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**STRENGTHENING  
THE  
U.S. MANUFACTURING SECTOR**

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### BACKGROUND

For America to remain a global economic leader, there must be continued investment in the scientific and engineering enterprise to generate new technologies, industries and jobs. Since 2005, the National Academy of Science has demonstrated through a series of its 'Rising Above the Gathering Storm' reports that the United States is falling behind in critical measures of technology, education, innovation, and highly skilled workforce development. In addition, the U.S. manufacturing industry lost 5.7 million jobs between 2000 and 2010. While the past three years have seen a small increase in manufacturing jobs and output in the U.S., significant setbacks have been dealt to the manufacturing base and the U.S. economy as a whole.

These declines are particularly troubling for America's long-term economic prosperity because the jobs produced by manufacturing activities are generally high-paid, and represent an entry point into the middle class for a significant portion of the workforce. This trend is expected to continue, as the manufacturing jobs of the future are likely to involve advanced technological products. Furthermore, a strong manufacturing base is critical to America's national security; domestic capacity for the manufacturing of key products and a highly skilled and creative workforce are the foundation for both a strong manufacturing economy and a strong national defense. Continued erosion of the U.S. manufacturing base will only increase procurement costs for the DOD, placing further strains on defense funding resources in a time of already tightened defense budgets.

America's manufacturing sector holds significant promise for expansion and job creation. U.S. manufacturers produce over 20 percent of all global manufacturing products, account for 11 percent of U.S. GDP and employ about 11 percent of the private sector workforce. U.S. manufacturers are also a critical part of the innovation enterprise, performing almost two-thirds of advanced stage research and development activities. The impact of manufacturing extends to other sectors of the economy, with manufacturers contributing more on a dollar for dollar basis than any other sector of the economy, thanks to the multiplier effect of manufacturing on the shipping, power, financial, and a host of other highly skilled service sector industries.

### ASME POSITION ON MANUFACTURING INITIATIVES

In support of these efforts, ASME recommends prioritizing federal funding to support the goals of the America COMPETES Act and for other programs that are focused on fostering cooperation among manufacturers and other R&D performers and users, or fostering the training and education of the manufacturing workforce, including:

- The Manufacturing Technology Program (ManTech) at Defense;
- The Defense Advanced Research Projects Agency (DARPA) at Defense;
- The Advanced Research Projects Agency-Energy (ARPA-E)
- The Industrial Technologies Program (ITP) at Energy's Office of Energy Efficiency and Renewable Energy (EERE);
- The Manufacturing Extension Partnership (MEP) at NIST;
- The Technology Innovation Program (TIP) at NIST;
- The Advanced Technological Education (ATE) at the National Science Foundation;
- The National Nanotechnology Initiative (NNI), a cross-agency federal initiative to support advancements in nanotechnology;
- The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs - cross agency programs which support innovation at small, high-tech businesses.

These programs have resulted in a number of innovations that have spawned new technologies and industries essential to U.S. manufacturing leadership, and contributed to improved capabilities and cost savings for U.S. national security needs. Many of these programs are operated in partnership with the private sector, leveraging and attracting additional outside funding to achieve innovation and create jobs. Underscoring the strong return on investment for federal funding of scientific and engineering oriented research, MEP has yielded \$32 in new sales growth for every dollar of federal investment. Given the challenges our economy continues to face – particularly in the field of advanced manufacturing - strong funding for each of these initiatives is vital to bolster these proven and successful programs aimed at encouraging innovation, job creation, and economic growth.

To remain competitive in the global market, U.S. manufacturers require qualified workers, an efficient and competitive fiscal and regulatory environment, open markets, and strong partnerships to ensure a healthy innovation pipeline. Thus far, ideas to promote a U.S. manufacturing recovery range from launching more aggressive trade and tax incentives to the redevelopment of our energy and transportation sectors. While certain policies may be beneficial to all businesses in general (i.e. lower tax rates and greater access to markets), our recommendations focus on the challenges most significant to the U.S. manufacturing sector. Specific recommendations are as follows:

## Promoting Innovation and Competitiveness

The government plays a key role promulgating policies that encourage innovation and set the groundwork for competitiveness. These policies must be mindful of the long-term, capital-intensive nature of investments in manufacturing capacity, as well as those of engineering and basic science innovation. They must also account for the U.S. standing among global competitors and should be continually reviewed to ensure that U.S. manufacturers receive competitive rates of taxation and incentives for investment at home, as well as open markets and intellectual property protections abroad. The U.S. has fallen behind other countries in offering critical tax incentives for manufacturers, including the strength of the R&D tax credit and benefits such as the Depreciation Tax Credit. While these policies impact a variety of industries, each credit has a particular impact on U.S. manufacturers because of their need to invest in new equipment and processes.

