The National Network for Manufacturing Innovation

A U.S. Initiative for Sustainable Collaboration

NSF Workshop on Sustainable Manufacturing:
Urgent Research Needs and Multidisciplinary Collaboration

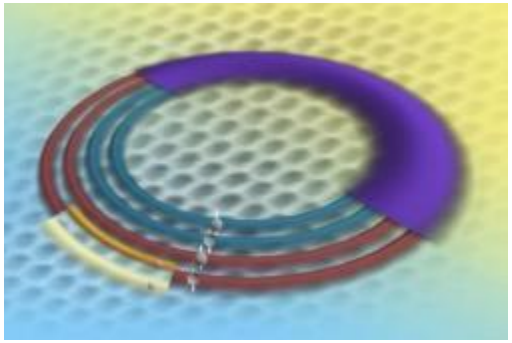
Mike Molnar
Advanced Manufacturing National Program Office
August 20, 2015

NIST's Mission

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.

- Mission focus: Targeting Investments to Advance U.S. Innovation and Boost Economic Recovery
- Deep research expertise underpins technological innovation – e.g. lasers, memory, GPS, wireless
- Non-regulatory status enables important role as a convener that facilitates collaboration between industry and government

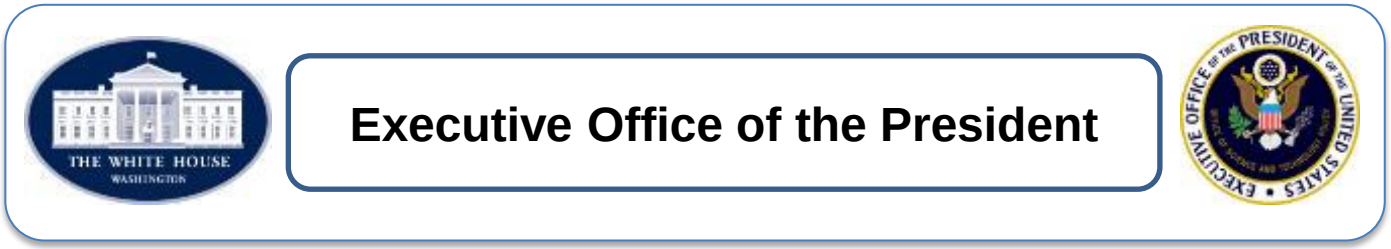
Cybersecurity: Improved response to cyber threats



Nanomanufacturing: New measurement tools for advanced materials manufacturing

Energy: Measurements and standards for energy security

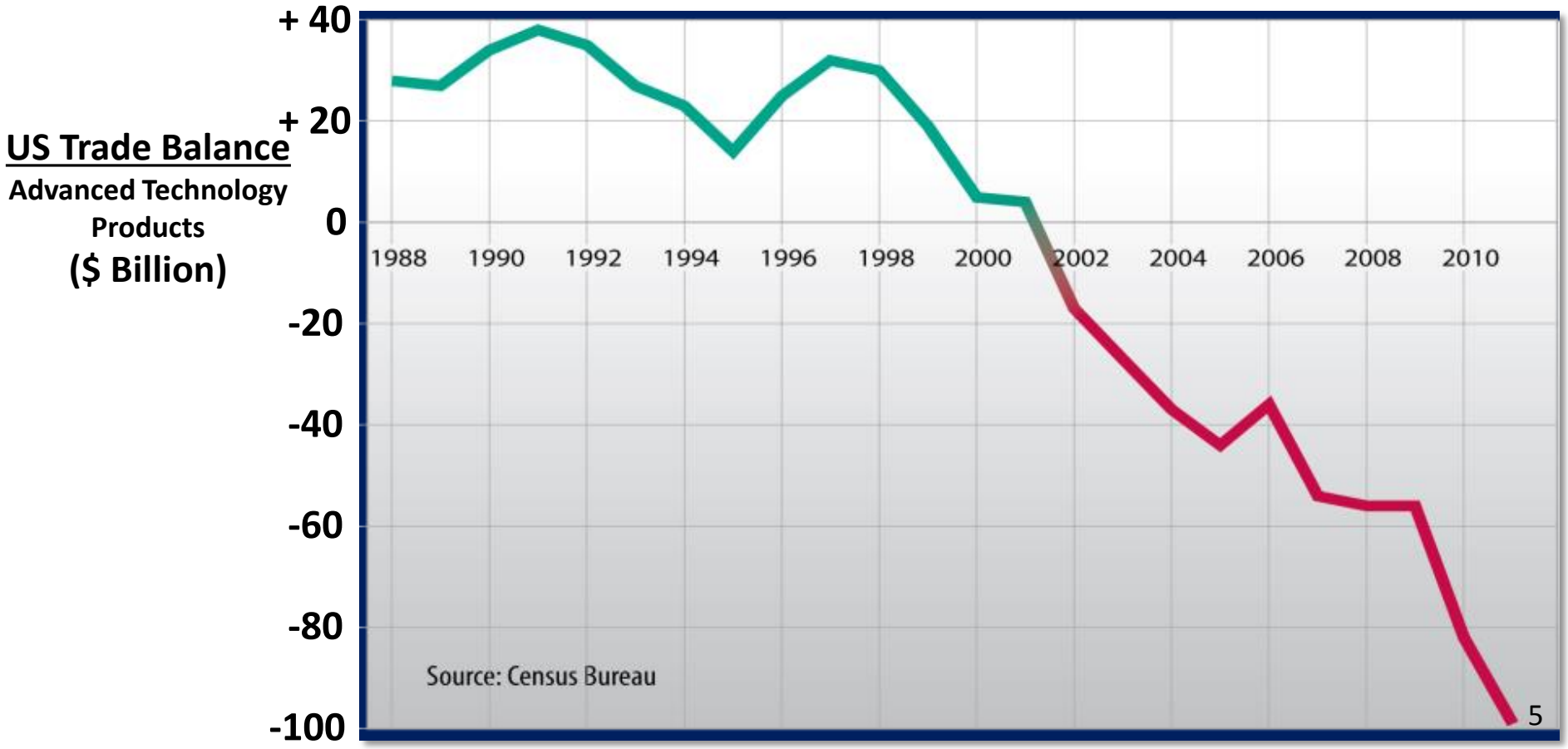
Interagency Advanced Manufacturing National Program Office
(hosted by DOC/NIST)



