Unleashing American Innovation

Walter G. Copan, Ph.D.
Under Secretary of Commerce for Standards and Technology & Director, National Institute of Standards and Technology (NIST)

APRIL 24, 2018
To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.
NIST and Joint Institute Locations

- NIST Headquarters
- National Cybersecurity Center of Excellence
- Institute for Bioscience & Biotechnology Research
- Joint Institutes for Quantum and Computer Science
- NIST Boulder & JILA
- Hollings Marine Lab
- Brookhaven National Lab
- Joint Institute for Metrology in Biology
- NIST Hawaii Atomic Clock Signal Station

NIST Centers of Excellence for
- Forensic Science
- Disaster Resilience
- Advanced Materials
Technology Development & Transfer

World-Leading Scientific and Engineering Research

Manufacturing Extension Centers

Advanced Manufacturing National Program Office
NIST is launching an ambitious plan to enable greater “Return on Investment” from the Federal government’s $150 billion annual investment in R&D.
VISION: Unleash the innovation power of America into our economy

GOAL: Maximize the transfer of federal investments in science and technology into value for America

• promote innovation, U.S. economic growth and national security
• attract greater private sector investment to create innovative products, processes, services, as well as new businesses and industries
Unleash
ROI Initiative Objectives

• Identify critically needed improvements to Federal technology transfer efforts

• Seek broad input from Federal R&D, intellectual property and technology transfer stakeholders
• Core technology transfer principles and practices to protect, adapt or change.
• Improve efficiency and reduce regulatory burdens.
• Attract private sector investment in later-stage R&D, commercialization and advanced manufacturing.
• New public-private partnering models for technology development and maturation.
• Reduce/eliminate barriers, accelerated commercialization in areas of strategic national importance.
• Improve metrics and methods to evaluate outcomes and impacts.
• Significantly increase technology transfer success from the Federal sector, universities and research organizations.
ROI Timeline and Milestones

**February / March**
- Initial key stakeholder meetings to engage industry and academic stakeholders
- NIST website for information and updates

**April / May / June**
- Unleash American Innovation Symposium
- Request for Information in Federal Register
- Public Forums announced in Federal Register

**July / August / September**
- Analysis
- Interagency review
- Recommendations (practices, policies, regulatory, legislative)
- Initiate implementation of action plan
Announcement of RFI and Public Forums will be distributed widely

ROI Initiative Information available at

www.nist.gov/tpo/ROI
The Science Budget in 2018: An Update

Matt Hourihan
April 24, 2018
For the Engineering Public Policy Symposium
AAAS R&D Budget and Policy Program
http://www.aaas.org/rd
Elements in recent play:

- The Budget Deal (the Bipartisan Budget Act of 2018). Which leads into...
- FY 2018 omnibus – good year for research!
- FY 2019 budget and appropriations: new White House budget, and where we might be headed
Composition of the Proposed FY 2019 Budget

Total Outlays = $4.4 trillion

outlays in billions of dollars

Net Interest $363
Defense Discretionary $618
[Defense R&D] $60
Nondefense Discretionary* $563
[Nondefense R&D]* $63
Social Security $1,047
Medicare $625
Medicaid $412
Other Mandatory $656

*Totals do not include last-minute additions of several billion dollars in response to passage of the Bipartisan Budget Act of 2018.
Source: Budget of the United States Government FY 2019. Projected deficit is $984 billion. © AAAS 2018
Limits on **NONDEFENSE** Spending

Estimated percent change from 2017, inflation adjusted

*Current caps last through 2021. Based on past and current budget resolutions, the Budget Control Act and subsequent legislation, and the FY 2019 OMB summary tables. © AAAS 2018*
Omnibus Notes

- ~11% increase for Research
  - Largest since Recovery Act
  - Excluding stimulus: largest in 15 years

- NSF: +5% for research
- DOE big winner
  - Office of Science: +16%
    - Priorities include exascale, fusion, user facilities
    - ARPA-E and other programs saved, tech boosted
- DOD: science and tech +6%
  - DARPA +6%
  - Navy basic research: +10.5%
  - Manufacturing programs among priorities
    (including National Defense Education Program)

