

**Engineering Investments
at the
National Science Foundation**

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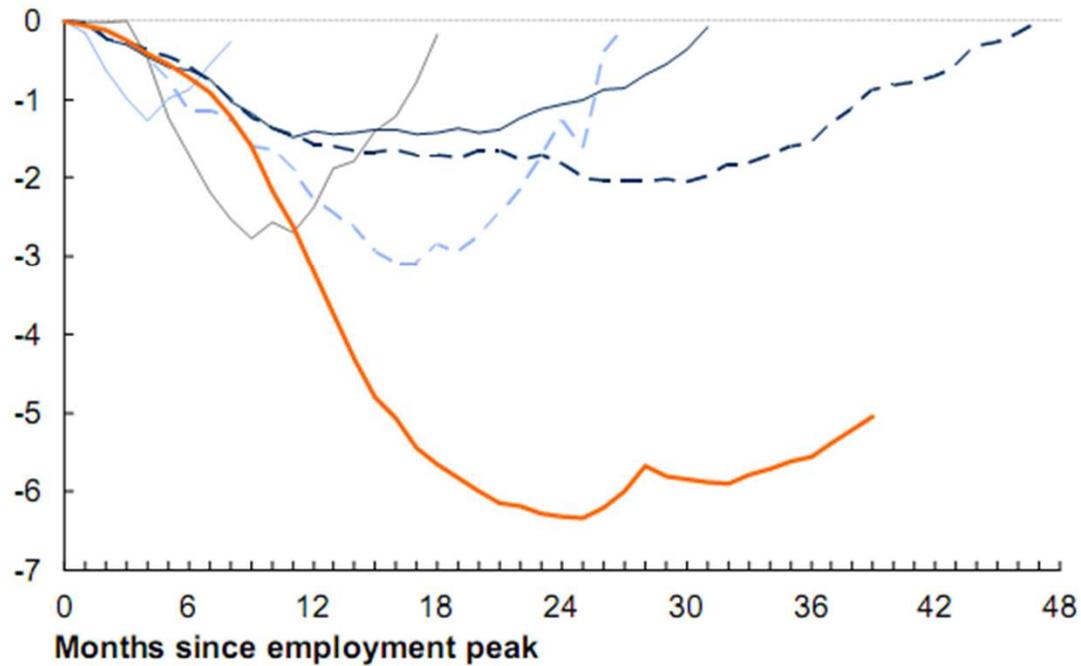
ASEE – ERC Meeting, 6 March 2012



The US employment decline in this recession was more than twice as large as in previous postwar recessions