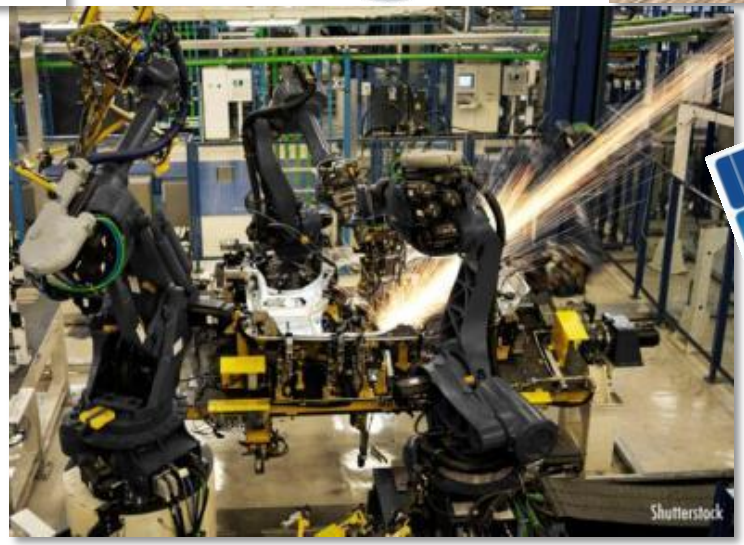
PCAST AMP and Manufacturing

Challenge: US losing leadership in Advanced Products

U.S. Trade Balance for Advanced Technology Products

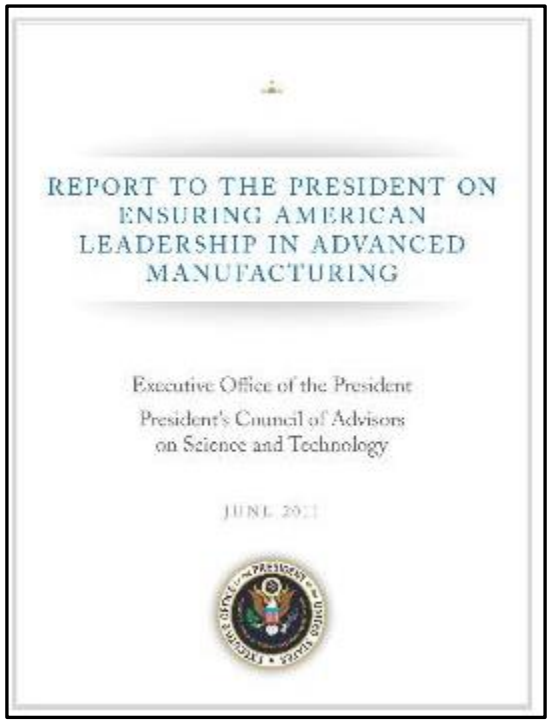


Products invented here, now made elsewhere - not driven by labor cost



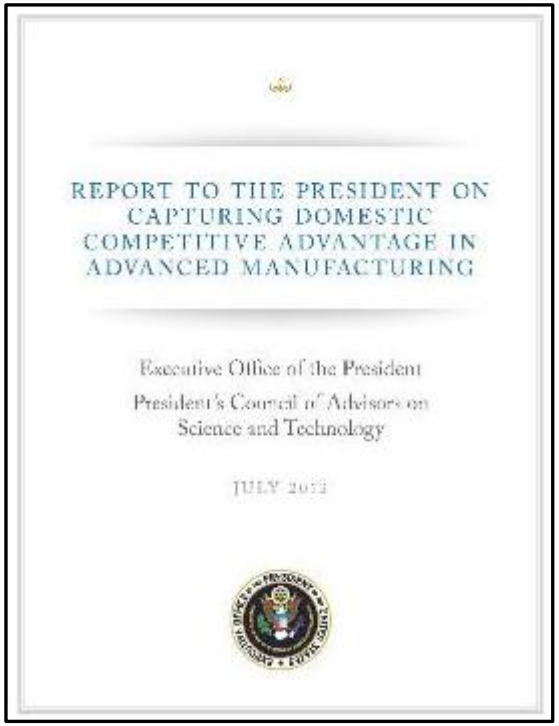
PCAST: The independent basis of NNMI

President's Council of Advisors on Science and Technology



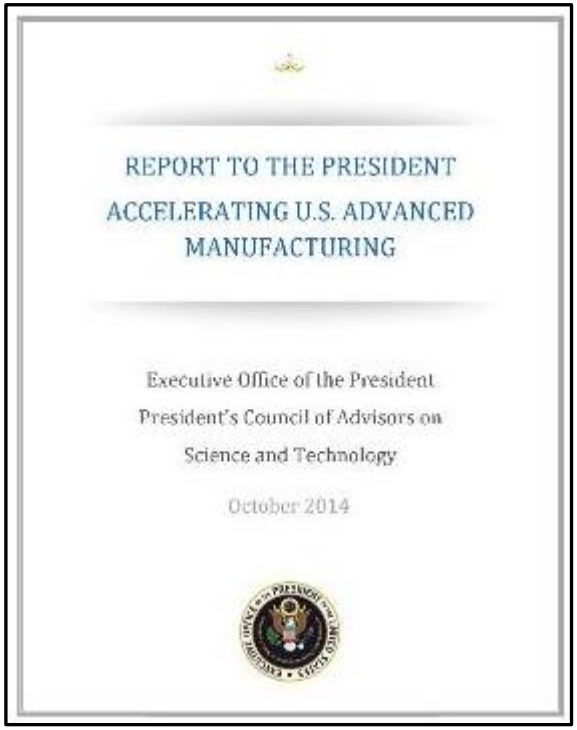
PCAST 2011

Recommends Advanced Manufacturing Initiative as national innovation policy



PCAST 2012

Recommends Manufacturing Innovation Institutes to address key market failure



PCAST 2014

Recommends strong, collaborative network of Manufacturing Innovation Institutes

PCAST Message on *HOW*….

Partnership

Industry – Academia – Government

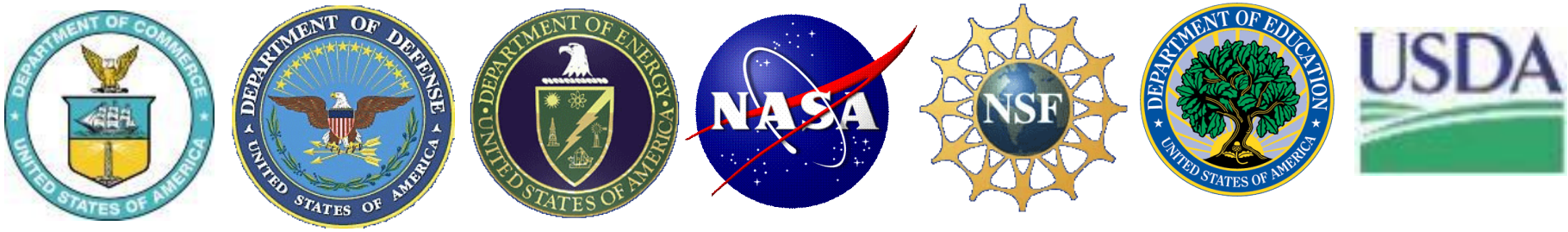
Working better, collaborating to create transformational technologies and build new products and industries

