APPENDICES

APPENDIX I

NSB 00-192
October 16, 2000

CHARGE
COMMITTEE ON EDUCATION AND HUMAN RESOURCES
TASK FORCE ON NATIONAL WORKFORCE POLICIES FOR SCIENCE AND ENGINEERING

Discovery and innovation in science and engineering (S&E), enabled by a robust, highly trained, and talented science and engineering workforce, is the foundation of our Nation's future economic growth and quality of life. Historically, the U.S. has benefited from both an abundant supply of indigenous talent and the contributions of a steady stream of scientists, engineers, and graduate students from other countries. This blend of domestic and foreign talent has helped advance the frontiers of knowledge and propel the U.S. to a position of global leadership in S&E.

The technological and information revolutions transforming the economy are changing the skill mix required in the national workforce and dramatically increasing the demand for scientists and engineers. However, these fundamental changes lack a coherent framework of long term national goals and strategies to insure the continued education, development and recruitment, from both within the US and other countries, of highly trained and talented workers. Important national trends point to the need for a serious assessment of our national S&E workforce needs and policies:

- Dramatic increases in the demand for scientists and engineers by all sectors of the economy;

- Profound inadequacies in U.S. K-12 in science, mathematics, and engineering education and declining rates of participation by domestic students in graduate S&E education;

- Demographic changes resulting in a significantly more diverse U.S. student population coupled with historically lower rates of participation in S&E by ethnic and racial minorities and women;

- Increasing reliance on foreign talent in the face of trends indicating rising rates of return to country of origin by foreign students after degree completion; and

- Inconsistencies among policies related to the recruitment and treatment of foreign scientists to fill the ranks of industry, Federal laboratories, and universities.

The NSB Task Force on National Workforce Policies for Science and Engineering (NWP), reporting through the Committee on Education and Human Resources, is established to assess long term national workforce trends and needs in science and engineering and their relationship to existing Federal policies, and to recommend strategies that will address long term S&E workforce needs. In its review, the task force should include consideration of the following issues:

- How U.S. demographic trends, trajectories of S&E preparation and degree attainment, and availability of foreign scientists and engineers may affect the future S&E workforce;

- How data on industry demand – both for requisite skills and the numbers of workers who possess them – can better inform preparation, hiring, and retention of students at all levels for high technology careers;

- How graduate training can be diversified to support aspirations that match opportunities, especially outside of research and of academe, while insuring continued excellence of traditional preparation of U.S. scientists and engineers; and

- How the mix of Federal law, such as immigration policy, Federal agency and state programs, higher education institution practices, and employer recruitment and other incentives affect student and worker choices related to S&E careers.

The NWP Task Force will submit a plan of work for discussion at the December 2000 meeting. The workplan should include a timetable of activities, including proposals for consultation with stakeholders in the relevant science and engineering education and employer communities, that yields a report with policy recommendations for Board consideration by the November 2001 meeting.

Eamon M. Kelly
Chairman

APPENDIX II

NSB/EHR/NWP 01-1

EHR TASK FORCE ON NATIONAL WORKFORCE POLICIES FOR SCIENCE AND ENGINEERING (NWP)

Task Force Briefing
January 30, 2001

AGENDA

8:15 AM	Welcome and Purpose	Dr. Miller, Chair, NWP Task Force
8:25	Overview: Coverage, Strengths, and Shortcomings of Data	Dr. Golladay, NSF/SRS
8:45	Databases on Occupations and Employment:	
	A. Employment Projections	Dr. William Parks Office of the Commissioner Bureau of Labor Statistics
	B. CPS and Training Issues	Dr. Enrique Lamas Bureau of the Census Demographic Surveys Division
	C. Longitudinal Data and Knowledge Requirements For 21st Century Work	Dr. Clifford Adelman Office of Educational Research and Improvement, U.S. Department of Education
	Discussion	*NSB Members*
10:30	Break	
11:00	A Dialogue on Immigration Data:	
	Presenter	Dr. Lindsay Lowell Institute for the Study of International Migration, Georgetown U.
	Discussant	Dr. Michael Teitelbaum Program Director Alfred P. Sloan Foundation
	Discussion	*NSB Members*
12:30	Lunch	

Task Force Briefing
January 30, 2001

AGENDA (CONT.)

