NNMI: The Power To Advance U.S. Manufacturing

NNMI Overview

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

2016 NIST NNMI Institute Competition

Proposers' Day, March 8, 2016

The National Need

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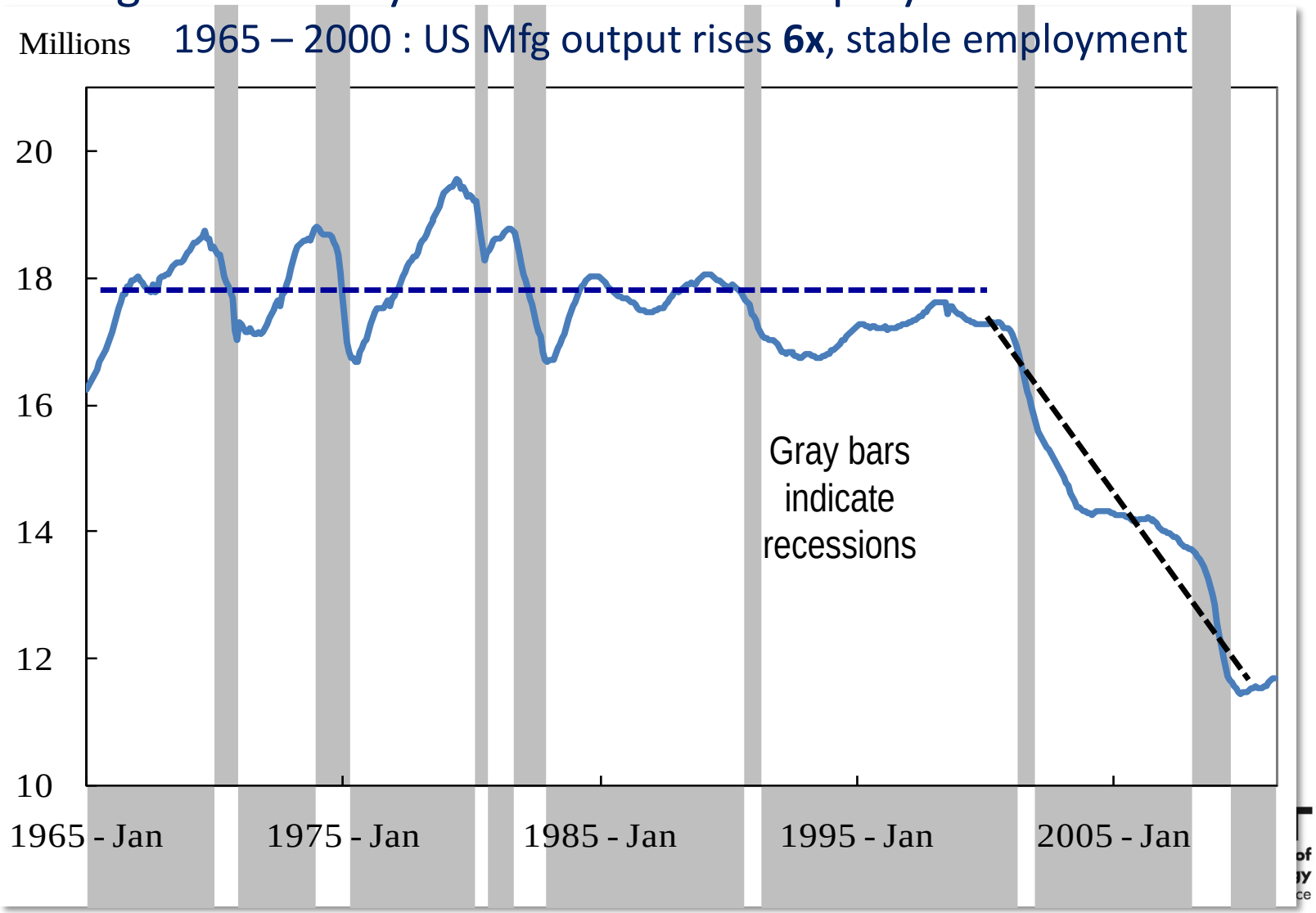
A sea change in U.S. Manufacturing Employment