And when… NOW

We can't wait to restore US Manufacturing Leadership

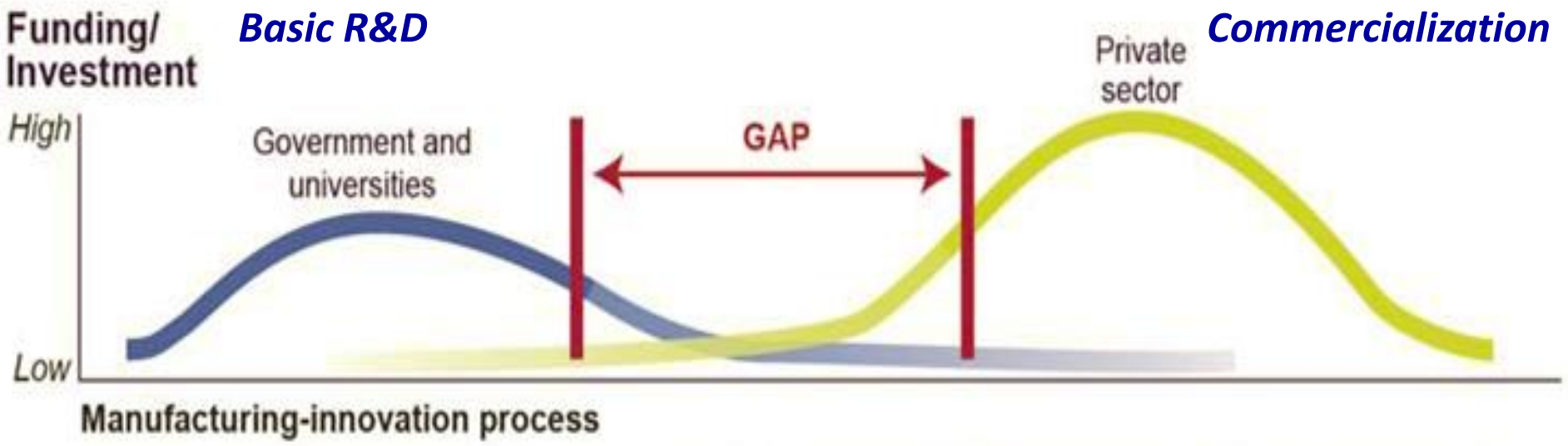
Interagency Federal Team supporting

National Network for Manufacturing Innovation



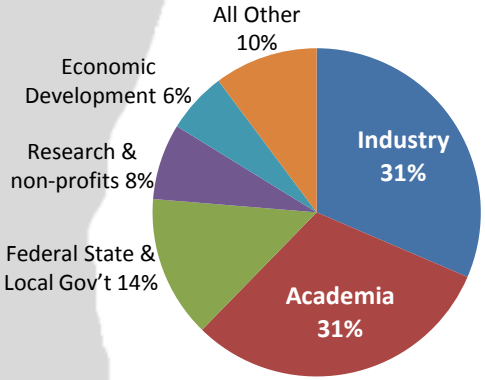
NNMI: addressing the "Scale-up" Gap

Focus is to address market failure of insufficient industry R&D in the "missing middle" or "industrial commons" to de-risk promising new technologies