US employment decline from peak¹

%

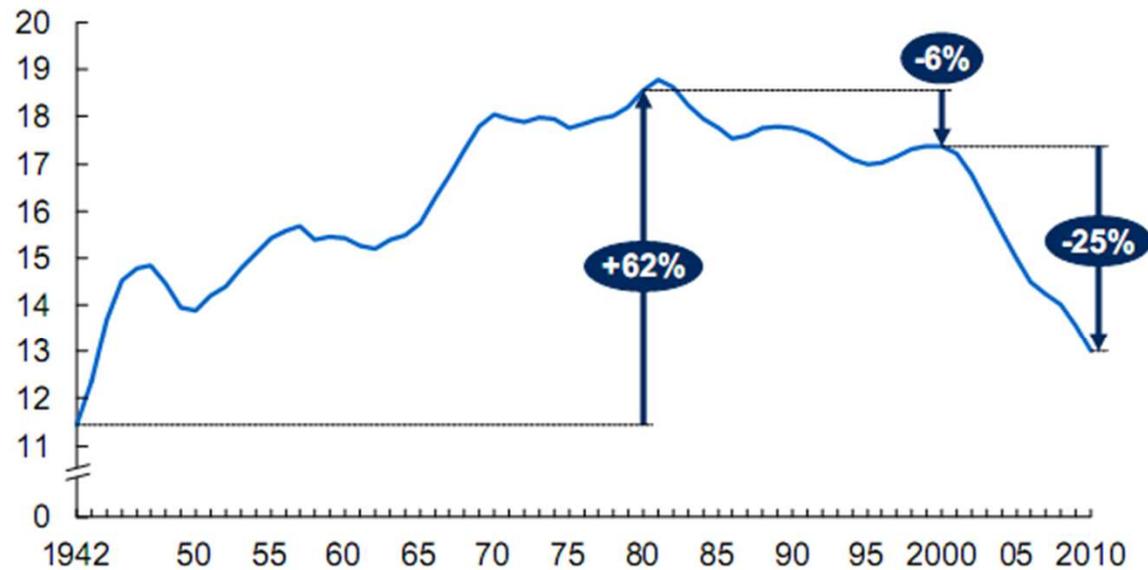


¹ Total nonfarm employment, seasonally adjusted.

SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

US manufacturing employment has been shrinking since 1980, but the pace dramatically accelerated after 2000

Manufacturing employment, 1942–2010, 5-year moving average
Millions of jobs



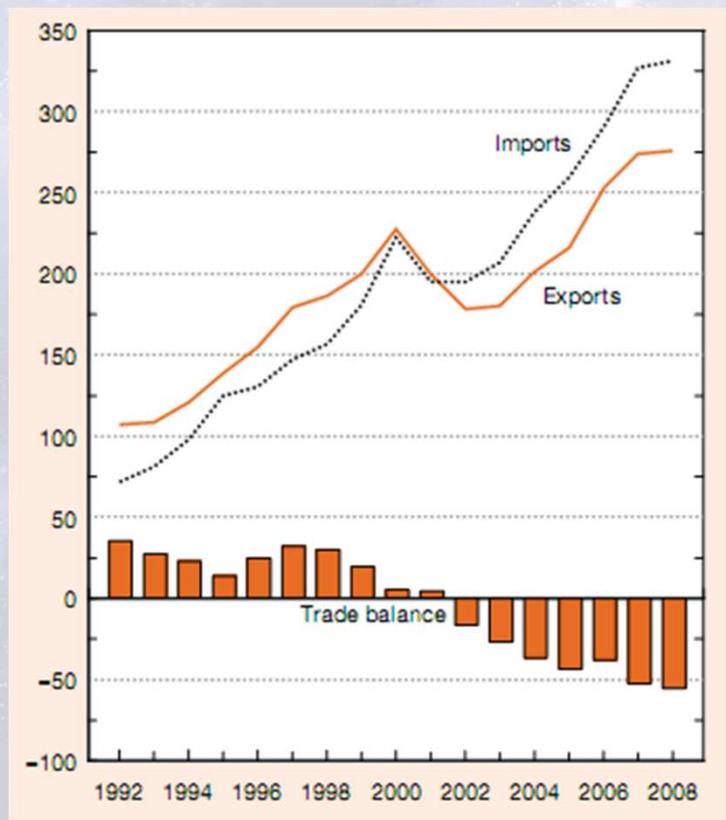
Manufacturing
share of US
employment
%

36 36 34 31 25 19 16 11

SOURCE: US Bureau of Labor Statistics; National Bureau of Economic Research; McKinsey Global Institute analysis



US Trade Balance in Advanced Technology



Includes

- Advanced materials
- Aerospace
- Biotechnology and life sciences
- Electronics, optoelectronics
- Flexible manufacturing
- IT and Communications
- Nuclear
- Weapons

NSF Science and Engineering Indicators, 2010

Charting the course in challenging times

Vision/Strategy grounded in core principles

Human capital development (GRF, post-doc, CAREER)
Supporting the best ideas and the best people

Catalyzing Innovation

Broadening participation

OneNSF



Engineering Prioritizes Research Critical to the Nation's Challenges

- National Priorities
 - National Nanotechnology Initiative
 - National Robotics Initiative
- OneNSF Initiatives
 - Advanced Manufacturing
 - Communications and Cyberinfrastructure
 - Education and Workforce
 - Interdisciplinary Research
 - Sustainability and Clean Energy
 - Innovation Ecosystem