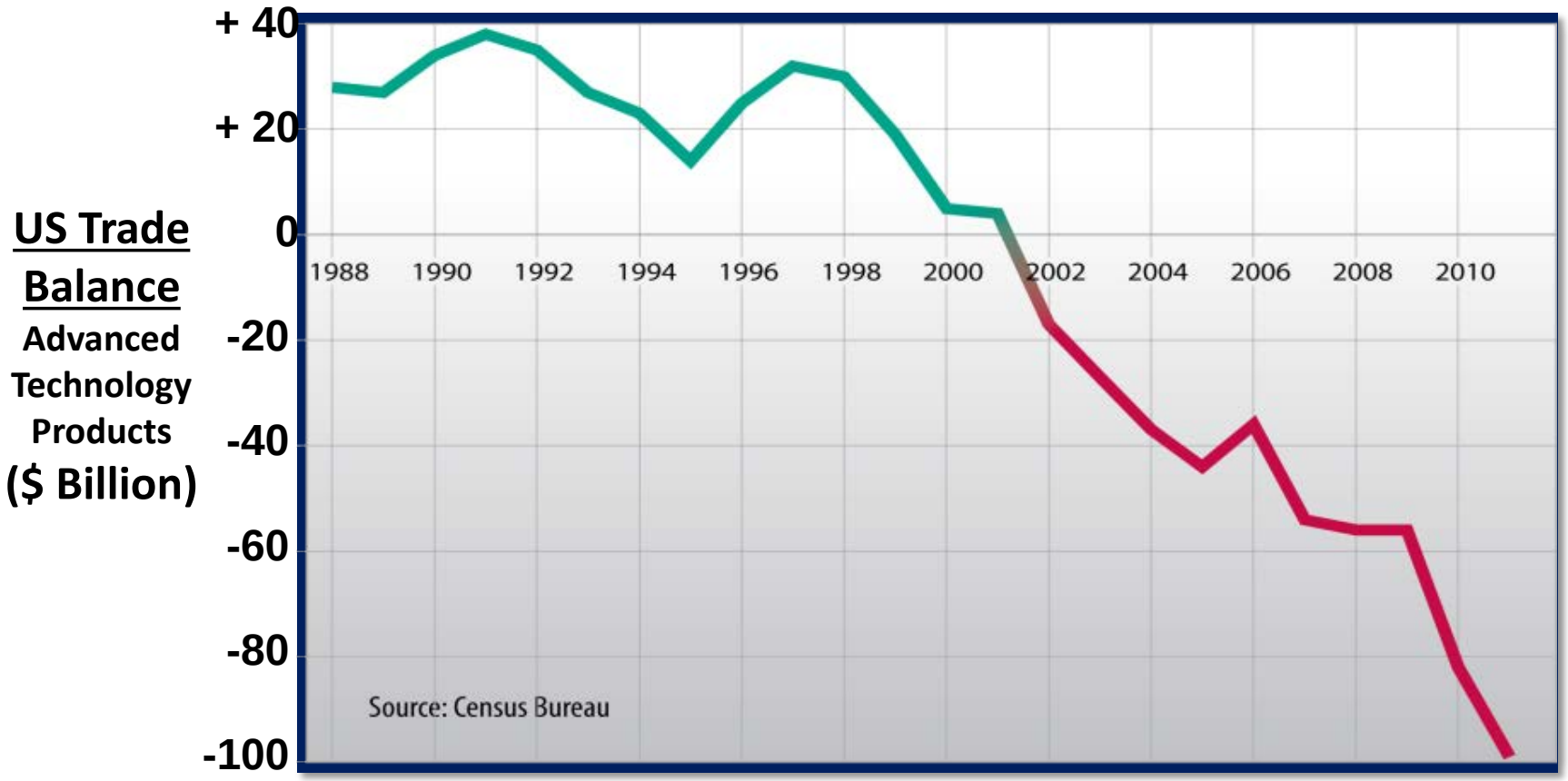
Rising Productivity does ***not*** create employment losses



The National Need

Beyond Commodity Manufacturing – U.S. losing leadership in Advanced Products

U.S. Trade Balance for Advanced Technology Products



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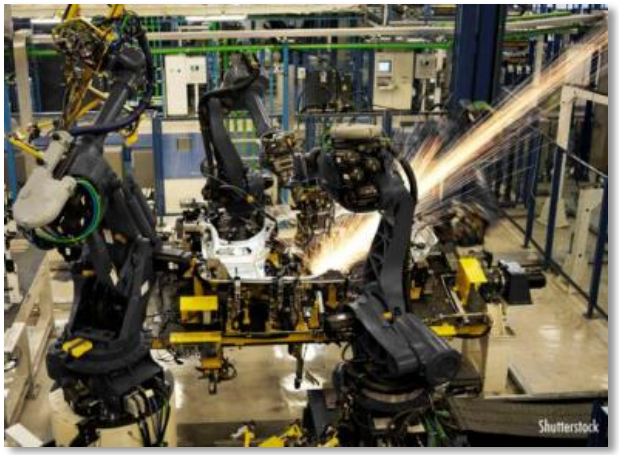
Products invented here, now entirely made elsewhere

Not driven by labor cost



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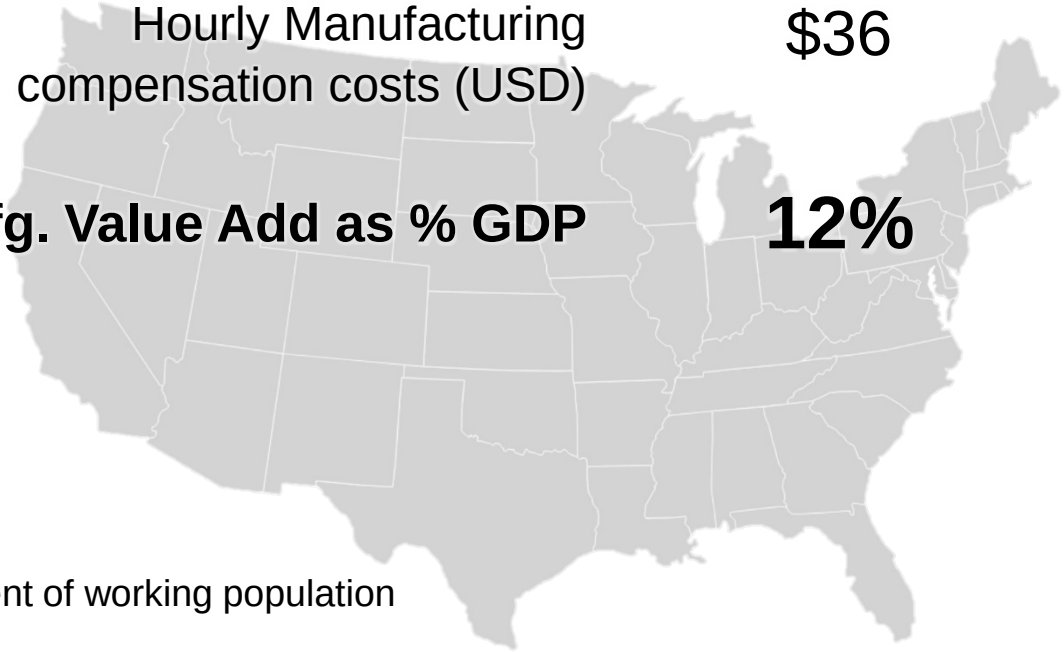
Competitiveness depends on Productivity, Technology Leadership, and Innovation