Public Engagement on Design

Workshops & Request for Information



Broad & Diverse Stakeholder Input
1,200 voices on the NNMI Design!

Rensselaer Polytechnic Institute
Troy New York

Cuyahoga Community College
Cleveland Ohio

University of Colorado
Boulder, Colorado

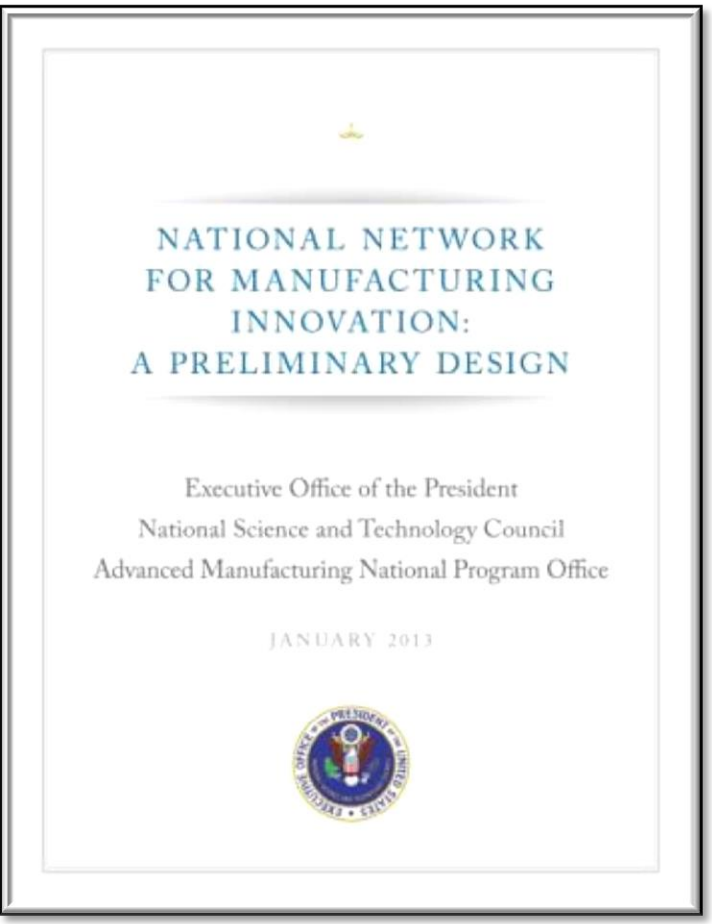
National Academies Beckman Center
Irvine California

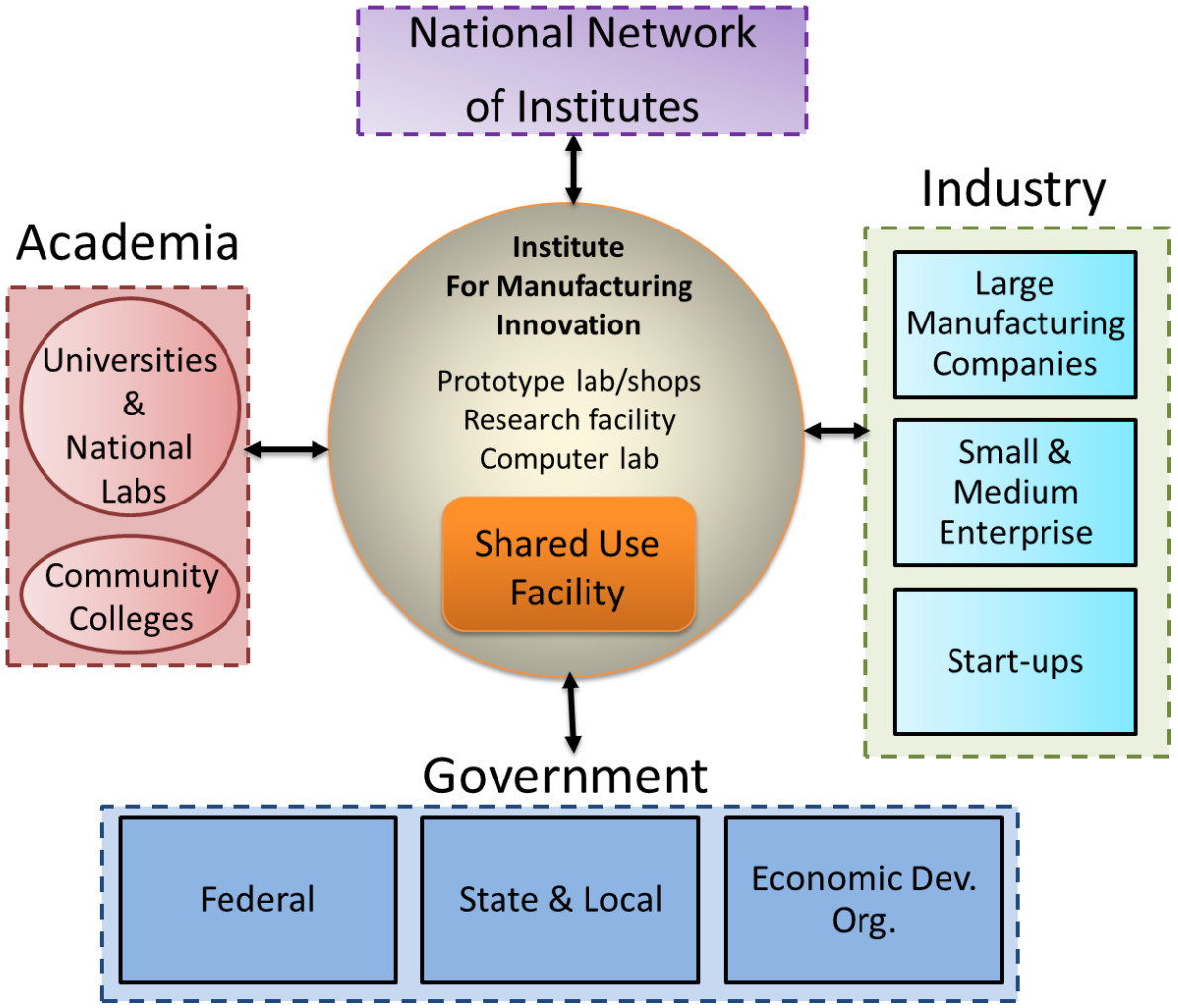
U.S. Space and Rocket Center
Huntsville, Alabama