National Nanotechnology Initiative

\$174 M

- The directorate will continue support for
 - nanomaterials and nanodevices
 - nanosystems
 - nanomanufacturing
 - environment, health, and safety
- ENG will direct additional funds towards three Signature Initiatives
 - Nanoelectronics for 2020 and Beyond
 - Sustainable Nanomanufacturing
 - Nanotechnology for Solar Energy Collection and Conversion

National Robotics Initiative

\$10 M

- ENG will support
 - Assistive mechanisms for those with physical disabilities and/or cognitive impairments
 - Systems integration that enables ubiquitous, advanced robotics to be realized
 - Next-generation robotics for manufacturing, healthcare and rehabilitation, surveillance and security, education and training, and transportation

ENG collaborates through OneNSF



ENG will be a major contributor to Advanced Manufacturing

- **Advanced Manufacturing**
ENG will support multi-scale modeling, nanomanufacturing, and complex engineering systems design
- **Cyber-Enabled Materials, Manufacturing, and Smart-Systems (CEMMSS)**
ENG will invest in breakthrough materials and design, advanced techniques and processes, and smart systems
- **Research at the Interface of the Biological, Mathematical, and Physical Sciences, and Engineering (BioMaPS)**
ENG will focus on nanoscale biosensing, neuro-engineering, cellular biomechanics, metabolic engineering, and engineering aspects of synthetic biology

**\$68 M for
Adv. Manu.**

**\$110 M for
CEMMSS**

**\$5 M for
BioMaPS**

ENG will strategically support better Communications and Cyberinfrastructure

- **Enhancing Access to the Radio Spectrum (EARS)**

ENG will prioritize research on more efficient radio spectrum use and energy-conserving device technologies

**\$14 M for
EARS**

- **Cyberinfrastructure for the 21st Century (CIF21)**

The ENG investment will focus on cyber–physical systems, engineering modeling and simulation, smart networks, and sensors

**\$11 M for
CIF21**

- **Secure and Trustworthy Cyberspace (SaTC)**

ENG support will focus on the engineering aspects of the Networking and Information Technology Research and Development (NITRD) strategic plan

**\$4 M for
SaTC**

Education and Workforce

- The directorate emphasizes support for
 - Expeditions in Education (E²)
 - CAREER awards
 - Activities that promote the entry and retention of veterans and other non-traditional students in engineering programs

\$1 M for E²

**\$53 M for
CAREER**

NSF Investments in Workforce

Primary focus: Enhancements to Flow (*all levels*)

- K12 Pre-college programs – EHR, EEC, RET
- Recruitment of undergraduate Engineers
 - GI Bill, PEEC
- Encouragement to pursue Graduate degrees
 - REU
- Support during graduate studies
 - GRF, IGERT
- Support for transition to Academia and Industry
 - Innovation Fellows, BRIGE, CAREER



ENG will continue its long-standing support for Interdisciplinary Research

- **INSPIRE (Integrated NSF Support Promoting Interdisciplinary Research and Education)**

ENG will support creative, important research collaborations between disciplines that may lead to new opportunities

**\$6 M for
INSPIRE**

- **Emerging Frontiers of Research and Innovation (EFRI)**

ENG will provide strategic support for fundamental research that may overcome scientific and/or national challenges and lead to breakthrough technologies

**\$32 M for
EFRI**

ENG will invest heavily in Sustainability and Clean Energy

- **Science, Engineering, and Education for Sustainability (SEES)**

ENG's investment will focus on sustainable research networks, sustainable chemistry, and human dimensions

**\$20 M for
SEES**

- **Clean Energy Technologies**

ENG will support novel research for smart grid technologies, solar energy technologies, biofuels and bioenergy, wind energy generation, and renewable energy storage

**\$128 M for
Clean Energy**

ENG will invest strategically in the Innovation Ecosystem

- **Innovation Corps (I-Corps)**

The ENG investment will provide mentoring and resources to help determine the commercial readiness of technology built on NSF-funded basic research

\$6 M for I-Corps

- **Partnerships for Innovation**

- ENG support for Accelerating Innovation Research (AIR) will foster connections with an existing NSF innovation research alliance
- ENG support for Building Innovation Capacity (BIC) will enable collaboration between academia and business to advance basic research for market-accepted innovations