One comparison

	United States	Germany
Total Population	314 million	80 million
Hourly Manufacturing compensation costs (USD)	$36	$46
Mfg. Value Add as % GDP	**12%**	**23%**



Map of Germany with States - Single Color by FreeVectorMaps.com

* Percent of working population

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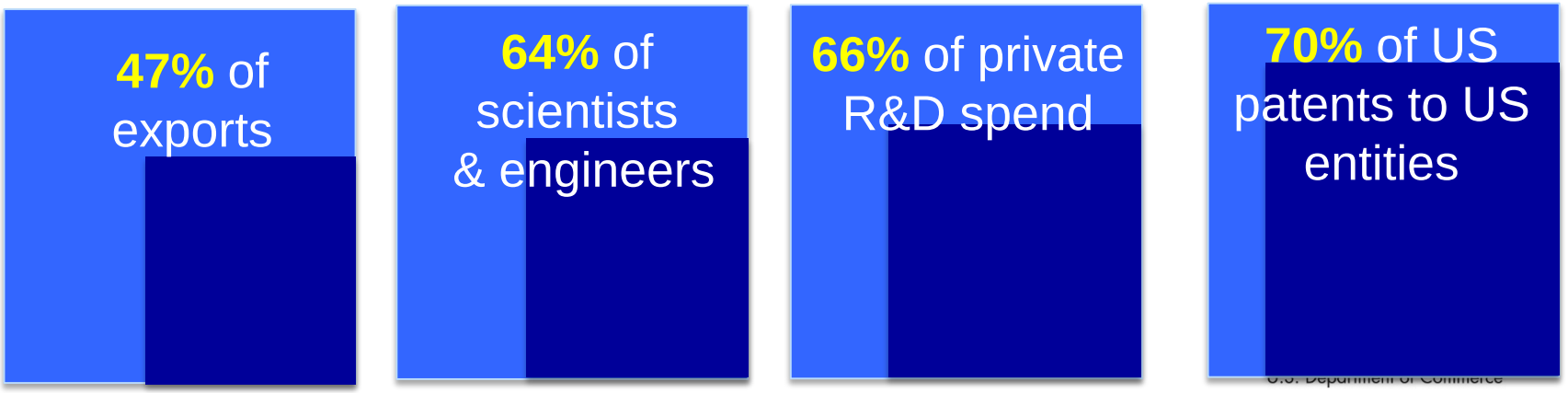
Advanced Manufacturing plays a special role in U.S. Innovation Ecosystem

Where you make it… matters!

Manufacturing "punches above its weight" for

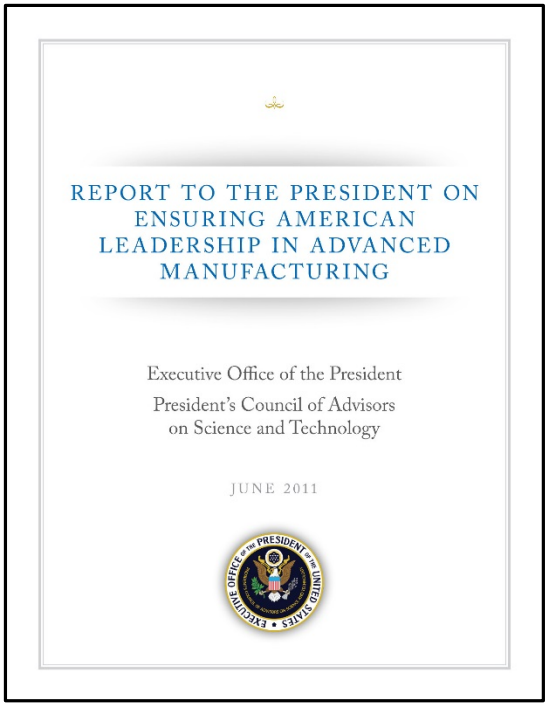
1. Economic Impact
2. High paying Jobs Impact
3. Innovation Ecosystem Impact