The Institute Design

Creating the space for Industry & Academia to collaborate

White House Report
NNMI Framework Design
January 2013





The Institute Summary

Applied Research + Education/Workforce Skills + Development of Future "Manufacturing Hubs"

The Federal investment in the National Network for Manufacturing Innovation (NNMI) serves to create an effective manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems. The NNMI will consist of linked Institutes for Manufacturing Innovation (IMIs) with common goals, but unique concentrations. In an IMI, industry, academia, and government partners leverage existing resources, collaborate, and co-invest to nurture manufacturing innovation and accelerate commercialization.

As sustainable manufacturing innovation hubs, IMIs will create, showcase, and deploy new capabilities, new products, and new processes that can impact commercial production. They will build workforce skills at all levels and enhance manufacturing capabilities in companies large and small. Institutes will draw together the best talents and capabilities from all the partners to build the proving grounds where innovations flourish and to help advance American domestic manufacturing.

Federal startup investment: $70M - $120M/institute over 5 years
Institute Consortium owners must have minimum 1:1 co-investment

The NNMI Mission

"The Network serves the Institutes, the Institutes connect through the Network, and the Program serves the Nation."

Program Mission (Institutes + Network)

Advance American domestic manufacturing innovation by creating an effective manufacturing research and development infrastructure for U.S. industry and academia to solve industry-relevant problems.

Institute Mission

Create and strengthen American manufacturing hubs through sustainable industry-led innovation institutes that create, showcase, and deploy new capabilities.

Network Mission

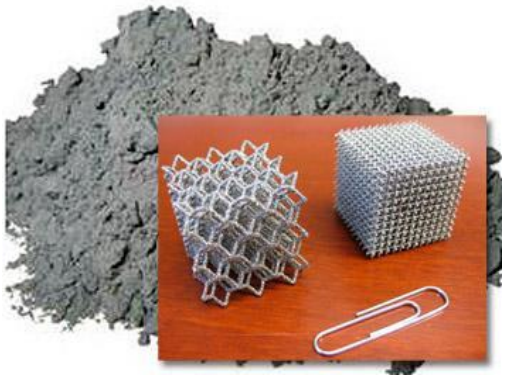
Maximize the integrated impact of the manufacturing innovation institutes on U.S. manufacturing competitiveness.

1st Institute: America Makes

Additive Manufacturing/3D Printing – Youngstown OH

Prime Awardee: National Center for Defense Manufacturing and Machining

- Initial $30M federal investment matched by $40M industry, state/local
- Strong leveraging of equipment, existing resources
- Strong business development
- Tiered membership-based model, low cost to small business and nonprofits



- **Now at $50M federal, $60M co-invested**
- **OVER 100 Participating partners!**

2nd Institute: PowerAmerica

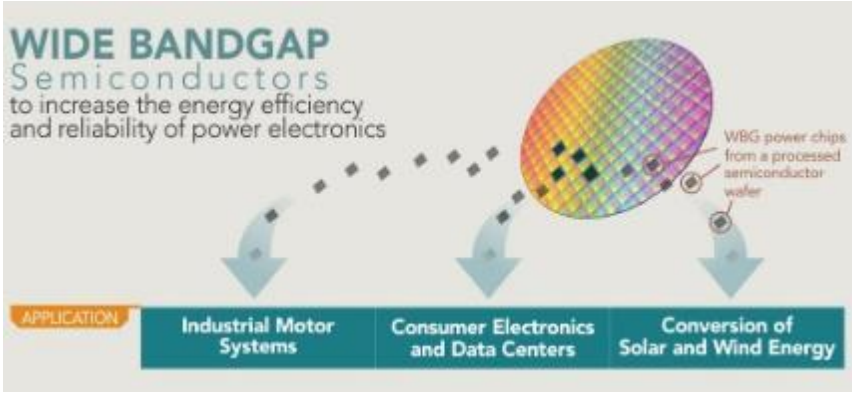
Next Generation Power Electronics, Raleigh NC