\$23 M for PFI

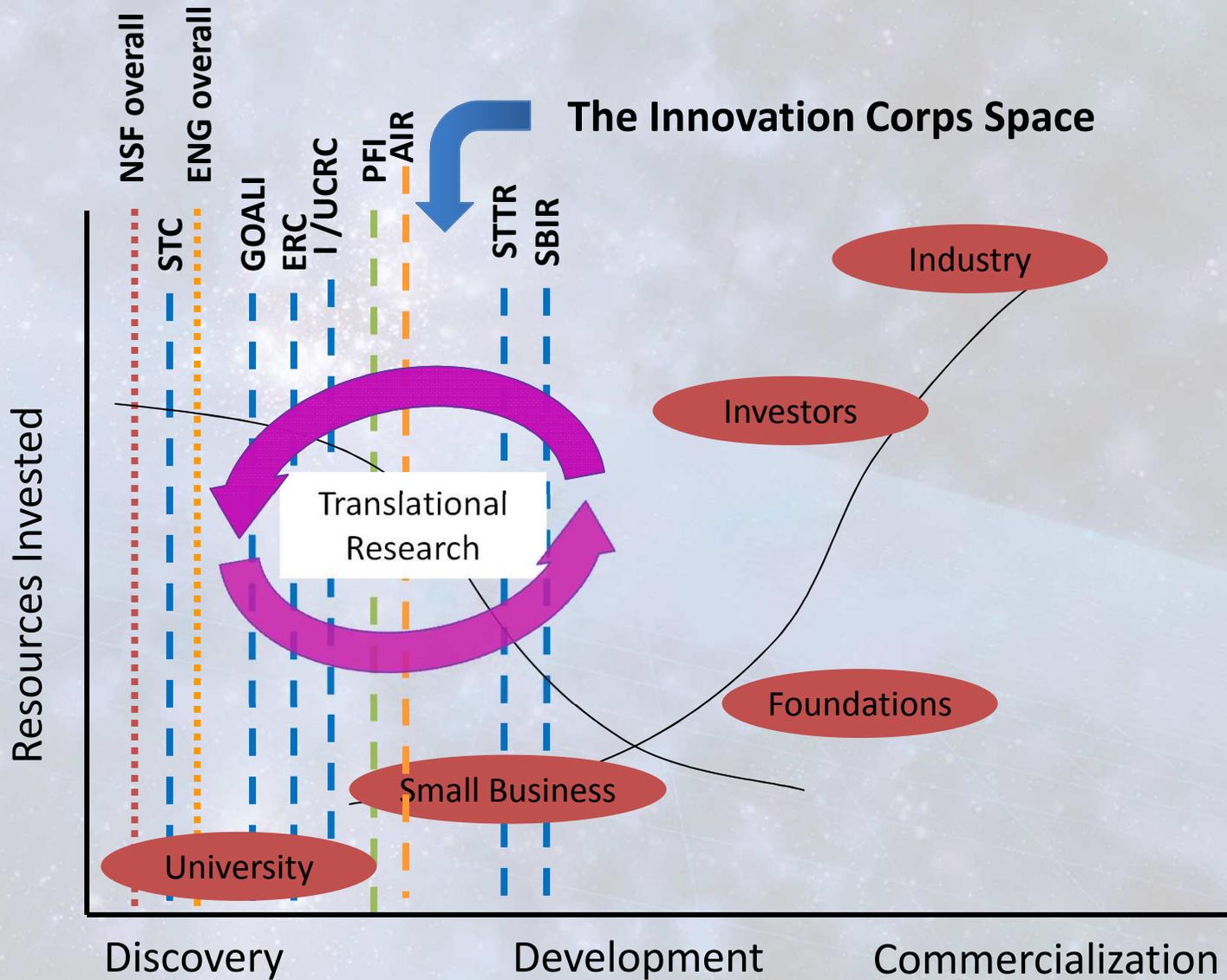
Research Centers

**\$69 M for
ERCs**

- Engineering Research Centers (ERCs)
 - EEC will continue support for the first class of Nanosystems ERCs from FY 2012 and 17 others
- Science and Technology Centers (STCs)
 - CBET will continue supporting the Center on Emergent Behaviors of Integrated Cellular Systems
 - ECCS will continue supporting the Center for Energy Efficient Electronics Science