The National Need

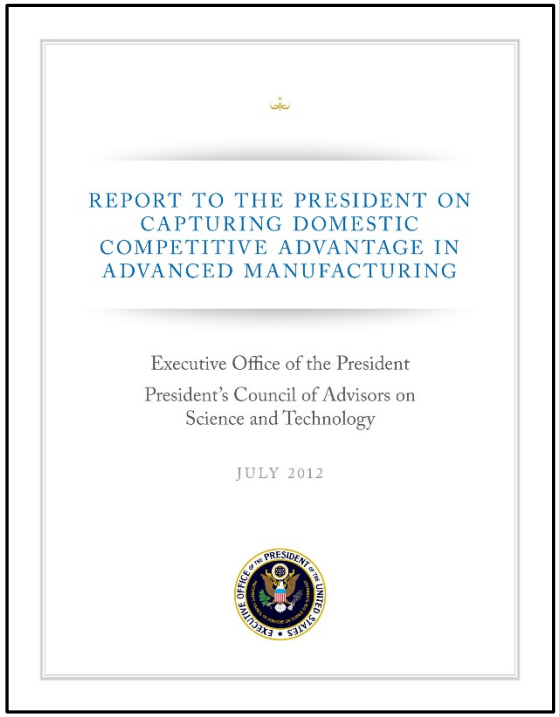
PCAST: The Independent Basis of NNMI

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

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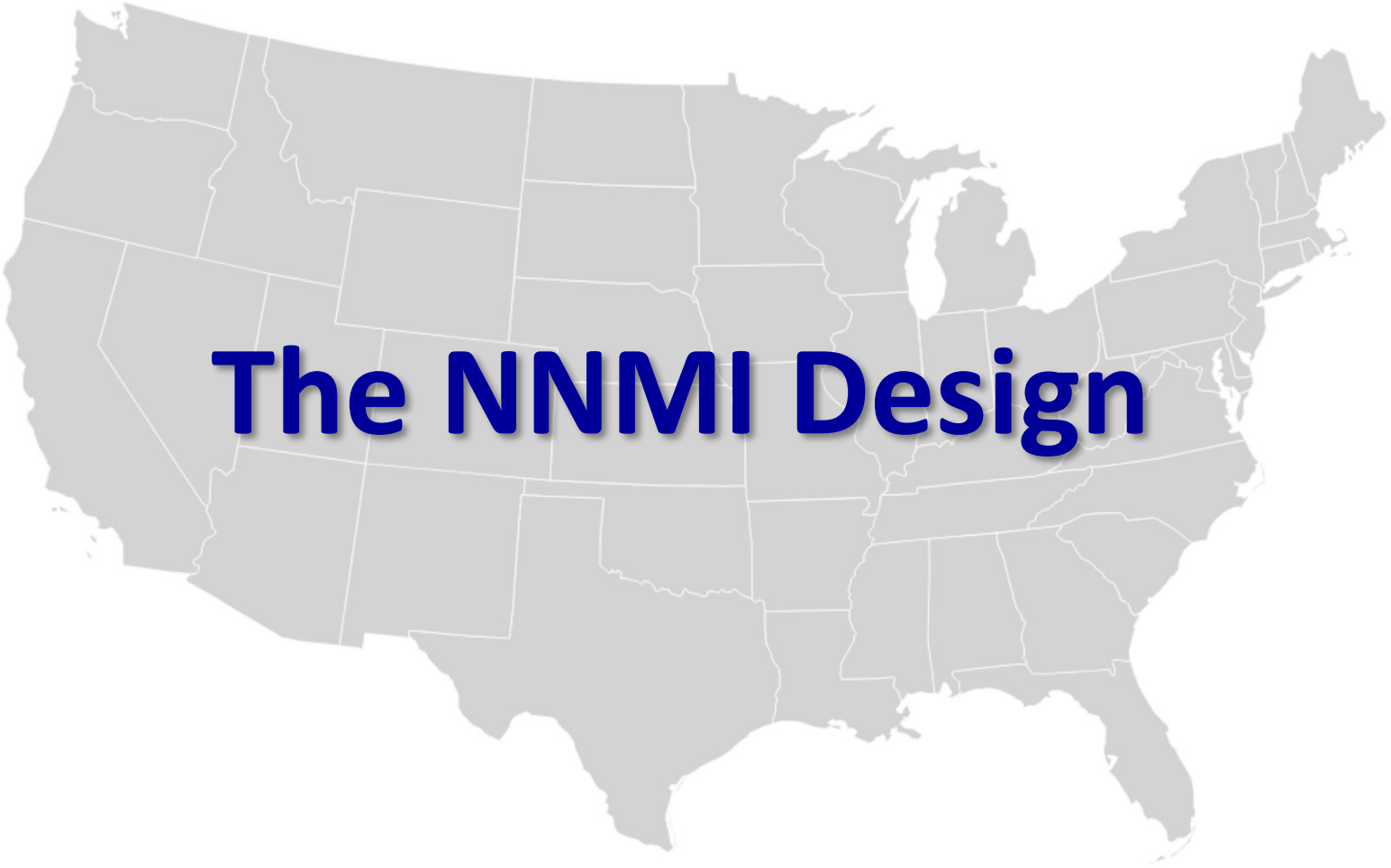
Unprecedented three successive PCAST reports to the President