$70M public investment, $70M match

Lead: North Carolina State University

Hub Location: Research Triangle Park, NC

- **17 Industry Partners**
- **5 Universities**
- **3 Labs and Other Organizations**



Mission: Develop advanced manufacturing processes that will enable large-scale production of wide bandgap semiconductors, which allow power electronics components to be smaller, faster and more efficient than silicon.

Poised to revolutionize the energy efficiency of power control and conversion

President Obama
North Carolina State University, January 15, 2014

3rd Institute: DMDII

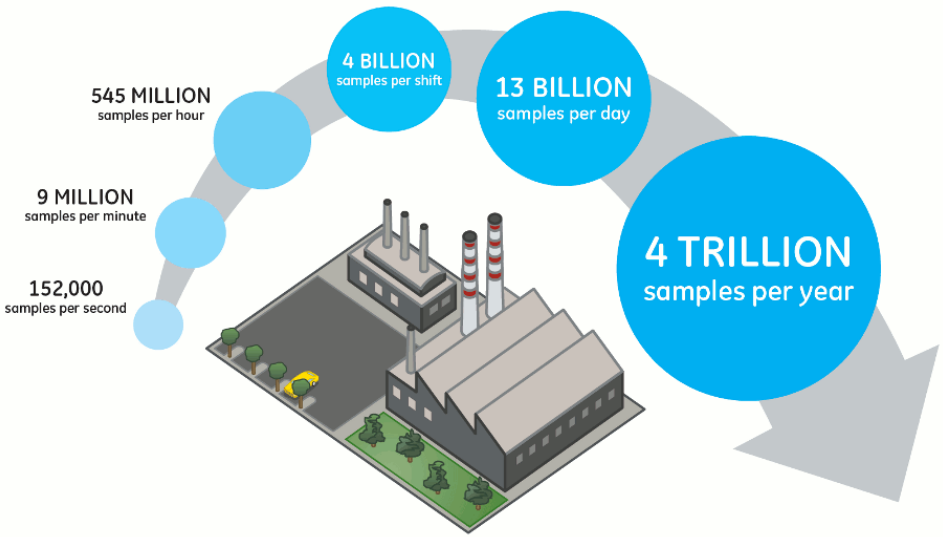
Digital Manufacturing & Design Innovation, Chicago IL

$70M public investment, ~$110M match

Lead: UI Labs

Hub location: Chicago, Illinois

- **41 Companies**
- **23 Universities and Labs**
- **9 Other Organizations**



***Mission**: Establish a state-of-the-art proving ground that links IT tools, standards, models, sensors, controls, practices and skills, and transition these tools to the U.S. design & manufacturing base for full-scale application*

4th Institute: LIFT
Lightweight and Modern Metals, Detroit MI

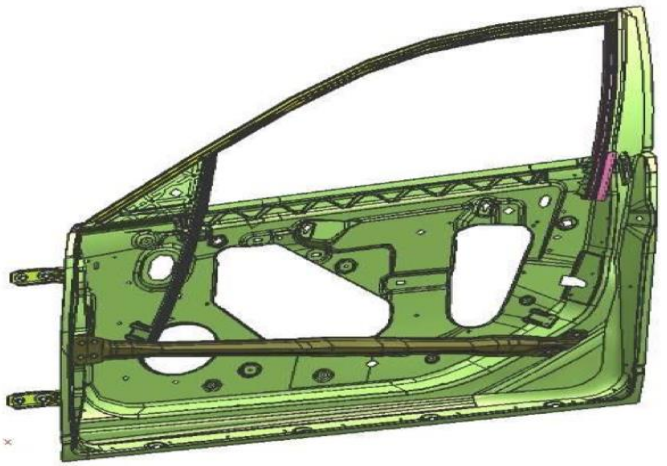
$70M public investment, $70M match

Lead: EWI

Hub location: Detroit, Michigan

Regional location: I-75 Corridor

- **34 Industry Partners**
- **9 Universities and Labs**
- **17 Other Organizations**

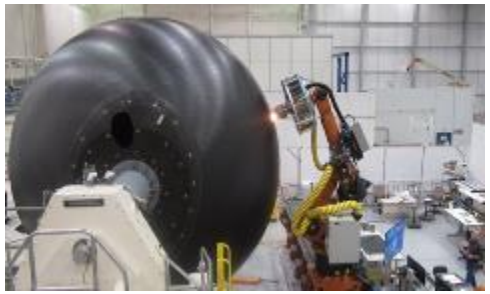


Mission: Provide the National focus on expanding US competitiveness and innovation , and facilitating the transition of these capabilities and new technologies to the industrial base for full-scale applications.