**\$10 M for
STCs**

NSF Innovation Investments



I-Corps in A Nutshell

- **A Public/Private Partnership:** to support the translation of NSF research into the development of technologies, products and processes
- **Increasing Network Opportunities:** aims to help create a national network scientists, engineers, innovators, business leaders and entrepreneurs building on existing NSF grantee events
- **Supporting NSF Strategy:** I-Corps will enhance our nation's economic competitiveness by “reaching out to a range of communities that play complementary roles in the innovation process and are essential to ensuring the impact of NSF Investments.” *

**From “Empowering the Nation through Discovery and Innovation” NSF Strategic Plan, April 2011*



I-Corps Projects are Team-Based

- Team Composition:
 - Entrepreneurial Lead: Post-doc or Student to move it forward
 - I-Corps Mentor: Domain-relevant volunteer guide
 - PI: Researcher with current or previous award
- Program Outcomes
 - Functioning network of Mentors/Advisors
 - Scientist and Engineers trained as Entrepreneurs
 - Increased impact of NSF-funded basic research



Credit: © 2011 JupiterImages Corp.

- 30 Hours of Curriculum
- \$50,000 per award
- F&A \$5,000 maximum
- 25 awards in FY2011
- 100 awards in FY2012

NSF Career-Life Balance Initiative



Announced at the White House on Sept. 26, 2011



Career Life Balance

- **Deferral of grants for child birth/adoption**
- **Grant suspension for parental leave**
- **Technician support for parental/family leave**