Common message on HOW

Partnership

Industry – Academia – Government

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



The NNMI Design

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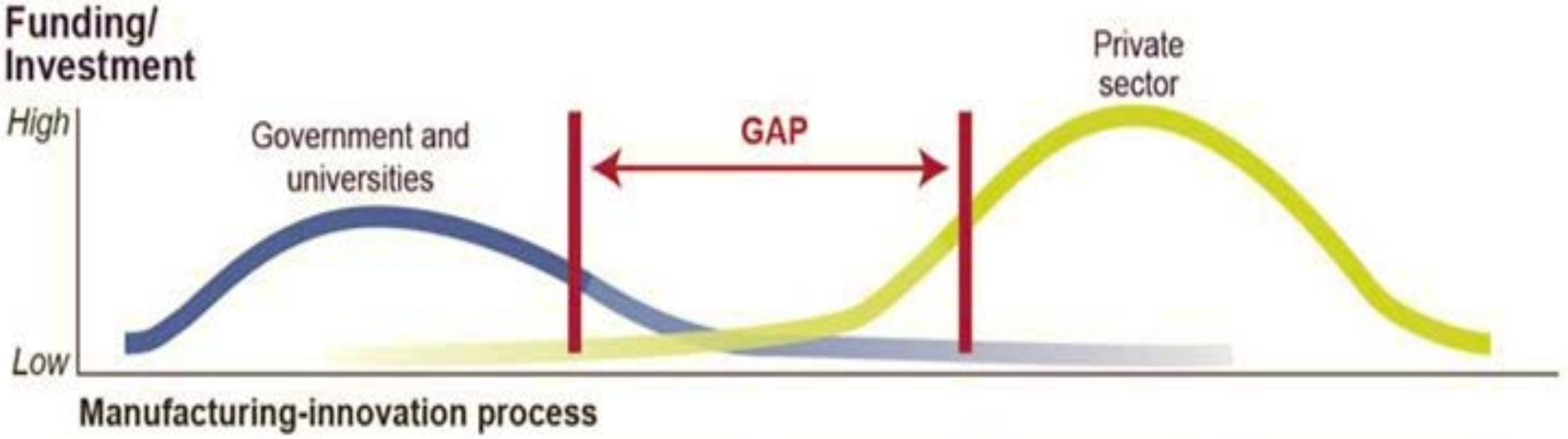
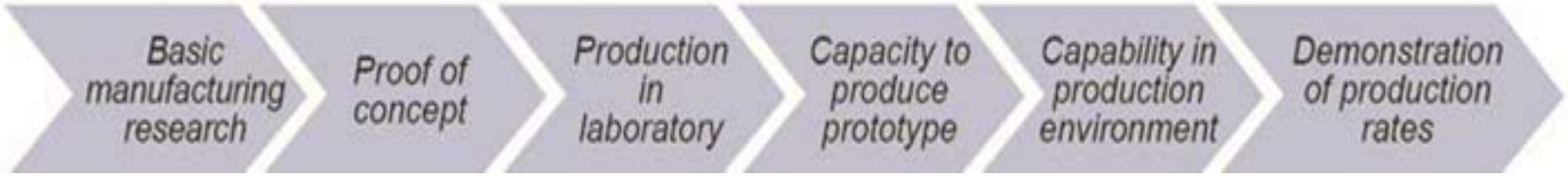
NMMI Design

NNMI Focus – Addressing the "Scale-up" Gap

Focus is to address market failure of insufficient industry R&D in the "missing middle" to ***de-risk/speed-up promising new technologies***

