Partnerships for Manufacturing Innovation

Frank W. Gayle
Deputy Director – Advanced Manufacturing National Program Office
U.S. Department of Commerce
Interagency Advanced Manufacturing National Program Office (AMNPO)

Executive Office of the President

Advanced Manufacturing Partnership (AMP/PCAST)

Advanced Manufacturing National Program Office (housed at DOC - NIST)
Challenge: US losing leadership in Advanced Products

U.S. Trade Balance for Advanced Technology Products

![Graph showing the U.S. Trade Balance for Advanced Technology Products from 1988 to 2010. The graph indicates a decline in the trade balance over time. Source: Census Bureau.]
Products invented here, now made elsewhere - not driven by labor cost
Partnership

Industry – Academia – Government

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

And when... NOW

We can’t wait to restore US Manufacturing Leadership
PCAST: The independent basis of NNMI

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
The “Scale-up” Gap or Missing Middle

Common terms
The “valley of death”
The “missing Bell Labs”
The “industrial commons”
The Institute Design
Creating the space for Industry & Academia to collaborate

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

Institute for Manufacturing Innovation
Prototype lab/shops
Research facility
Computer lab

Shared Use Facility

National Network of Institutes

Academia
Universities & National Labs
Community Colleges

Government
Federal
State & Local
Economic Dev. Org.

Industry
Large Manufacturing Companies
Small & Medium Enterprise
Start-ups

$70 – 120 M one-time federal funds + matching
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 (SMEs).

Education, technical skills and Workforce development
Education and training at all levels for workforce development
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.’”

- July 30, 2013
NNMI Authorized: Revitalize American Manufacturing & Innovation Act

118 bipartisan RAMI Bill Sponsors

Rep. Tom Reed  R NY-23
Rep. Joe Kennedy  D MA-4
Sen. Sherrod Brown  D Ohio
Sen. Roy Blunt  R Missouri
President Barack Obama

September 15, 2014 – Passed House
100 Co-sponsors (51D, 49R)

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

Signed by President Obama into LAW on December 16, 2014

Bipartisan Momentum
Call to Action: RAMI calls upon the U.S. Secretary of Commerce and NIST to

1. Establish within NIST the “Network for Manufacturing Innovation Program” (Network) to convene and support the network of Institutes.

2. Establish “Centers for Manufacturing Innovation” (Institutes) using an open topic, open competition process

Coordination: The National Program Office at NIST is established by the Act to oversee and carry out RAMI.
Building the Network:  

Network Status & FY16 Plans

Institutes Planned for FY16:

- 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 Solicitation

- Smart Manufacturing
  DOE Solicitation

- Flexible Hybrid Electronics
  DOD Solicitation

- Revolutionary Fibers & Textiles
  DOD Solicitation

FY17-26 – central fund proposed for remaining institutes, via open topic process
AMTech

The Advanced Manufacturing Technology Consortia Program
What is AMTech?

The Advanced Manufacturing Technology Consortia Program (AMTech)

Launched by NIST in FY 2013
• 19 awards in May 2014
• 16 awards in May 2015

Goal
Catalyze formation and support of industry-led consortia
• To strategize on basic and applied research needed by a manufacturing sector …
• On long-term, pre-competitive and enabling technology development
What is AMTech?

The Advanced Manufacturing Technology Consortia Program (AMTech)

Program Outcomes and Expectations:

• Increase the number of industry sectors and organizations that participate in technology partnerships

• Identify critical pre-competitive, enabling manufacturing processes and platform technologies

• Unlock capital and spur industry-led research that arises from the partnerships and roadmaps

• Spur technology diffusion and knowledge dissemination among the partnerships

• Strengthen the capacity of new small and medium companies to become successful enterprises
FY2014 AMTech Awards

- 16 Awards, May 2015
- $7.8 M total, for 13 new and 3 existing consortia
- 322 participants, with 298 unique entities
  - Academia – 56 (50 unique)
  - Not for Profit – 56 (53 unique)
  - For Profit – 197 (187 unique)
  - Government – 12 federal departments (10) & 1 state/local

- Crosscutting Technologies (# of efforts)

<table>
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<tr>
<th>Technology</th>
<th>Efforts</th>
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<tr>
<td>Advanced Materials Design, Synthesis &amp; Processing (3)</td>
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<tr>
<td>Advancing Sensing, Measurement &amp; Process Control (1)</td>
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<td>Biomanufacturing &amp; Bioinformatics (3)</td>
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<td>Energy Efficiency (2)</td>
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<td>Fluid Power (1)</td>
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<td>Hybrid Manufacturing (1)</td>
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<td>Large-scale Structures (1)</td>
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<td>Medical Equipment (1)</td>
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<td>Sustainable Manufacturing (1)</td>
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<td>Synthetic Bio-nanotechnology (1)</td>
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<td>Visualization, Informatics &amp; Digital Manufacturing Technologies (1)</td>
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</table>
Awardee: Univ. of Houston, Houston, TX
Participants (funded, green) – 1
Collaborators (unfunded, blue) – 32, including 1 Nat’l Lab

Goal: Develop an industry-wide consortium and roadmapping effort to overcome the technological obstacles inhibiting growth of commercial manufacturing of high-temperature superconductors (HTS). Overcoming these barriers can position the U.S. as a leader in the global HTS marketplace and lead to the creation of high-tech jobs.
“Manufacturing Universities Act of 2015”
H. R. 1441

To emphasize manufacturing in engineering programs by directing the National Institute of Standards and Technology, in coordination with other appropriate Federal agencies including the Department of Defense, Department of Energy, and National Science Foundation, to designate United States manufacturing universities.