- Other winners: Planetary science, competitive ag grants, NIH, NNSA, DHS S&T
- Climate/environmental research programs protected, and in some cases boosted
- More than $3 billion for opioids research, surveillance, response (CDC, NIH, SAMHSA, Justice, FDA, etc)

Estimated R&D by Type in FY 2018 Appropriations
percent change from FY 2017 estimates, nominal dollars

* Using old definition, including DOD 6.7 account as R&D. The new official definition excludes this account from R&D. Based on OMB and agency data, and AAAS estimates from FY 2017 and FY
Limits on **NONDEFENSE** Spending

Estimated percent change from 2017, inflation adjusted

- Pre-Sequester Caps
- Sequester Caps
- Actual Caps w/ Congress Adjustments
- Future Caps (Current Law)*
- Original Budget Before Revisions

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- Future Caps (Current Law)*
- President's FY 2019 Budget
- Original Budget Before Revisions

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Select Science & Tech Agencies and Programs in the FY 2019 Budget

Estimated percentage change from FY 2018 enacted omnibus, nominal dollars

- DOD S&T
- NIH
- NSF
- DOE Science
- NOAA Research
- USDA R&D
- DHS S&T
- EPA S&T
- NIST
- DOE Tech*

*Includes renewables and efficiency, nuclear, fossil, grid research, cybersecurity, ARPA-E. | AAAS
Quick Notes on FY19 Proposed Budget

- FY 2018 omnibus makes the FY 2019 budget request look a lot worse!

- **DOE**: Another big increase for exascale computing research; other basic science reduced
  - Technology: ARPA-E terminated (again), deep cuts for efficiency and renewables (again); priorities include small modular reactors, advanced coal

- **NSF**: research cut 3% compared to omnibus; two vessels instead of three; “10 Big Ideas”
  - Success rate, awards to drop; social science targeted

- **NASA**: WFIRST terminated, Science cut by 5% (especially Earth Science); moon projects and commercial space

- **NIH**: Consolidates AHRQ, NIOSH, NIDILRR to bring NIH to 30 institutes; $750m for opioids research
  - Salary capped at 90%, lowered to $152k from $187k

- **Manufacturing Institutes**: of the 14 existing institutes:
  - Five DOE institutes de-funded (and no future institutes)
  - Eight DOD institutes, one NIST institute (biomanufacturing) funded
  - These generally were protected in the FY 2018 omnibus

- **Infrastructure plan**: $45 million proposed in FY19, plus another $155 billion over nine years

- Multiple agencies: Climate and environment broadly targeted
- Coming soon: the return of trillion-dollar deficits?
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How much does all this matter?
Looking Ahead

- FY 2019: Hurry up and wait, again
  - Will probably be OK year, but certainly less generous than FY 2018 given spending caps
    - Only a 3% increase allowed for nondefense overall in FY19, versus the 12% jump in FY18
  - White House budget in many areas likely ignored, again. But...
  - Won’t be finalized until late fall given midterms? Or later?

- FY 2020: cap negotiations one more time
  - Who controls Congress next year?
  - Will widening deficit impact the negotiations?
Select Science & Tech Agencies/Programs in FY 2018 Appropriations

Estimated percentage change from FY 2017 enacted levels, nominal dollars

Based on the FY 2018 budget request, the FY 2017 omnibus, and current appropriations.

*Includes renewables and efficiency, nuclear, fossil, grid research, ARPA-E. **Flat in omnibus.
Limits on NONDEFENSE Spending

Estimated percent change from 2017, inflation adjusted

*Current caps last through 2021. Based on past and current budget resolutions, the Budget Control Act and subsequent legislation, and the FY 2019 OMB summary tables. © AAAS 2018
Figure 2-1.

**Outlays, by Category**

Percentage of Gross Domestic Product

Under current law, rising spending for Social Security and Medicare would boost mandatory outlays.

Total discretionary spending is projected to fall as a share of gross domestic product as outlays grow modestly in nominal terms.

At the same time, growing debt and higher interest rates are projected to push up net interest costs.

Source: Congressional Budget Office, using data from the Office of Management and Budget.
For more info...

mhouriha@aaas.org
202-326-6607
http://www.aaas.org/rd
An interagency team building partnerships with U.S. industry and academia
The U.S. leads the world in innovation and inventions, but the manufacturing capabilities and new products get developed in other countries instead.