AND address the ***education and workforce gaps*** *on these technologies*

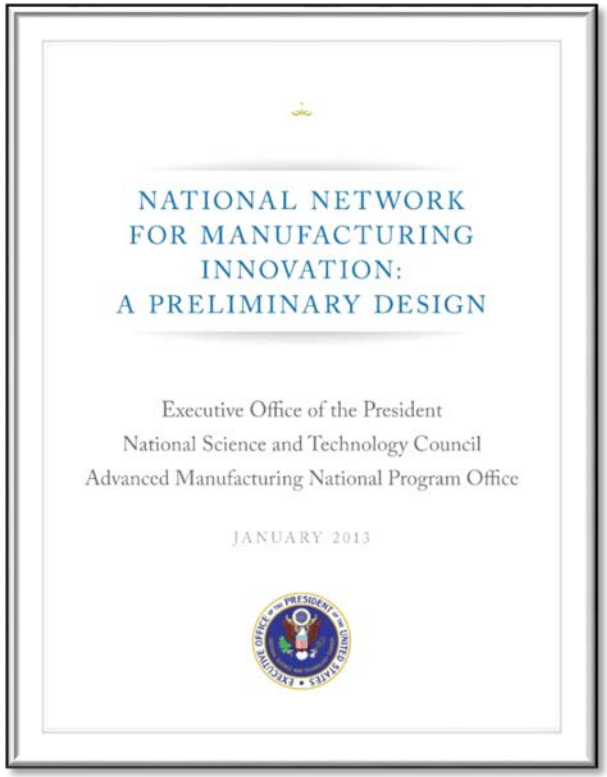




NMMI Design

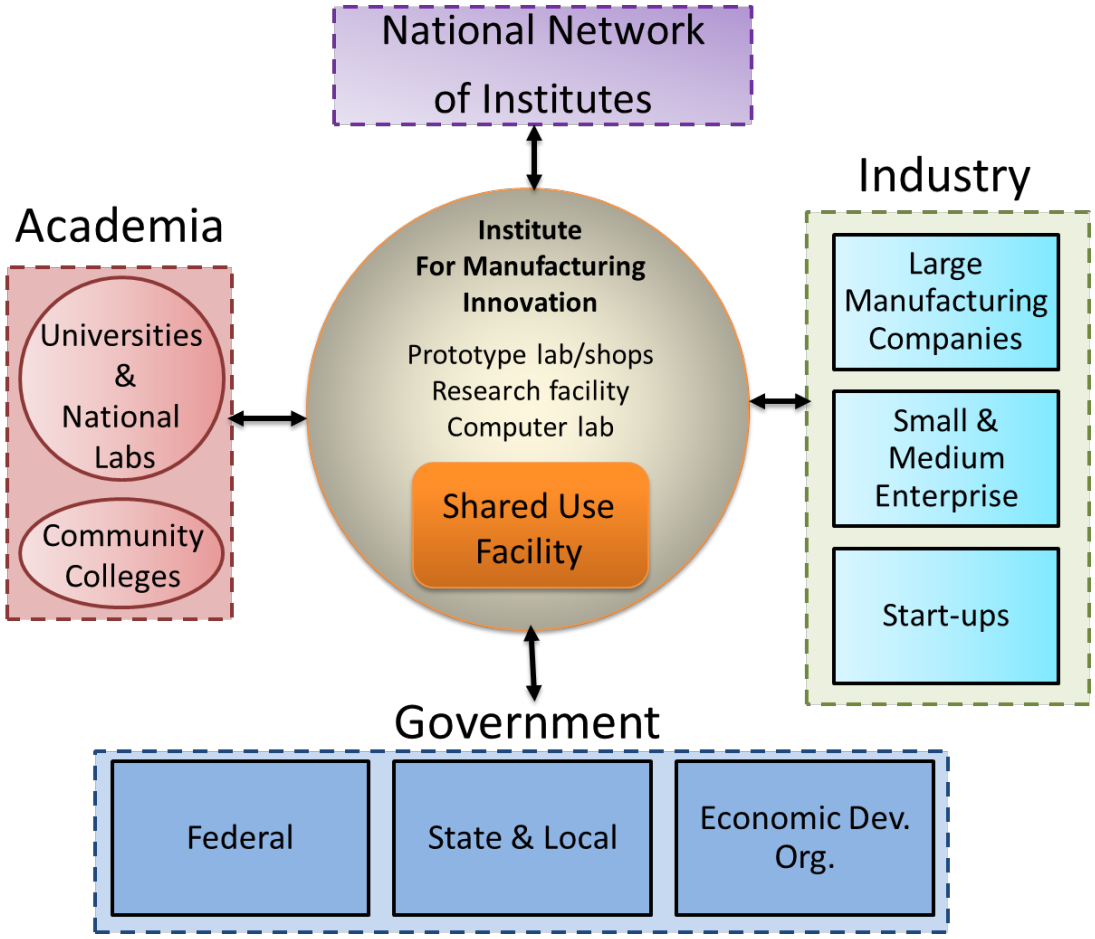
NNMI is a "Private-Public" Partnership

White House Report
NNMI Framework Design
January 2013


NATIONAL NETWORK FOR MANUFACTURING INNOVATION: A PRELIMINARY DESIGN

Executive Office of the President
National Science and Technology Council
Advanced Manufacturing National Program Office

JANUARY 2013



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NMMI Design

NNMI "elevator speech" – the twin mission

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 5-7 years
Institute Consortium owners must have minimum 1:1 co-investment

NMMI Design

NNMI Institute Major Activities

Applied Research & Demo projects for

- reducing cost/risk on commercializing new tech.
- Solving pre-competitive industrial problems

Tech Integration - Development of innovative methodologies and practices for supply chain integration