1:30	University Perspectives: A. Market Analysis of Students	Dr. Karen Spahn Institutional Research University of Phoenix
	B. Council of Graduate Schools: What VPs and Deans Say	Mr. Peter Syverson Council of Graduate Schools
	C. Reinventing the Master's Degree in Science: An Overview of Programs, Students, and Jobs	Ms. Sheila Tobias Outreach Coordinator, Sloan Science Master's Degree Initiative and Dr. Michael Teitelbaum Alfred P. Sloan Foundation
	Discussion	*NSB Members*
3:00	Wrap-up	Dr. Miller Dr. Golladay
3:30	Adjourn (Task Force Executive Session)	

APPENDIX III

NSB/NWP 02-3

WORKSHOP ON NATIONAL POLICY OPTIONS
TASK FORCE ON NATIONAL WORKFORCE POLICIES FOR SCIENCE AND ENGINEERING

National Science Board
March 12, 2002
Stafford II, Room 555, NSF

AGENDA

9:00 - 9:30 AM	Welcome	
		Dr. Joseph Miller, Task Force Chairman, National Science Board
		Dr. Eamon Kelly, Chairman, National Science Board
		Dr. Rita Colwell, Director, National Science Foundation
	Introduction to the Workshop	Dr. Joseph Miller, NSB Task Force Chairman
9:30 AM –12:00 PM	Panel on national policies addressing the U. S. education system and its ability to move students from secondary school into undergraduate studies and thence into employment and/or graduate studies.	
	Moderator:	Dr. Diana Natalicio, NSB Task Force Member
9:30	Policy focus on precollege to undergraduate transition (Presentation and Q/A)	Dr. David Conley, Associate Professor, University of Oregon, Center for Education Policy Research
10:00	Policy focus on multiple pathways to the workforce and mobility of students among kinds of educational offerings (Presentation and Q/A)	Dr. Anthony Carnevale, Vice-President, Educational Testing Service
10:30-10:45	Break	

AGENDA (CONT.)

10:45	Policy focus on the system for teacher preparation and certification and the interplay with other career options (Presentation and Q/A) Dr. Rodger Bybee, Executive Director, Biological Sciences Curriculum Study	
11:15	Discussion	
12:00- 1:00	Lunch	
1:00–1:45 PM	Report of Critical Path Analysis of California's Science and Technology Education System Dr. Susan Hackwood, Executive Director, California Council on Science and Technology	
1:45 – 5:00 PM	Panel on national policies to strengthen student interest in science, engineering, and technology and graduate increased numbers of associate and baccalaurate degree recipients well-prepared for employment opportunities and/or advanced study.	
	Moderator:	Dr. George Langford, NSB Task Force Member
1:45	Policy focus on incentives to increase supply of college graduates (Presentation and Q/A) Dr. Paul Romer, Professor, Stanford University	
2:30 – 2:45	Break	
2:45	Policy focus on diversity and student development (Presentation and Q/A) Ms. Yolanda George, Deputy Director, Directorate for Education and Human Resources Programs, AAAS	
3:15	Policy focus on institutional strategies and their impact on undergraduate students (Presentation and Q/A) Dr. Charles Goldman, Economist, RAND	
3:45	Discussion and synthesis	
5:00	Adjourn	
5:15	Reception, National Science Board Suite, Room 1225, Stafford I	

Karolyn Eisenstein, Executive Secretary

APPENDIX IV

NSB/NWP 02-15

WORKSHOP II ON NATIONAL POLICY OPTIONS
TASK FORCE ON NATIONAL WORKFORCE POLICIES FOR SCIENCE AND ENGINEERING

National Science Board
June 28, 2002
Stafford I, Room 375, NSF

AGENDA

9:00 - 9:20 AM	Welcome	Dr. George Langford, Task Force Vice-Chair, National Science Board
		Dr. Rita Colwell, Director, National Science Foundation
	Introduction to the Workshop	Dr. George Langford, Task Force Vice-Chair, National Science Board
9:20 AM –12:00 PM	Panel on the workforce needs of government and industry	
	Moderator:	Dr. Maxine Savitz, NSB Task Force Member
9:20	Employment serving the U.S. government	Dr. John McTague, Vice-President – Laboratory Management, University of California
10:10-10:30	Break	
10:30	U. S. corporations and their workforce needs	Dr. Donald Keck, Vice-President and Executive Director for Research (retired), Corning
11:15	Discussion of government and industry needs	All panelists and NSB members
12:00- 1:00	Lunch	

AGENDA (CONT.)