“Embracing technological innovation and speeding adoption are critical for U.S national security and economic competitiveness.”
Manufacturing USA Strategic Goals

VISION
U.S. global leadership in advanced manufacturing

MISSION
Connecting people, ideas, and technology to solve industry-relevant advanced manufacturing challenges, thereby enhancing industrial competitiveness and economic growth and strengthening our national security.

PROGRAM GOALS

<table>
<thead>
<tr>
<th>Competitiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Advancement</td>
</tr>
<tr>
<td>Workforce Development</td>
</tr>
<tr>
<td>Technology Sustainability</td>
</tr>
<tr>
<td>Institute Metric Category</td>
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<tr>
<td>---------------------------</td>
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<tr>
<td>Impact to U.S. Innovation Ecosystem</td>
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<td>Technology Advancement</td>
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<tr>
<td>Development of an Advanced Manufacturing Workforce</td>
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Metric 1: Impact to U.S. Innovation Ecosystem - Membership

1,291 members (FY 2017)

+50% increase in membership over 2016

65% from industry
  o 65% are small and medium-sized manufacturers

297 universities, community colleges, and other academic institutions

150 federal, state, and local government agencies, federal laboratories, and not-for-profits

Membership breakdown of 12 institutes in FY 2017
Metric 2: Financial Leverage

More than **1.5 to 1 investment match** (FY 2017)

$298,500,00 in total institute expenditures

- 60% of institute support came from non-federal matching funds
- 40% came from federal program funds

Expenditures funded all aspects of institute operation (e.g. technology advancement projects, education and workforce training efforts, and capital equipment)
While many technology R&D projects can take several years to conclude, the high level of participation by industry and the progress in meeting technical objectives are early indicators of success.
Example Project: Composite Wind Turbine Blade

New, nine-meter (~30 foot) composite wind turbine blade created by partners

- Commercialization of this prototype projected to speed production times, reduce manufacture cost, and provide stronger, more energy-efficient blades for the U.S.

- **IACMI partners** include SMMs from across the country, Oak Ridge National Laboratory, and the Colorado Office of Economic Trade and Development

- **IACMI is a Manufacturing USA institute focused on** fiber-reinforced polymer composites based in Knoxville, Tennessee
Nearly **200,000 people** participated in institute-led advanced manufacturing workforce development training programs. **8X increase** from 2016

- **185,425 students** in institute research and development projects, internships, or training
- **4,302 workers** completed institute-led certificate, apprenticeship, or training programs
- **1,299 teachers** and trainers in institute-led training for instructors
Together we are Securing America’s Future

Making an Impact

• 14 innovation institutes develop new manufacturing techniques
  - decrease manufacturing costs; scale up; share equipment; develop standards; ensure cybersecurity for manufacturing; provide access to expertise; ensure industry leadership

• ~300 collaborative R&D projects

• 200,000 people trained in advanced manufacturing

• 1 billion federal investment matched by over $2 billion non-federal funds
NSF Mission

“to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense...”
**RESEARCH IDEAS**

<table>
<thead>
<tr>
<th>Harnessing Data for 21st Century Science and Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work at the Human-Technology Frontier: Shaping the Future</td>
</tr>
<tr>
<td>Windows on the Universe: Multi-messenger Astrophysics</td>
</tr>
<tr>
<td>Quantum Leap: Leading the Next Quantum Revolution</td>
</tr>
<tr>
<td>Navigating the New Arctic</td>
</tr>
</tbody>
</table>

**PROCESS IDEAS**

<table>
<thead>
<tr>
<th>Mid-scale Research Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF 2026</td>
</tr>
<tr>
<td>Growing Convergence Research at NSF</td>
</tr>
<tr>
<td>NSF INCLUDES: Enhancing STEM through Diversity and Inclusion</td>
</tr>
</tbody>
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**NSF Big Ideas**

“... bold questions that will drive NSF's long-term research agenda — questions that will ensure future generations continue to reap the benefits of fundamental S&E research.”
NSF Engineering Research Centers