With annual outlays of approximately \$261.7 billion, the private sector accounts for almost two-thirds of total R&D spending in the U.S, with the manufacturing sector supporting 65 percent of all industrial R&D activities. R&D Magazine forecast U.S. industrial R&D growth at 1.2 percent in 2013, a weak rate when considering an inflation rate of 1.9 percent and the 6.8 percent average annual growth over the 1981 to 2008 period. The majority of this private R&D effort is focused on developmental applications and moving products to market, which is a fundamentally different activity from the basic research supported by the federal government and academia. In order to ensure strong growth in domestic R&D and to support the U.S. manufacturing innovation pipeline from fundamental advancements in science all the way through technology commercialization, the federal government should:

- Expand and make permanent the R&D tax credit.
- Support new efforts to drive research through the 'valley of death' transition from initial technology concepts to commercialization.
- Encourage and sustain the formation of R&D partnerships among government, industry, and universities by fully-funding the National Network for Manufacturing Innovation (NNMI). This can be accomplished by passing the Revitalize American Manufacturing and Innovation Act.
- Prioritize long-term federal research projects and support a balanced portfolio of engineering and scientific research among the physical and life sciences. Congress should do this by supporting the goals of the America COMPETES Act- an effort focused on the NSF, DOE Office of Science, and NIST, agencies that support basic research in engineering and have a high impact on economic competitiveness.
- Extend the first-year 50 percent bonus depreciation tax credit.

## Encouraging Workforce Development and STEM Education

Federal investments in fundamental scientific discovery and technological development have declined almost 60 percent in the last 40 years, when adjusting for inflation. Fewer research dollars over time have resulted in fewer companies with skilled workers capable of designing and building complex systems. As result, the U.S. is increasingly dependent on immigration to meet its technical workforce needs. The NSF's 2010 S&T Indicators report found that over 50 percent of Doctorate level engineers working in the U.S. engineering fields came from foreign backgrounds, an increase from 41 percent in 2000, and the Government Accountability Office and National Science Foundation have consistently reported that the U.S. remains dependent on foreign talent for a large percentage of highly skilled workers to perform the critical tasks needed to sustain the key parts of our industrial base, particularly with respect to aerospace and defense industries.

The decline in the U.S. manufacturing base and rise of manufacturing competitors abroad poses further workforce training and capacity issues for the economy. As other nations develop their production and design capacity, and are therefore better able to educate and retain the best science and engineering talent, the U.S. ability to attract foreign talent will erode. As the manufacturing workforce becomes increasingly more global and technology-driven, it is essential that the United States align its K-12 core curriculum, undergraduate and graduate education systems to the knowledge and skill requirements of its 21st century workforce. While some of these issues have suffered decades of neglect and will take decades to correct, all require immediate attention and a national commitment to improvement. Accordingly, the federal government should:

- Encourage partnerships to involve private organizations and businesses in addressing STEM education improvements.
- Support scholarships to students and workers pursuing manufacturing engineering degrees and technical certificates.
- Strengthen tax incentives for workforce development and continuing education, including those at the graduate level, both for employers and employees.
- Conduct a high level review of the health and sustainability of the U.S. high-tech workforce to ensure that education and immigration policies are working to expand the number of highly-skilled workers in STEM fields.
- Support community colleges and technical schools to ensure worker training programs provide the next generation of technically skilled workers.

## Conclusion

Manufacturing has tremendous potential in sparking economic growth and job creation in the U.S. In addition to being a critical part of the U.S. national security apparatus, innovation pipeline, and process for job creation, manufacturing holds the promise for the establishment of entirely new industries and the reinvention of new methods of doing business.

The U.S. maintains leadership in a range of machinery and equipment manufactured goods, as well as in the pharmaceutical, transportation, food processing, and electronic products industries, with each sector slated for future expansion fed by global demand from expanding and emerging markets. Other countries have already recognized the importance of spurring the creation of new products and industries – particularly in energy technology sector – and have taken steps to ensure a healthy science and engineering workforce and a competitive market for attracting investment. In closing, the key steps the U.S. should immediately take to signal our commitment to a long-term growth strategy include:

- Commit to long-term federal investment in engineering and scientific research and support a balanced portfolio of engineering and scientific research among the physical and life sciences. Congress should do this by supporting the goals of the America COMPETES Act – an effort to double investments at the NSF, DOE Office of Science, and NIST that support basic research in engineering and have a high impact on economic competitiveness.
- Fully-fund the NNMI to encourage and sustain the formation of R&D partnerships among government, industry, and universities.
- Expand and make permanent the R&D tax credit and strengthen tax incentives for workforce development and continuing education.
- Encourage and sustain the formation of R&D and STEM education partnerships among government, industry, and universities.
- Support scholarships to students and workers pursuing science and engineering degrees and technical certificates for those who are willing to work in a manufacturing environment after graduation.

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