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IN THE HOUSE OF REPRESENTATIVES

March 18, 2015

Ms. Esty (for herself, Mr. Collins of New York, Mr. Tonko, Mr. Meehan, Mr. Thompson of California, and Mr. Rodney Davis of Illinois) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

This Act may be cited as the “Manufacturing Universities Act of 2015”.

(2) FUNDS PROVIDED.—An institution of higher education that receives a designation under paragraph (1) shall be awarded $5,000,000 for each fiscal year for a 4-year period beginning in the fiscal year in which the institution of higher education receives the designation under paragraph (1).
Thank you

For questions or comments, please contact the Advanced Manufacturing National Program Office

amnpo@nist.gov

www.manufacturing.gov

301-975-2830

Twitter: @AdvMfgNPO

Unless otherwise labeled, images are courtesy of The White House, the National Institute of Standards and Technology, and Shutterstock
Supplemental Slides
The First Manufacturing Innovation Institute
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: Next Generation Power Electronics

$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
3rd Institute: Digital Manufacturing & Design Innovation

$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

Over 3:1 Industry Cost Share
4th Institute:
Lightweight and Modern Metals

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 application.

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

$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

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5th Institute: Selected for Negotiation
Advanced Composites Manufacturing

$70M Federal investment and more than $180 Non-Federal investment over five years (Over 2:1 cost share) Source: www.iacmi.org

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.

Application | Estimated Current CFC Cost | Institute CFC Cost Reduction Target (2018) | 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)

50% Lower cost
Using 75% Less Energy
And reuse or recycle >95% of the material
6th Institute Funding Opportunity BAA in 2014
Integrated Photonics Manufacturing Innovation Institute

~ $110M federal investment over five years

Objective
Develop and demonstrate innovative 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

This Institute will focus on developing an end-to-end photonics ‘ecosystem’ in the U.S., including domestic foundry access, integrated design tools, automated packaging, assembly and test, and workforce development.

All these developments will require cross-cutting disciplines of design, manufacturing, packaging, reliability and testing.
Next three institute topics announced...

7th Institute Funding Opportunity, 2015
Flexible Hybrid Electronics
DOD - $70M federal investment over five years

8th Institute Funding Opportunity, 2015
Smart Manufacturing:
Advanced Sensors, Controls, Platforms and Modeling for Manufacturing.
DOE - $70M federal investment over five years

9th Institute Funding Opportunity, 2015
Revolutionary Fibers and Textiles
DOD - $75M federal investment over five years
To emphasize manufacturing in engineering programs by directing the National Institute of Standards and Technology, in coordination with other appropriate Federal agencies including the Department of Defense, Department of Energy, and National Science Foundation, to designate United States manufacturing universities.

IN THE SENATE OF THE UNITED STATES

JULY 31, 2014

Mr. COONS (for himself and Mr. GRAHAM) introduced the following bill; which was read twice and referred to the Committee on Health, Education, Labor, and Pensions

A BILL

To emphasize manufacturing in engineering programs by directing the National Institute of Standards and Technology, in coordination with other appropriate Federal agencies including the Department of Defense, Department of Energy, and National Science Foundation, to designate United States manufacturing universities.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the “Manufacturing Universities Act of 2014”.
Consortium for Advanced Manufacturing Foresights
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
Roles & Responsibilities

Who’s Involved

- NSF, DOC/NIST will stand it up
- Partnership members, drawn from industry and academia, will provide input as requested

Partners Will Provide

- Faster (days/weeks) response to high-level inquiries (e.g., WH)
- Substantive (months-long) studies of deeper issues requested by Agencies
- Identification of new areas that would benefit from shared public-private research efforts
Governance & Funding

- **Joint oversight**
  - NSF and NIST will coordinate oversight, with participation of other interested agencies
  - 50/50 financial support from NSF & NIST for 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.
Timeline & Next Steps

Timeline

- Solicitation published – 4/22/15.
- Proposal due date – 7/20/15.
- Award – September, 2015

Next Steps

- Encourage capable performers and encourage proposal submission
- Identify reviewers from interested agencies
- Identify reviewers from industry, universities, and other private sector organizations

* Review panel includes representatives from agency partners, and private sector reviewers