



**Testimony of R. Neal Elliott, Ph.D., P.E.
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Before the Senate Energy Committee

Hearing on:

**Restoring America's Manufacturing Leadership through Energy
Efficiency Act of 2009 (S. 661)**

March 26, 2009

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 working 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

¹ N.D. Swartz, "Rapid Declines in 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>.

⁴ Swartz, op cit.

Figure 1. Industrial Production (year-over-year percentage change)

Source: Bloomberg

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, 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:

⁵ Elliott, et al., op. cit.

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

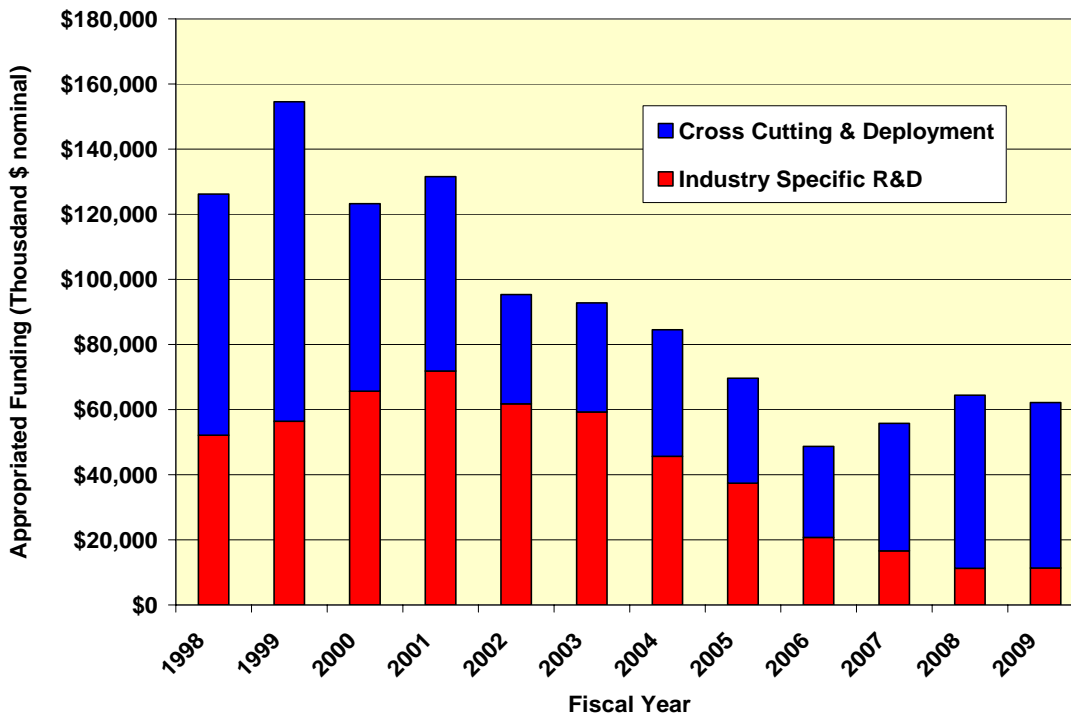
Much of the manufacturing sector is largely invisible to outsiders. This is due to the interconnected nature of the sector and its supply chains. ACEEE estimates that five out of six business transactions occur as business-to-business transactions in these interconnected supply chains while only 15%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

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>.

Figure 2. Annual Funding Appropriation for "Core" Industrial Technology Program Activities

Source: developed by ACEEE staff

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.

- 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.