1:00–1:45 PM Impact of security policies on the S&E workforce
Dr. John Marburger, Director, Office and Science and Technology Policy, Executive Office of the President

1:45 – 5:00 PM Panel on policies affecting the U. S. and global supply of scientists and engineers
Moderator: Dr. George Langford, NSB Task Force Member

1:45 U.S. policies and regulations affecting international graduate students and postdoctoral researchers
Dr. James Burns, Foreign Relations Associate, American Council on Education

2:30-2:45 Break

2:45 Policies and approaches in other countries: China
Dr. Yugui Guo, Guest Professor, Fudan University

3:15 Factors affecting the choice of domestic students to attend graduate school
Dr. Frank Solomon, Professor of Biology, MIT

4:00 Discussion of U.S. policies for improved development of our domestic advanced S&E workforce
All panelists and NSB members

5:00 Adjourn

Karolyn Eisenstein, Executive Secretary

APPENDIX V

NSB/NWP 01-1
May 2001

"State of Knowledge on the Flow of Foreign Science and Technology Workers to the United States,"

by B. Lindsay Lowell, Georgetown University

EXECUTIVE SUMMARY

This summary presents seven basic data needs and recommendations on the statistical infrastructure needed to monitor or forecast immigrants' contribution to science and engineering. It provides an appendix that describes the data elements currently collected on immigrants.

Occupation and Educational Characteristics *Basic occupational and educational data should be collected for all working-age legal permanent residents (LPRs) and selected temporary-working nonimmigrant (NIV) classes.* It is not possible to identify scientists and engineers unless information is available on the occupation and/or educational characteristics of individual migrants. As far as occupation is concerned, the priority should be for the collection of data on all LPRs and all working temporary visas. The corollary for this priority must be the use of the same occupational classification scheme by the involved agencies. As far as education is concerned, the minimal data priority should be years of education completed. However, additional information on degree completion and field of study would be of value and could either be included in administrative collection systems or as part of special surveys (see below).

Tracking Immigrant Status Transitions.Linking Immigration Statuses *The U.S. needs a reliable administrative and statistical system to track individual transitions in immigrant status.* There are two basic types of immigrants who are often not distinguishable in most immigration statistics. "New" entrants are individuals who have never before resided (at least recently) in the United States. "Transitional" entrants are those who, although counted as new to a given visa class, have actually already been resident in the U.S. Typically, the transitional migrant has legally resided on a temporary visa to study or work (for example, one-fifth of F foreign students adjust and about half of H-1B workers).

Measuring Person Years or Duration of Stay. ***Duration of Stay in Status in the United States*** *There is a need for reliable data on the duration of time that various classes of temporary nonimmigrants have been in the United States.* Duration of stay information is critical for evaluating the relationship between temporary jobs and cycles in the economy. For example, the person-year population is the full-time equivalent contribution of working visas to the labor force: if there were 100 temporary workers with an average stay of one-half year, they would contribute 50 person-years' worth of labor in that year. Further, a reliable administrative and statistical system would permit us to know when an individual left the United States for extended periods of time.

Data On Employer Sponsors. *Basic information about employer-sponsors of immigrants should be collected, i.e., industry, size of the organization, and a common employer identifier.* Systematically tracking industry and employer size class would help businesses and policymakers monitor shifts in national and global demand. Policymakers would have more confidence about the fit between policy and meeting national priorities, while employers would have more information to plan human resource strategy.

Random Surveys and Statistical Data. *Random samples of individuals taken outside of the normal routine of administrative data collection are another way to get the statistical information that policymakers regularly call for and need to reach informed decisions.*

Data elements that would impose an unwarranted burden on administrative systems, or elements that pertain to special subjects not of regular interest, should be collected in random surveys.

A Special Immigrant Current Population Survey. *There should be a pilot CPS supplement on immigrants, and it should include survey items that permit researchers to investigate policy-relevant issues.* The determination of items to be included in the survey should be arrived at after soliciting input from various agencies, the research community, immigrant advocacy groups, and other stakeholders. At the least, a special supplement could shed light on the effect of immigrant status, U.S. experience and residence, where and how much education is completed, and language ability.

Organizational Reform of Data Collection. *For over two decades several panels have condemned the organizational incapacity of the INS in particular to collect and manage data.* Without reform of its capacity it is likely that recommendations on data improvements will subsequently fail. Congress has considered and should establish an independent Bureau of Immigration Statistics. The new organization should conform to the National Academy of Sciences' test of independence: The BIA should be established by statute as a separate entity; it should be headed by a career civil servant; it should require no approval for the release of data, and it should have predetermined/scheduled data releases.