Small/Medium Enterprises

- Engagement with small and medium-sized manufacturing enterprises

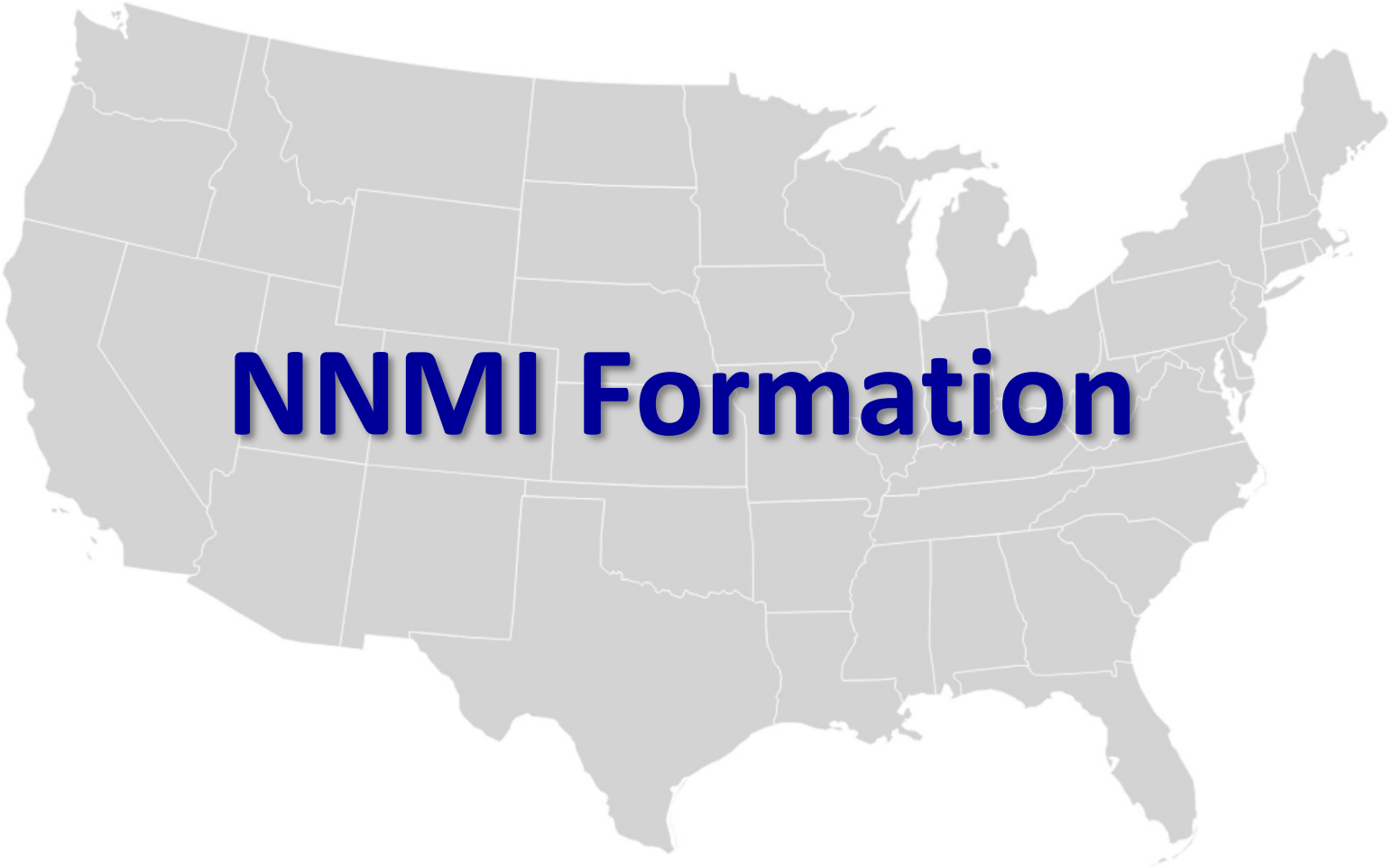
Institute

Education, technical skills and Workforce development

Education and training at all levels for workforce development

2016 NIST NNMI Institute Competition

Proposers' Day, March 8, 2016



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NNMI Formation

"Sparking this network of innovation across the country, it will create jobs and will keep America leading in manufacturing…"

President Obama

March 9, 2012

- President asks Congress to authorize initial network of up to 15 Manufacturing Innovation Institutes
- President directs Agencies to work together on Pilot Institute, while designing Institutes with input from Industry and Academia

NMMI Formation

Current Institute Status

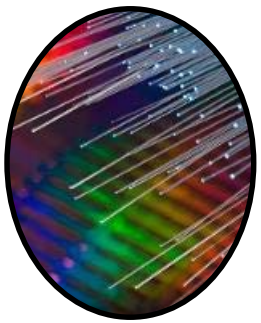
America Makes
Additive Manufacturing
DOD–Youngstown OH

DMDII
Digital Mfg & Design Innovation
DOD – Chicago IL

LIFT
Lightweight & Modern Metals
DOD – Detroit MI

PowerAmerica
Power Electronics Manufacturing
DOE – Raleigh NC

IACMI
Adv. Composites Manufacturing
DOE – Knoxville TN



Integrated Photonics
DOD-
Rochester NY

Flexible Hybrid Electronics
DOD
Solicitation

Smart Manufacturing
DOE
Award TBA

Revolutionary Fibers & Textiles
DOD
Award TBA

Open-Topic
NIST
Solicitation

NNMI Congressional Authorization

Revitalize American Manufacturing and 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

NNMI Formation

RAMI – The Purpose of NNMI Program

1. to improve U.S. manufacturing competitiveness
2. to stimulate U.S. leadership in advanced manufacturing research, innovation, and technology;
3. to facilitate transition of innovative [illegible]es into scalable, cost-effective, and [illegible]nufacturing capabilities;
4. to facilitate acc[illegible]erprises to technolog[illegible]ply chains
5. to a[illegible]ent of an advanced man[illegible]rce;
6. to faci[illegible]st practices in addressing advanced manufacturing challenges;
7. to leverage non-Federal sources for sustainable operations
8. And, to create and preserve jobs

Catalyze an Advanced Manufacturing Hub

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NNMI Institute Example

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Example Institute: Composites Manufacturing

THE COMPOSITES
iacmi
INSTITUTE

Institute of
Advanced Composites Manufacturing Innovation

NMMI Institute Example

Composites Institute Launched June 2015

IACMI, The Composites Institute Knoxville, TN
Launched June 16, 2015

Agency sponsor: DOE
Startup funding: $70M public, $159M co-investment

+344,000 square feet in five core regions – composite manufacturing, laboratory, instructional and collaboration space

THE COMPOSITES iacmi INSTITUTE

NMMI Institute Example

1) Unique Institute Focus / Charter

Each Institute has a clear mission based on a critical Industry need

Opportunity

Lightweight composites offer benefits to energy efficiency and renewable power generation, overcoming limitations through deployment of advanced technologies to make composite lower cost, faster, using less energy that can be readily recycled offer tremendous opportunities for US manufacturers.

Big Idea

The Institute will provide access to world-class resources to partner with industry and develop new low-cost, high-speed, and efficient manufacturing and recycling process technologies that will promote widespread use of advanced fiber-reinforced polymer composites.

At the new Institute, a world-class team of organizations from leading industrial manufacturers, material suppliers, software developers, government and academia will focus on lowering the overall manufacturing costs of advanced composites by 50 percent, reducing the energy used to make composites by 75 percent, and increasing the ability to recycle composites by more than 95 percent within the next decade.

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NMMI Institute Example

2) Create Value to Industry

Each Institute creates value for industry participation and funding

- Access to Shared RD&D Resources: Leverage and provide access to equipment from lab to full-scale to enable demonstration and reduce risk for industry investment

- Applied R&D: Leverage significant government, industry, and academic investments to develop innovative solutions to member challenges

- Composites Virtual Factory: Provide access to end to end commercial modeling and simulation software for composite designers and manufacturers through a web based platform.