2017

CELL-MET
NSF Engineering Research Center for Cell Manufacturing Technologies

CSTAR
NSF Engineering Research Center

CMaT
NSF Engineering Research Center

PATHS-UP
NSF Engineering Research Center

2018

Planning Grants for Engineering Research Centers (ERC)

PROGRAM SOLICITATION
NSF 18-549

National Science Foundation
Directorate for Engineering
Engineering Education and Centers

Full Proposal Deadline(s) (due by 5 p.m. submitter’s local time):
June 06, 2018
Convergence Accelerator Concept

0: Team Seeding
- Organic or through structured workshops
- Multi-disciplinary
- Diverse membership

1: Team Formation
- Cohorts of ~20 teams in several tracks
- ~6 months
- Ideation
- Convergence
- Team dynamics

2: Accelerated Research
- Large grants to selected teams
- Semi-annual or annual reviews
- Maintain cohort structure

NSF PIs, partners, basic research results,

Prize(s)

Compete

Review

Pitch
AMO Vision and Mission

**VISION:** U.S. global leadership in sustainable and efficient manufacturing for a growing and competitive economy.

**MISSION:** Catalyze research, development and adoption of energy-related advanced manufacturing technologies and practices to drive U.S. economic competitiveness and energy productivity.

**MULTI-YEAR PROGRAM PLAN:**
- Describes the Office mission, vision, and goals
- Identifies the technology, outreach, and crosscutting activities the Office plans to focus on over the next five years.
AMO Success Indicators

- Validate selected advanced manufacturing technologies and deploy practices that improve manufacturing energy productivity by 25% by 2025 as compared to a 2015 average technology baseline.

- Advance materials and manufacturing technologies with the potential to reduce lifecycle energy by 50% by 2025 compared to the 2015 state-of-the-art.

- Establish partnerships resulting in 30,000 U.S. manufacturing facilities implementing AMO-recognized energy management products, practices and measures by 2025.

- Double supported technical education and training activities in advanced manufacturing made available for private entities, universities, community colleges, and high schools by 2025.
AMO: Three complementary strategies

Technology Partnerships: Direct engagement with Industry
Driving a culture of continuous improvement and wide scale adoption of proven technologies, such as CHP, to reduce energy use in the manufacturing sector

R&D Consortia: Public-Private consortia model
R&D Consortia offer affordable access to physical and virtual tools, and expertise, to foster innovation and adoption of promising technologies

R&D Projects: Bridging the innovation gap
Research and Development Projects to support innovative manufacturing processes and next-generation materials
Thank You

For additional information:

energy.gov/eere/amo/advanced-manufacturing-office
Office of Electricity Delivery and Energy Reliability

A Brief Overview

ASME Engineering Public Policy Symposium

Eric Lightner
Director, Federal Smart Grid Task Force
Advanced Grid Research, Office of Electricity
US Department of Energy
Office of Electricity Delivery and Energy Reliability

Advancing grid modernization to ensure a strong, secure, and prosperous America

- Securing the Nation’s grid
- Ensuring reliable and resilient electricity
- Preparing for and responding to energy emergencies
- Spurring grid innovation
Priorities for OE Moving Forward

- Puerto Rico and U.S. Virgin Islands Resiliency Efforts
- North American Energy Systems Resiliency Model
- Operational Strategy for Cyber and Physical Threats
- Mega-Watt Scale Grid Storage
- Revolutionize Sensing Technology Utilization
Advanced Grid Research Focus

- **Design and Planning Tools**: Create grid planning tools that integrate transmission and distribution system dynamics over a variety of time and spatial scales.

- **System Operations, Power Flow, and Control**: Design & test technologies that enhance/enable the capability to control and coordinate millions of assets for grid operations through EMS/DMS.

- **Sensing and Measurements**: Explore integrating advanced low cost sensors, communications, visualization and analytics to enable 100% observability.

- **Devices and Components**: Evaluate and develop new devices and components for improved reliability/resilience.

- **Security and Resilience**: Develop resilient and advanced security (cyber and physical) solutions and real-time incident response capabilities for emerging technologies and systems.

- **Institutional Support**: Enable regulators & utility/grid operators to make more informed decisions & reduce risks on key issues that influence the future electric grid/power sector.