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**Position Statement on the
National Science Foundation (NSF) FY 2016 Budget Request
submitted by the NSF Task Force**

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NSF FY 2016 Budget Request Overview

The National Science Foundation (NSF) Task Force is pleased to comment on the NSF Fiscal Year (FY) 2016 budget request, in support of this year's proposed funding level of \$7.7 billion for the NSF.

By supporting broad-based, cross-cutting programs that push the frontiers of science and engineering, the NSF is essential in guiding the nation's non-defense-related research and education. As recognized by the Administration and Congress, for the U.S. to remain globally competitive, prosperous, and secure, the nation must support transformative, fundamental research that promotes invention and leads to ground-breaking societal advances. Such a paradigm produces a high-tech workforce, stimulates economic growth, addresses critical national challenges, and sustains our nation's position as a global leader.

The total FY 2016 NSF budget request represents an increase of 5.2 percent over the \$7.3 billion enacted for NSF in FY 2015. While the NSF Task Force understands the concerns over the current budget deficit, the activities funded by the NSF contribute significant value to the US economy and develop the next generation of US innovation.

Research and Related Activities (RRA) contains the major portion of the total NSF request at \$6.2 billion, a 4 percent increase over the FY 2015 enacted level. The resources for the Engineering Directorate (**ENG**) increase by 6.4 percent over the FY 2015 enacted level to \$949 million, of which \$194 million is mandated for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs that **ENG** administers for all of NSF. The increase for **ENG** is higher than foundation wide average for the NSF directorates.

ENG consists of the disciplinary-area divisions of Chemical, Bioengineering, Environmental, and Transport Systems (CBET), up 8.1 percent to \$192 million; Civil, Mechanical and Manufacturing Innovation (CMMI), up 6.3 percent to \$222.7 million; and Electrical, Communications and Cyber Systems (ECCS), up 8 percent to \$119 million. Industrial Innovation and Partnerships (IIP) increases 9.3 percent to \$248 million; Emerging Frontiers in Research and Innovation (EFRI) increases 12.8 percent to \$56.5 million; and Engineering Education and Centers (EEC) decreases 6 percent to \$110 million. Within CMMI, Advanced Manufacturing will receive \$80 million with a focus on nanotechnology, cyber-enabled manufacturing, and advanced biomanufacturing.

NSF will continue to support research and education efforts related to broad, foundation-wide investments. A share of the **ENG** budget, as allocated from the constituent divisions, will be used

for these initiatives. NSF-wide funding for the National Nanotechnology Initiative is flat-funded at \$168.5 for FY 2016. In another agency-wide technology program, the Administration has again proposed continued funding for a cross-cutting advanced manufacturing initiative entitled Cyber-enabled Materials, Manufacturing, and Smart Systems (CEMMSS), totaling \$107.5 million in FY 2016, an increase of 9 percent from FY 2015, taking into account that the Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP) program has been moved into the Risk and Resilience portfolio.

Another initiative which the Task Force views as important to re-establishing US leadership is the Clean Energy Technology, proposed for a \$3.3 million increase to \$140.8 million in FY 2016. This program integrates NSF's climate, energy, and engineering programs to increase U.S. energy independence, enhance environmental stewardship and reduce energy use and carbon intensity, while generating continued economic growth. This program offers funding assistance to research projects that bridge the gap between basic and applied research. Traditionally, the Department of Energy has not funded this type of research so this program fills a very specific role.

The ASME NSF Task Force Position

Affirmation and Endorsement

The ASME NSF Task Force highly endorses NSF's critical function in directing basic research and integrated education programs that keep America at the vanguard of science, engineering, and technology. NSF possesses an exceptional record of comprehensive and flexible support of a breadth of research, from 'curiosity-driven' science to targeted initiatives. This achievement has been made possible via strict adherence to the independent peer-review process for merit-based awards. The proposed increases under the President's FY 2016 budget should allow NSF to sustain these efforts and commitments, advancing discovery and learning, spurring innovation, and maintaining the nation's competitive edge.

Sufficient investment in fundamental science and engineering research, that involves both established and emerging areas, is essential in recognizing and nurturing innovation, in preparing the next generation of scientific talent and leaders, and in producing the products, processes, and services that improve health, living conditions, environmental quality, energy conservation, and national security for all Americans.

Overall, the Task Force also supports and commends activities within **ENG**. NSF's support of "fundamental research linked to key national priorities" is exemplified within **ENG**. It is important to emphasize that it is through such fundamental science and engineering investment that the next generation technologies are produced, advancing U.S. competitiveness. For example, researchers have developed new bioceramic foams that act as scaffolds for bone repair, perhaps ending the use of metal plates as bone substitutes.

NSF leads the U.S. nanotechnology research effort, and **ENG** is the focal point within NSF for this key national research endeavor. ASME has strongly endorsed the National Nanotechnology Initiative (NNI) since its inception as an NSF investment area in FY 2000. The Task Force advocates for augmentation of funding, particularly for investments in activities that will increase research in two key areas: nanomanufacturing and energy development.

Finally, ASME continues to support NSF's vision of "a nation that capitalizes on new concepts in science and engineering and provides global leadership in advancing research and education."