Positioned to expand the US Industrial base for new products and technologies for commercial and USG demands that utilize new, lightweight high-performing metals

5th Institute: Advanced Composites Mfg
IACMI, Knoxville TN

$70M Federal investment and more than $180 Non-Federal investment over five years



Objective

Develop and demonstrate innovative technologies that will, within 10 years, make game-changing advanced fiber-reinforced polymer composites. The Institute's negotiation is led by University of Tennessee-Knoxville. The full team includes: *57 Companies, 15 Universities and Laboratories, 14 Other Entities, w/ 36 Consortia Members.*

50% Lower cost

Using 75% Less Energy

And reuse or recycle >95% of the material

Application	Estimated Current CFC Cost	Institute CFC Cost Reduction Target (2018)[88]	CFC Ultimate Cost Target (2024)	CFC Tensile Strength	CFC Stiffness	Production Volume Cycle Time
Vehicles (Body Structures)	$26-33/kg	>35%	<$11/kg by 2025 ~60%	0.85GPa (123ksi)	96GPa (14Msi)	100,000 units/yr <3min cycle time (carbon) <5min cycle time (glass)
Wind (Blades)	$26/kg	>25%	$17/kg ~35%	1.903 GPA (276ksi)	134GPa (19.4Msi)	10,000 units/yr (at >60m length blades)
Compressed Gas Storage (700 bar – Type IV)	$20-25/kg	>30%	$10-15/kg ~50%	2.55 GPa (370ksi)	135 GPa (20Msi)	500,000 units/yr (carbon fiber)

6th Institute: Integrated Photonics
Rochester, NY

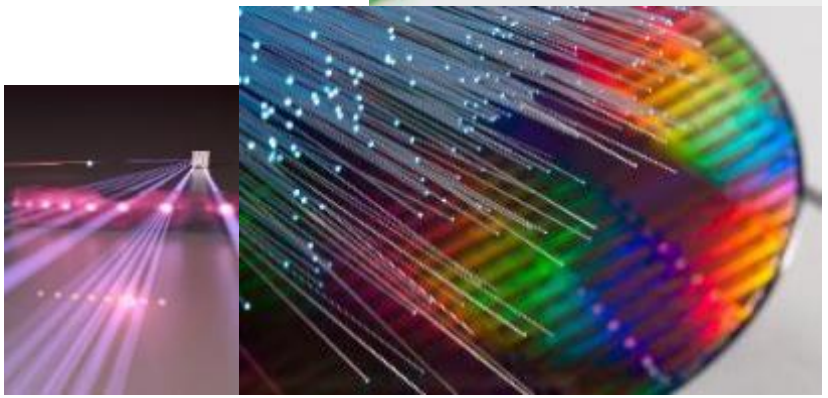
Integrated Photonics Institute for Manufacturing Innovation

- **Date Launched:** 7/27/2015
- **Founding Organization:** Research Foundation, State University of New York
- **Funding**: Federal $110m, Matching $500m
- **Partners: 75**

Objective

Develop and demonstrate innovative manufacturing technologies for:

- Ultra high-speed transmission of signals for the internet and telecommunications
- New high-performance information-processing systems and computing
- Sensors and imaging enabling dramatic medical advances in diagnostics, treatment, and gene sequencing



The NNMI Vision

"In my State of the Union Address, I asked Congress to build on a successful pilot program and create 15 manufacturing innovation institutes that connect businesses, universities, and federal agencies to ***turn communities left behind by global competition into global centers of high-tech jobs.***

"Today, I'm asking Congress to build on the bipartisan support for this idea and triple that number to 45 – ***creating a network of these hubs and guaranteeing that the next revolution in manufacturing is 'Made in America.'"***

- President Barack Obama, July 30, 2013

AP Photo/Susan Walsh

NNMI Authorized: Revitalize American Manufacturing & Innovation Act

Rep. Tom Reed
R NY-23

Rep. Joe Kennedy
D MA-4

Sen. Sherrod Brown
D Ohio

Sen. Roy Blunt
R Missouri

September 15, 2014 –
Passed House
100 Cosponsors (51D, 49R)

December 11, 2014 –
Passed Senate with 2015 Appropriations
18 Cosponsors (10D, 7R, 1I)

