstone depends on enlightened policy from government like the legislation being considered today. We strongly support this bill and urge the Congress in the months ahead to fight on the side of the emerging innovative, green economy in America. The approach to climate change and renewable energy should balance the desire to cut carbon emissions with the realization that fossil fuels can be used cleanly and efficiently. Energy efficiency is a key weapon in the double-pronged fight against climate change and the economic challenges we face today.

In particular, it is critical that increasing our nation's combined heat and power assets be a priority of forthcoming energy legislation. Adding CHP will increase energy efficiency, lower emissions, bolster energy efficiency, create jobs, and increase economic competitiveness.

Again, on behalf of the 200 green employees at Capstone, I thank you for this opportunity to provide testimony on this important legislation.

Sincerely,

DARREN R. JAMISON,
President and CEO.

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