SAVI: Science Across Virtual Institutes



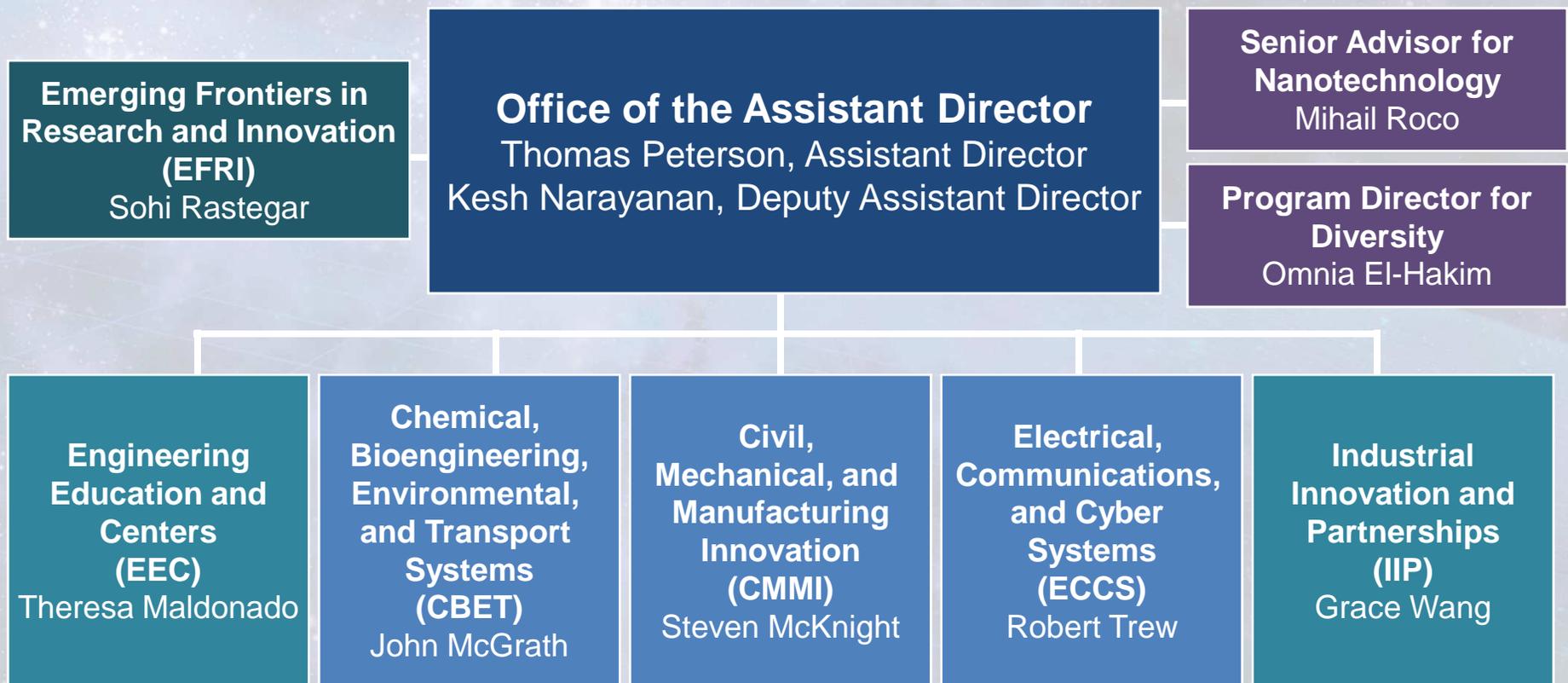
Launched October 5, 2011



Science Across Virtual Institutes (SAVI)

- Create a uniform platform for International Collaborations between NSF funded US researchers and other institutions around the world.
- Facilitate collaboration among scientists, engineers and educators across the globe to help solve society's most vexing problems.
- Early pilots VIs:
 - Mathematical and Statistical Sciences (VI-MSS) with India
 - Physics of Living Systems Student Research Network (PoLS SRN) with Israel and others
 - Wireless Innovation (WiFiUS) with Finland