December 16, 2014 –
Signed By President Obama

118 Bipartisan RAMI Bill Sponsors

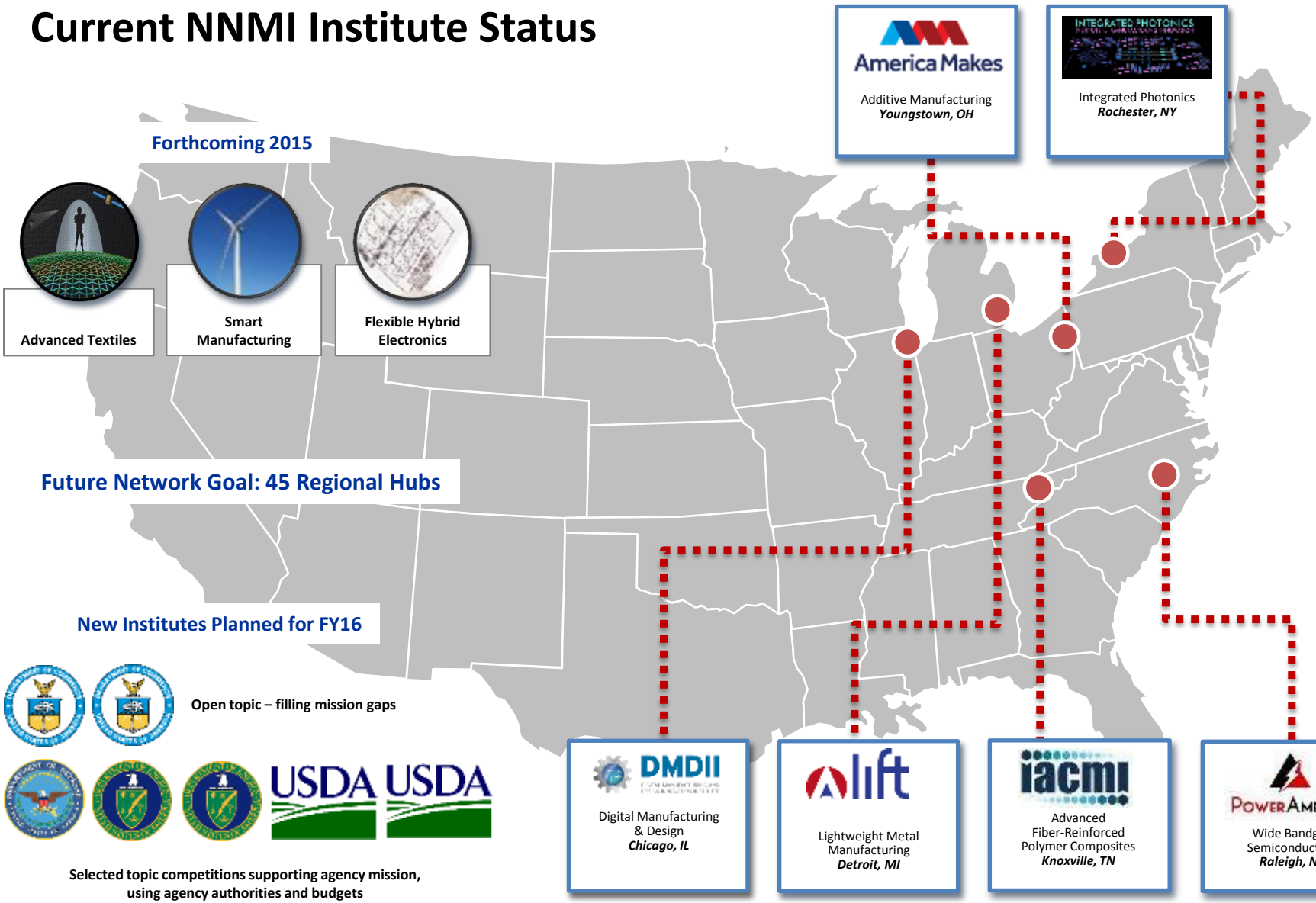
Legislative Requirements: A Call To Action

The Revitalize American Manufacturing Innovation Act (RAMI)
RAMI calls upon the U.S. Secretary of Commerce to establish:

- **The "Network for Manufacturing Innovation Program"** *(Network function)* - to convene and support a network of Institutes
- **New "Centers for Manufacturing Innovation"** *(Institutes)* - using an open topic, open competition process
- **The National Program Office at NIST** - to oversee and carry out the program *(coordination, network support, and reporting)*

Building the Network
Network Status and FY16 Plans

Current NNMI Institute Status



NNMI: Enabling a Manufacturing Renaissance
Accelerating Discovery to Application to Production

- Establish a presence, at scale, in the "missing middle" of advanced manufacturing research
- Create an Industrial Commons, supporting future manufacturing hubs, with active partnering between all stakeholders
- Emphasize/support longer-term investments by industry
- Combine R&D with workforce development and training
- ***Overarching Objective: Unleash new U.S. advanced manufacturing capabilities and industries – for stronger global competitiveness and U.S. economic & national security***

Consortium for Advanced Manufacturing Foresights

Consortium for Advanced Manufacturing Foresights

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505203

What It Is

- A response to the Advanced Manufacturing Partnership 2.0 (AMP 2.0) recommendation #2:
  - ***"Create an Advanced Manufacturing Advisory Consortium*** *to provide coordinated private-sector input on national advanced manufacturing technology research and development priorities."*

Why It Matters

- Provides private sector technical input to interagency initiatives and programs
- Build an "advanced manufacturing community" for all stakeholders
- Provides a new conduit for connections and collaboration

NSF

NIST National Institute of Standards and Technology U.S. Department of Commerce

Advanced Manufacturing Foresights Consortium
Structure and Funding

- Support and oversight
  - NSF Cooperative Agreement, no cost-match required
  - NSF and NIST will coordinate oversight, with participation of other interested agencies
  - NSF and NIST funds base operations, up to $2 million/year
- Base operations
  - Establishment and maintenance of a standing committee that will meet approximately two times per year and whose members can be called upon for advice and to support the recruitment, guidance, and oversight of rapid response studies.
  - Operational staff and related expenses for management of logistics, recruitment of experts, and publication of studies.
- Funding period
  - Initial funding period will be 3 years, renewable based on progress
- Additional funding
  - Partners will be expected to secure incremental funding for individual studies from interested USG agencies, either single or multiple agencies.
- Timing
  - Solicitation published – 4/22/15
  - Proposal review Panel - 8/10-8/11
  - Proposal due date – 7/20/15
  - Award – September, 2015

NSF

NIST National Institute of Standards and Technology U.S. Department of Commerce

Thank you

Connecting with the

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