Thus, ASME commends the President's commitment to the Faculty Early Career Development and the Graduate Research Fellowships programs. Funding of \$52 million for the Faculty Early Career Development (CAREER) awards will support exceptionally promising college and university junior faculty who are most likely to become the academic leaders of the 21st century. The FY 2016 request provides \$3 million for the NSF Research Traineeships Program (NRT) which includes the Integrative Graduate Education and Research Traineeship (IGERT) Program and the Graduate STEM Fellows in K-12 Education program.

Questions and Concerns

ASME's key questions and concerns arising from the FY2016 budget request center on:

- The need for sustainable funding for NSF,
- Low funding success rates for new grants,
- Funding for **ENG** with respect to other Directorates within NSF; and
- The need for increased funding for core disciplinary research within **ENG**.

NSF is the only federal agency devoted "to the support of basic research and education across all fields of science and engineering." While comprising only a small percentage of the total federal budget for R&D, NSF provides about 20 percent of the federal support given to academic institutions for basic research overall, or 40 percent when medical research supported by the National Institutes of Health (NIH) is excluded. Moreover, while NSF does not directly support medical research, its investments do provide the technologies in diagnosis, medicine, pharmaceutical manufacturing, and drug delivery that are essential for the medical sciences and related industries. Given recent appropriations to provide NSF with budget increases despite the long-term fiscal challenges posed by our national debt, the ASME NSF Task Force commends Congress and the Administration for their recognition of the unique role that NSF plays in the scientific enterprise, and encourages them to provide sustainable funding for NSF in FY 2016 for the future prosperity of our nation.

Although the funding success rate for research grants at NSF has increased over the past few years, it is still well below the 30 percent level of the late 1990s, a trend projected to continue in FY 2016. The **ENG** 2014 funding success rate is 23 percent, evincing that the current budget climate is still preventing a large number of excellent, meritorious proposals from being funded. Nonetheless, even maintaining current grant size and duration is not enough. An extended period of constant grant sizes has eroded buying power for grants due to inflationary effects, thus limiting the ability of grant recipients to adequately support research and student development. Note that the bulk of the grants are budgeted for graduate student stipend and tuition. Noteworthy, **ENG** has a funding success rate for research grants well below the average for other NSF directorates (ENG achieved an 18 percent success rate versus a 23 percent for NSF-wide in 2014). **ENG** has increased its average annualized award size slightly to \$121,000 in 2014, up \$3,000 from the 2013 level.

ENG is the single largest source of federal funding for university-based, fundamental engineering research – providing 32 percent of the total federal support in this area. However, **ENG** (less SBIR/STTR) would still only be fourth in total funding of the six Directorates within NSF. Our Nation's long-standing global prominence in technological innovation may be jeopardized if such investments in basic engineering research and education are hindered by lack of federal funding in engineering.

The total funding for non-priority-area core disciplinary research, from which new priority areas and even new disciplines are often born, within **ENG** should still be scrutinized. Funding for broad, Directorate-wide priority areas (e.g., Cyber-Enabled Materials, Manufacturing, and Smart-Systems (CEMMS); Innovation Corps (I-Corps); Science, Engineering, and Education for Sustainability (SEES); and the Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21)) and the SBIR/STTR program within ENG constitute almost half of the budget request for ENG. The Task Force does not advocate for the redistribution of monies from **investment priority-areas** into non-priority core areas, but rather provide significant increases for completely flexible core funds in order to develop the creative and novel ideas that feed the comprehensive fundamental Science, Engineering, and Technology knowledge base, which serves “to advance the national health, prosperity, and welfare; and to secure the national defense.”

Conclusion

The ASME NSF Task Force urges Congress to support the Administration’s request at a minimum of \$7.7 billion for FY 2016, and enthusiastically supports the NSF’s strategic plan of “empowering the nation through discovery and innovation.” We commend Congress and the Administration for their recent support for NSF in the FY 2015 omnibus, but remain concerned that inadequate funding will impede those pursuing research oriented careers in STEM disciplines.

We are further troubled that the goals of the America COMPETES Act have largely fallen off of the national agenda. U.S. investments in science and technology have consistently paid back into the economy--generating new jobs and new industries--far more than taxpayers have invested. The lack of focus on scientific and technological competitiveness is particularly worrisome for America’s future global competitiveness given the continued strong growth in R&D investments around the world. Congress should work to fulfill the goals of the America COMPETES Act in order to stimulate our economy with the fruits yielded from science and technology. Sustained yearly increases in the NSF’s budget are needed for both core disciplinary research and integrated education. Increasing award duration would promote a more stable and productive environment for learning and discovery. Longer timetables would also provide researchers with opportunities to deliver expanded education and research experiences to students. We encourage Congress to provide these needed resources for NSF in FY 2016.

Introduction to ASME

Founded in 1880 as the American Society of Mechanical Engineers, ASME is a not-for-profit professional organization representing over 140,000 engineers that enables collaboration, knowledge sharing, and skills development across all engineering disciplines, while promoting the vital role of the engineer in society. ASME codes and standards, publications, conferences, continuing education, and professional development programs provide a foundation for advancing technical knowledge and a safer world. ASME conducts one of the world’s largest technical publishing operations, holds more than 30 technical conferences and 200 professional development courses each year, and sets some 600 industrial and manufacturing standards.

ASME is a non-profit technical and educational organization with over 140,000 members worldwide. The Society's members work in all sectors of the economy, including industry, academia, and government. This position statement represents the views of the NSF Task Force and is not necessarily a position of ASME as a whole.