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**Position Statement on the
National Science Foundation (NSF) FY 2014 Budget Request
submitted by the
NSF Task Force of the ASME Technical Communities, Knowledge and Community Sector**

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Introduction to ASME

Founded in 1880 as the American Society of Mechanical Engineers, ASME is a not-for-profit professional organization 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.

NSF FY 2014 Budget Request Overview

The National Science Foundation (NSF) Task Force of ASME's Knowledge & Community Sector is pleased to comment on the NSF Fiscal Year (FY) 2014 budget request, in support of this year's proposed funding level of \$7.6 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 2014 NSF budget request is \$7.6 billion (B), representing an increase of 8.4 percent over the \$7.1 B for NSF in FY 2012 enacted. While the present budget request still places the NSF well behind the goals of the America COMPETES Act, the NSF Task Force considers this to be a responsible budget given the current fiscal environment.

Research and Related Activities (RRA) contains the major portion of the total NSF request at \$6.2 B, a 9.2 percent increase over the FY 2012 enacted level. The increase should help the Directorates to recover from the post-2004 NSF budget cuts, as well as sequestration, but would still not bring total NSF funding to its previous high level in 2004 (in FY 2012 adjusted dollars). The resources for the Engineering Directorate (**ENG**) increase by 10.3 percent over the FY 2012 enacted level to \$911 M, of which \$177 M is mandated for the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs that **ENG** administers for all of NSF.

ENG consists of the disciplinary-area divisions of Chemical, Bioengineering, Environmental, and Transport Systems (CBET), up 8.1 percent to \$185M; Civil, Mechanical and Manufacturing Innovation (CMMI), up 10 percent to \$224M; and Electrical, Communications and Cyber Systems (ECCS), up 10.5 percent to \$118M. Industrial Innovation and Partnerships (IIP) increases 16.6 percent to \$225M; Emerging Frontiers in Research and Innovation (EFRI) increases 3.9 percent to \$32.0M; and Engineering Education and Centers (EEC) increases 5.2 percent to \$126M.

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 decreases by 1.8 percent to \$431M for FY 2014. In another agency-wide technology program, the Administration has again proposed significant new funding for a cross-cutting advanced manufacturing initiative entitled Cyber-enabled Materials, Manufacturing, and Smart Systems (CEMMSS), totaling \$300M in FY 2014, an increase of 212 percent from roughly \$142M in FY 2012.

Another initiative which the Task Force views as important to re-establishing US leadership in clean energy technology is the Science, Engineering, and Education Sustainability (SEES) program. SEES, proposed for a 41.9 percent increase to \$223M in FY 2014, will integrate 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.

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 2014 budget should allow NSF to properly sustain and expand these efforts and commitments, advancing discovery and learning, spurring innovation, and maintaining the nation's competitive edge.

The FY 2014 Budget Request represents an 8.4 percent increase over FY 2012 enacted funding. R&D activity funding accounts for a large part of the total increase for NSF, totaling \$6.2B, an increase of 9.2 percent over FY 2012 enacted funding. 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 Administration has only requested \$175M for **ENG**'s contribution to the NNI in FY 2014, a significant decrease. The Task Force advocates for augmentation of funding, particularly for investments in activities that will increase research in two key areas: nanomanufacturing and environmental health and safety.

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 expansion of the Faculty Early Career Development and the Graduate Research Fellowships programs. Funding 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 2014 request makes substantial changes to some of NSF's flagship graduate fellowship and traineeship programs: \$325M is provided for the Graduate Research Fellowship (GRF) program (an increase allowing for 2,700 new fellows over FY13 amounts), the Integrative Graduate Education and Research Traineeship (IGERT) Program and the Graduate STEM Fellows in K-12 Education program will evolve into the NSF Research Traineeships Program (NRT) and will be funded at \$55M (an increase of \$3M over previous IGERT funding).

Questions and Concerns

ASME's key questions and concerns arising from the FY2014 budget request center on:

- the need for sustainable funding for NSF
- low funding success rates for new grants, and low funding levels for existing 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 21 percent of the federal support given to academic institutions for basic research overall, or 58 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 2014 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 2014. The **ENG** 2012 funding success rate is estimated at 18 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 approximately 24 percent for NSF-wide in 2012). **ENG** has increased its average annualized award size slightly to \$115K in 2012, up \$5k from the 2011 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 fifth in total funding (at \$734M) of the six Directorates within NSF, despite a proposed increase of 9.0 percent in the FY 2014. 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 (CEMMSS); 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 \$7.6B for FY 2014, 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 2013 continuing resolution, 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 2014.

ASME is a non-profit technical and educational organization with over 130,000 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 of ASME’s Technical Communities of the Knowledge & Community Sector and is not necessarily a position of ASME as a whole.