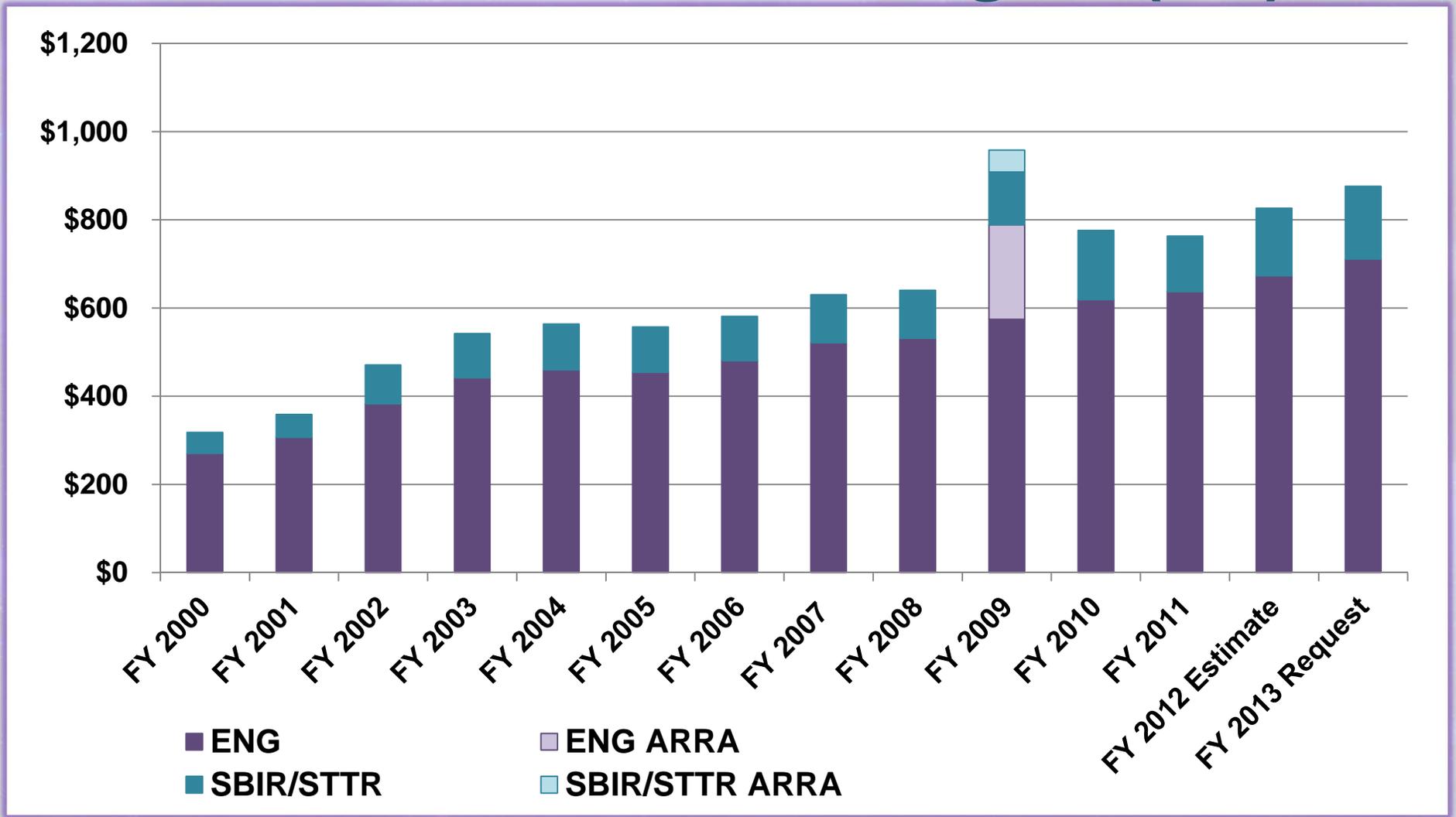
NSF ENG Organization



ENG Budget (\$M)

	FY 2011 Actual	FY 2012 Estimate	FY 2013 Request	Change over FY 2012 Estimate	
				Amount	Percent
CBET	\$158.82	\$171.45	\$179.40	\$7.95	4.6%
CMMI	189.62	203.58	217.06	13.48	6.6%
ECCS	97.54	106.73	114.30	7.57	7.1%
EEC	125.76	120.00	123.27	3.27	2.7%
IIP	162.65	193.41	210.30	16.89	8.7%
SBIR/STTR	126.47	152.76	165.20	12.44	8.1%
EFRI	28.95	31.00	32.00	1.00	3.2%
ENG TOTAL	\$763.33	\$826.17	\$876.33	\$50.16	6.1%

ENG and SBIR/STTR Budgets (\$M)





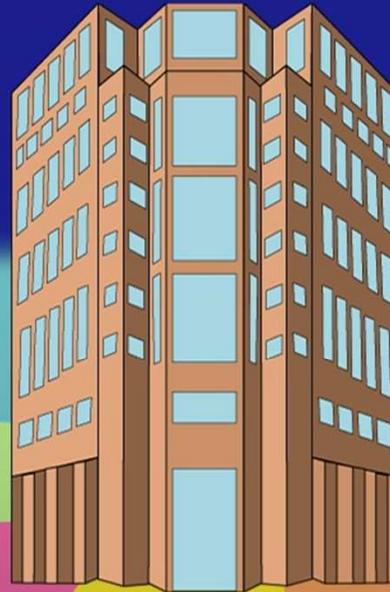
OneNSF



catalyze human capital development



improve
organizational
efficiency



create
networks and
infrastructure
for the nation

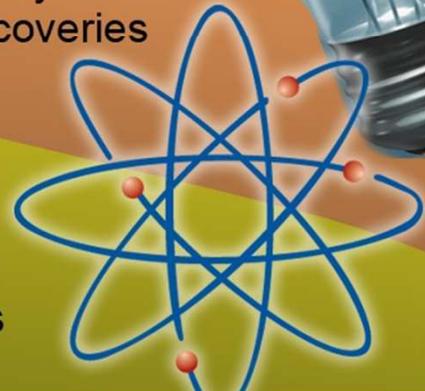


spark greater innovation
and opportunity for
scientific discoveries



address
multidisciplinary
challenges of
national/global significance

support
fundamental
research in
all disciplines



Questions