- Workforce Training: Provide specialized training to prepare current and future workforces for the latest manufacturing methods and technologies

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NMMI Institute Example

3) Build Strong Private-Public Partnership

Each Institute is operated by a consortium; serving a partnership of Industry, Academia and government

A partnership of **world-class companies** including:

DOW, Ford, GE, BASF The Chemical Company, Dassault Systèmes, DowAksa, Boeing, Lockheed Martin, Volkswagen, DuPont, Local Motors

Top universities including:

The University of Tennessee, UT Research Foundation, Vanderbilt University, Michigan State, Purdue University, Iowa State, Colorado State University, University of Kentucky, University of Colorado, University of Louisville, Colorado School of Mines, Ohio State

Economic Development Council to leverage state support and investment

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NMMI Institute Example

4) Address Industry-relevant Challenges

By workshops and Technology Roadmaps, Each Institute works on the industry priorities and big challenges only solvable by collaboration

Five/Ten Year Technical Goals

- 25/50% lower carbon fiber–reinforced polymer (CFRP) cost
- 50/75% reduction in CFRP embodied energy
- 80/95% composite recyclability into useful products

Impact Goals

- Enhanced energy productivity
- Reduced life cycle energy consumption
- Increased domestic production capacity
- Job growth and economic development

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NMMI Institute Example

5) Address Industry-relevant Challenges

From Technology Roadmaps and Strategic Investment Plan, Each Institute manages a balanced portfolio of real projects for Industry

Activity	Result
1. First Projects Identified in proposal to DOE	• Strengthen infrastructure capacity: - Materials and processing - Modeling and simulation • Innovation and workforce development in strategic areas with national benefit: - Automotive - Wind - Compressed gas storage
2. Technology Roadmap Driven by IACMI CTO, Industry and Technology Advisory Board	• Identifies key hurdles to high -impact, large scale advanced composites manufacturing • Prioritizes opportunities across the materials and manufacturing supply chain
3. Strategic Investment Plan Driven by IACMI BOD and Technical Advisory Board	• Changing the innovation cycle to enable rapid adoption and scale-up of advanced composites manufacturing
4. Open Project Call	• Aligns with strategic investment plan and technology roadmap • Emphasis on projects with high near term impact. • **Project Call-** open NOW

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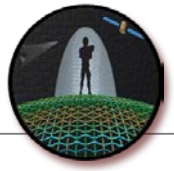
Network Status and 2016 Plans

Future Network Goal: 45 Regional Hubs

Forthcoming Awards



Advanced Textiles

Smart Manufacturing

Flexible Hybrid Electronics
San Jose, CA

America Makes

Additive Manufacturing
Youngstown, OH

Integrated Photonics
Rochester, NY

New Institutes Planned for 2016

Open topic competitions

Selected topic competitions supporting agency mission, using agency authorities and budgets

DMDII

Digital Manufacturing & Design
Chicago, IL

lift

Lightweight Metal Manufacturing
Detroit, MI

iacmi

Advanced Fiber-Reinforced Polymer Composites
Knoxville, TN

PowerAmerica

Wide Bandgap Semiconductors
Raleigh, NC

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NNMI – Bringing it Together

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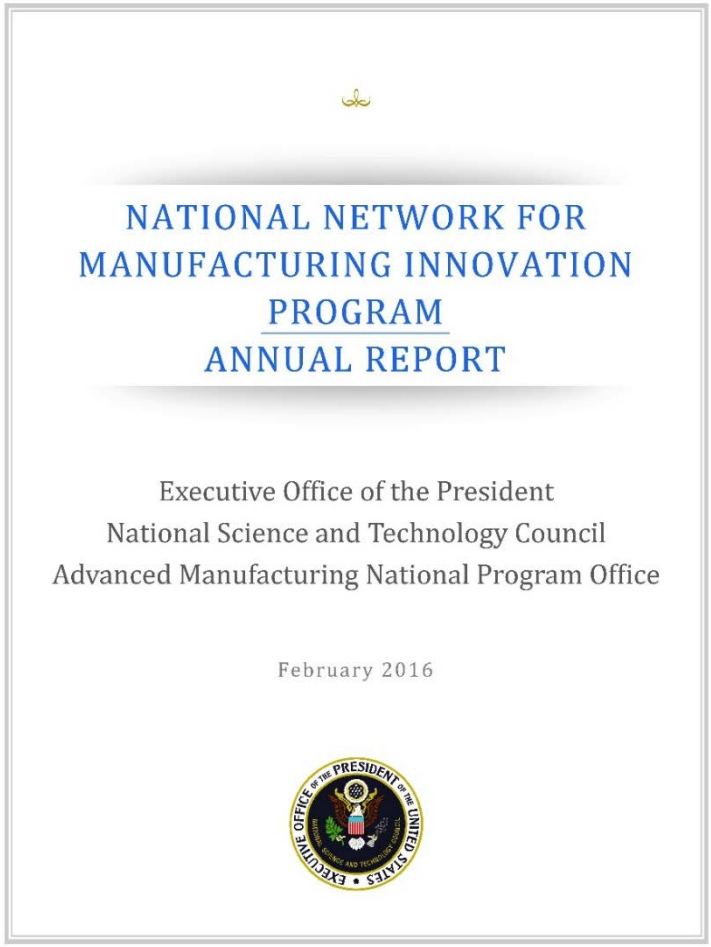
To understand more… NNMI Reports



First Annual Report on the NNMI Program

First Strategic Plan on the NNMI Program

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NMMI Overview Conclusion

Returning to the NNMI "elevator speech"

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Federal startup investment: A Cooperative Agreement *[NOT a Grant]* providing at least $70M over 5-7 years. Institute Consortium owners must have minimum 1:1 co-investment

NMMI Overview Conclusion

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*

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The Future Institute Topics…

Public input identified 135 unique topics

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