APPENDIX VI

PUBLIC COMMENTS: ORGANIZATIONS AND INDIVIDUALS

Organizations

ACT, Inc., Rose Rennekamp, Vice President, Communications

Advanced Technology Institute, North Charleston, South Carolina, Jon D. Tirpak, Engineering Director

American Association of Community Colleges, George R. Boggs, President and CEO

American Geophysical Union

American Astronomical Society, Andrea Schweitzer, Chair, Committee on Employment

American Institute of Physics, Roman Czujko, Director, Statistical Research Center

American Physical Society, Myriam Sarachik, President

American Society of Mechanical Engineers (ASME), Willard A. Nott, Vice President, ASME Board on Pre-college Education

American Society of Agronomy, Karl M. Glasener, Director of Science Policy

Association of American Universities (AAU), Nils Haselmo, President

Association of Science-Technology Centers, Bonnie VanDorn, Executive Director

Committee on Science, Engineering and Public Policy, National Academies

Committee on Equal Opportunities in Science and Engineering

Corning Incorporated, SPIE Scholarship Committee, Christopher W. Wightman

Crop Science Society of America, Karl M. Glasener, Director of Science Policy

Department of Homeland Security, Office of the Under Secretary for Science and Technology, Vic Tambone, Chief of Staff

EPSCoR Foundation, Royce Engstrom, Chair, Board of Directors

Federation of American Societies for Experimental Biology (FASEB), Howard H. Garrison, Director, Office of Pubic Affairs

Health Physics Society, John R. Frazier, President

Industrial Research Institute, F.M. Ross Armbrecht, Jr., President

Innovative Technology Partnerships, LLC, John P. Jekowski, Principal Partner

Institute of Electrical and Electronics Engineers, Inc., Vin O'Neill, Senior Legislative Representative

McGeary and Smith, Philip M. Smith and Michael McGeary

National Association of State Universities and Land-Grant Colleges (NASULGC), C. Peter Magrath, President

National Postdoctoral Association (NPA), Raymond J. Clark, PhD

National Workshop on Space Education, Executive Committee, Professors Joseph N. Pelton, Donald Flournoy, and Professor Randy Johnson

Office of Science and Technology Policy, James A. Griffin, Assistant Director, Social Behavioral and Education Sciences, SBE Department

Oklahoma Center for the Advancement of Science and Technology/Oklahoma Institute of Technology, W.A. Sibley, Executive Director, CEO

The Packer Foundation, Kenneth F. Packer, Chairman of the Board, Packer Engineering, Inc., Margaret Truax, Director, The Packer Foundation

PeoplePC, Michael Danyo

Semiconductor Industry Association, San Jose, California, Daryl Hatano, Vice President, Public Policy

Alfred P. Sloan Foundation, Ralph E. Gomory, President

Soil Science Society of America, Karl M. Glasener, Director of Science Policy

Tallahassee Scientific Society

Texas Instruments, Paula J. Collins, Director, Government Relations

U. S. Geological Survey, Anna Cruse, Denver, Colorado

U.S. Department of Health and Human Services, Office of Science and Data Policy, Office of the Assistant Secretary for Planning and Evaluation, Jim Scanlon, Acting Deputy Assistant Secretary

U. S. Department of Health and Human Services, National Institutes of Health, National Institute of Allergy and Infectious Diseases, Vicki L. Pierson, Senior Project Officer, Office of Biodefense Research Affairs, Division of Microbiology and Infectious Diseases

U.S. Department of Health and Human Services, The National Institutes of Health, Ruth Kirschstein, Senior Advisor to the Director

University of California, Richard C. Atkinson, President

Individuals

George Allen

Robert Ando

Kevin Aylesworth

Diola Bagayoko, Director Timbuktu Academy, Southern University System Distinguished Professor of Physics

Robert Bartolo

Jeremy Bergsman, Yale University Medical School

Andrea Blake-Garrett, Science Supervisor, Jersey City Public Schools, New Jersey

David F. Brakke, Dean, College of Science and Mathematics, James Madison University

David Bruggeman, Virginia Tech, Northern Virginia Campus

Paul Carliner, Senate staff

Marta Cehelsky

Neal R. Chamberlain, Associate Professor, Kirksville College of Osteopathic Medicine, Department of Microbiology/Immunology

Susan Cure, American University in Paris

C. R. Cvitanich, Postdoctoral fellow, University of California

Lance A. Davis, National Academy of Engineering

Melinda K. Duncan, Associate Professor, Department of Biological Sciences, University of Delaware, Newark

