

RESPONSE OF DR. ELLIOTT TO QUESTIONS

APRIL 2, 2009

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 experienced 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.

Questions from Chairman Jeff Bingaman:

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?

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.

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?

The energy-intensive industries that the ITP program has historically worked with are among the biggest opportunities for energy efficiency, and could be 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 among 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 interested. 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.

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?

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 its 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 result 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 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.

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?

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 of our economic competitors is much more modern and they have 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 to 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.

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?

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.

Questions from Senator Blanche Lincoln:

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?

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.

Questions from Ranking Member Murkowski:

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.

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 competition exists among 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.

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

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.

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

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 concert with the national labs that could be leveraged to build a more robust national effort. Similarly, ongoing, low-level efforts at EPA could complement the efforts from DOE.

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.

Several years ago, ACEEE led 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 the security of the water supply have attracted the attention of the experts. The primary focus of these efforts has 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.

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.

As noted in my testimony, ACEEE feels that S. 661 provides important new strategic direction to the ITP program, addresses some of the existing shortcomings in existing program authorization that have existed for decades, and provides 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.

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?

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.

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?

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.