



**UNITED STATES OF AMERICA
BEFORE THE
NATIONAL SCIENCE FOUNDATION**

**The National Science Foundation
Request for Comment Regarding
The NSF Strategic Plan for
FY 2006-2011**

19 January 2006

**COMMENTS OF THE
INSTITUTE OF ELECTRICAL AND ELECTRONICS
ENGINEERS – UNITED STATES OF AMERICA (IEEE-USA)**

The IEEE-USA is an organizational unit of the Institute of Electrical and Electronics Engineers, Inc. (IEEE). IEEE-USA was created in 1973 to advance the public good and promote the careers and public-policy interests of the more than 220,000 technology professionals who are U.S. members of the IEEE. We appreciate this opportunity to provide comments in response to the following questions posed by the National Science Foundation in developing its 2006-2011 Strategic Plan:

1. Does NSF's current Strategic Plan effectively communicate NSF's roles and responsibilities as part of the science and engineering (S&E) community? If not, what is lacking and how can it be improved?
2. What broad characteristics of the near- and long-term environment for S&E research and education should NSF consider and address in its next Strategic Plan?

The following are important near- and long-term environmental challenges for S&E research and education that we would encourage NSF to address in its 2006-2011 Strategic Plan:

- Globalization and leveling of the playing field in science and engineering. How can the U.S. maintain its preeminence in science and engineering in order to ensure that we remain competitive as a nation in those technology fields that are critical for our economic and national security.

- The aging of our population and the demographic implications for our national research and engineering needs, such as the uses of information technology to improve health and quality of life.
- Energy security and the long-term challenge of finding energy sources to replace fossil fuel energy.
- Re-energizing aerospace and aeronautics research activities in areas complimentary to NASA's aerospace program.
- Strengthening cyber-security, which is essential to protect critical national information infrastructures and to enable a vision of society in which networked computer systems are ubiquitous, predictable, accountable and less vulnerable to attack and abuse. In this area, NSF should expand its research support to aid policy making that will lead to a more secure infrastructure at national, local, and industrial levels.
- Educating future generations of scientists and engineers who are not only technically competent, but who are also innovators and who are prepared to maintain their career vitality in the face of rapid technological change.

NSF's plan should also identify which scientific fields will be de-emphasized in the near or long-term simply because the field has matured and incremental payoff in further research is small.

IEEE-USA believes the current Strategic Plan communicates NSF's role and responsibilities very well. However, NSF is not the only entity responsible for fundamental science and engineering research. We would recommend that the 2006-2011 Strategic Plan attempt to highlight those areas where NSF plays a unique role in the country's fabric of science and engineering research and education relative to other entities, such as other federal, state, and local agencies, and the private sector and industry.

IEEE-USA has also identified the following areas in which the NSF could more effectively communicate the roles and responsibilities of the S&E community, and outlines specific recommendations for the NSF' next strategic plan:

- The 2006-2011 Strategic Plan should be more explicit in explaining the return on NSF's investments in science and engineering research. In other words, what are the measurable societal benefits realized from that research and education investment? The

assumption is that increased knowledge would automatically benefit society, but that is not necessarily true. The return on investment should be explained explicitly.

- On the energy front, we have witnessed problems with the aging US electricity grid, increases in oil prices, the finite supply of fossil fuels, the recognition of global warming as a consequence of fossil fuel consumption, and increased vulnerability to unstable politics and war in the Middle East, the world's primary source of petroleum energy. All of these trends point to the need to reinvigorate our domestic science and engineering base and to apply same to all facets of energy production and utilization. While the DOE has the primary charter in this area, the NSF should also target this as a priority area for U.S. R&D.
- The trend toward globalization of corporations and outsourcing of manufacturing and technical services has emerged as a major factor in the U.S. economy and the well being of US citizens. Furthermore, the globalization of scientific research and engineering is forcing the country to face the challenges of competition for ideas and process/technology innovations. While the prices of imported goods are low, the viability of the US industrial base has diminished, and many jobs have been lost. In addition, the ability of the U.S. to produce key technological/industrial components has diminished, thereby reducing our security and self-sufficiency. The free market economy is a feedback system which will always find the lowest cost of production, so this trend is probably inevitable. However, there are measures which can be taken to preserve and advance our national well being. These measures are all consistent with the mission of the NSF: reinvigorating science and engineering in the U.S. at all levels, and deploying technology in smart and appropriate ways to maintain U.S. leadership and competitiveness.

The following comments offer suggested text that could be added to specific sections of the current Strategic Plan, as it evolves into the 2006-2011 plan:

1) **Introduction, p. 7**, we suggest that a paragraph be added titled "Energy" prior to that titled "Environment". Following is suggested text:

World population growth and the rising standard of living in developing countries increase strain on the supply of energy and the impact of its consumption. Political, economic, and environmental consequences of energy use patterns are vast on a global scale. The need to supply an increased worldwide demand while restricting carbon emissions and conserving the dwindling supply of fossil fuels, is one of the greatest challenge to be faced. Both incremental and breakthrough advances are urgently needed. The mission and principles of the NSF will foster this cause via strengthening of the S&E workforce and infrastructure and also via specific targeted research and education initiatives.

2) **Strategy, p. 23, under NSF Priority Areas**, we suggest adding a priority titled “Energy Science and Engineering”. Following is suggested text:

The objective of the Energy Science and Engineering priority area is to foster both incremental and breakthrough advances in all aspects of energy production and utilization. This cause is synergistic with the desire to reinvigorate U.S. S&E communities, U.S. industrial and economic competitiveness, and U.S. national security through reduced reliance on foreign energy sources and energy technologies.

Respectfully submitted,

A handwritten signature in black ink that reads "Ralph W. Wyndrum, Jr." The signature is written in a cursive style and is positioned to the left of a vertical red line.

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President, IEEE-USA

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