Abraham Eisenstark

Patricia L. Eng

David E. Everhart, Navy

Emanuel Goldman, Professor of Microbiology & Molecular Genetics, New Jersey Medical School, University of Medicine & Dentistry of New Jersey

Dinos Gonatas

Edward R. Greisch

Yugui Guo

W. Christopher Hollinsed

Robert Kaman, Associate Dean, University of North Texas Health Science Center at Fort Worth

Pramod P. Khargonekar, Dean, College of Engineering, University of Florida

Kevin Kilty, Clinical Professor, Manufacturing Engineering, Washington State University, Vancouver

Peter W. Krug, Post-Doctoral Associate, Viral Immunology Center, Department of Biology, Georgia State University

Melanie Leitner, PhD, AAAS Science Policy Fellow

Wendy Lick

Marc Lipsitch, Assistant Professor, Department of Epidemiology, Harvard School of Public Health

Robert Loewy, Georgia Institute of Technology, Aerospace

Carol L. Manahan, Postdoctoral Fellow, Johns Hopkins School of Medicine, Chair, National Postdoctoral Association

Michael Mazzei, Air Liquide America, LP

Mark McCaffrey, Science Communications Specialist, Paleoclimatology Branch, National Climate Data Center, National Oceanographic and Atmospheric Administration

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Michael S. Teitelbaum, Program Director, Alfred P. Sloan Foundation

Ronald Williger

Christopher M. Witty

APPENDIX VII

SRI International

January 31, 2003

National Workforce Policies for Science and Engineering: Bibliography

Submitted by:

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SRI Project Number: PDU 02-089

INTRODUCTION

The National Science Board's Task Force on National Workforce Policies for Science and Engineering was established in 2000 to assess long-term national workforce trends and needs in science and engineering and their relationship to existing Federal policies, and to recommend strategies for long-term S&E workforce needs. The National Science Foundation contracted with SRI International to support the Task Force by providing a review of science and engineering workforce policy literature, summaries of the key studies, and an inventory of major recommendations. This resulted in a August 13, 2002 report, *National Workforce Policies For Science And Engineering: Literature Review And Inventory Of Recommendations.* This document reproduces the bibliography of that report in a compact form.

The bibliography includes all the reports identified by the SRI project team that (1) were produced since 1995[69] and (2) identify science and engineering workforce policy issues, options, and recommendations as part of the content. Sources considered in the literature review included national commissions, Federal agency reports, Congressional reports, National Research Council studies, reports from non-governmental organizations, U.S. states, and international organizations, as well as privately authored journal articles.

The bibliography is divided into two categories. The first category is the set of studies the SRI project team selected to summarize, based on the following criteria, which were developed with NSF:

- The importance of the study in national and international policy discussions.
- Intellectual contribution (originality and quality of the data and analysis).
- The reputation and credibility of the sponsoring and performing organizations.
- The extent to which the study reflects the views of important stakeholders.

The second, larger category includes other studies that the SRI project team but did not select to summarize, based on a consideration of the criteria described above.

[69] A few significant studies from 1995 were also considered for inclusion.

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APPENDIX VIII

Selected Acronyms and Abbreviations

A&M	Agricultural and Mechanical
ACE	American Council on Education
BCIS	Bureau of Citizenship and Immigration Services
BEST	Building Engineering and Science Talent
EHR	Education and Human Resources Committee
ETS	Educational Testing Service
FY	fiscal year
GDP	Gross Domestic Product
GRE	Graduate Record Examination
HR	House Resolution
INS	Immigration and Naturalization Service
K-12	kindergarten through grade 12
K-16	kindergarten through undergraduate studies
LIGO	Laser Interferometer Gravitational Wave Observatory
NCAR	National Center for Atmospheric Research
NRC	National Research Council
NS&E	natural science and engineering
NSB	National Science Board
NSF	National Science Foundation
NWP	Task Force on National Workforce Policies for Science and Engineering
NSTC	National Science and Technology Council
OECD	Organisation for Economic Cooperation and Development
OSTP	Office of Science and Technology Policy
PCAST	President's Council of Advisors on Science and Technology
PIRG	Public Interest Research Group
R&D	research and development
REU	Research Experience for Undergraduates
S&E	science and engineering
SEI	*Science and Engineering Indicators*
S&T	science and technology
SBE	Social, Behavioral, and Economic Sciences Directorate
SESTAT	NSF's science and engineering labor force data system
SEVIS	Student and Exchange Visitor Information System
SME	science, mathematics, and engineering
SMET	science, mathematics, engineering, and technology
SRS	Division of Science Resources Statistics
US	United States

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