Accelerating U.S. Advanced Manufacturing

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The National Network for Manufacturing Innovation

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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

Source: Census Bureau
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
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 of Institutes

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

Shared Use Facility

Academia
Universities & National Labs
Community Colleges

Industry
Large Manufacturing Companies
Small & Medium Enterprise
Start-ups

Government
Federal
State & Local
Economic Dev. Org.

$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
3rd Pilot Institute: Digital Manufacturing & Design Innovation

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

$70M public investment, ~$110M match

Lead: UI Labs

Hub location: Chicago, Illinois

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

Over 3:1 Industry Cost Share
4th Pilot 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
“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

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.
Establish the Network – all pilot institutes and new institutes: *Current Institute Status*

The full NNMI network is planned for 45 regional hubs.

- **FORTHCOMING FY15**
  - Integrated Photonics
  - Smart Mfg.
  - Flex. Hybrid Electronics

- **PLANNED FY16**
  - DMDII
    - Digital Mfg.
    - Chicago, IL
  - America Makes
    - Additive Mfg.
    - Youngstown, OH
  - IACMI
    - Adv. Composites
    - Knoxville, TN
  - LIFT
    - Lightweight Metals
    - Detroit, MI
  - Smart Power
    - Electronics
    - Raleigh, NC
Thank you

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

amnpo@nist.gov

www.manufacturing.gov

301-975-2830

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Supplemental Slides
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 Pilot 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**

President Obama
North Carolina State University, January 15, 2014
**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.

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<table>
<thead>
<tr>
<th>Application</th>
<th>Estimated Current CFC Cost</th>
<th>Institute CFC Cost Reduction Target (2018)</th>
<th>CFC Ultimate Cost Target (2024)</th>
<th>CFC Tensile Strength</th>
<th>CFC Stiffness</th>
<th>Production Volume/Cycle Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles (Body Structures)</td>
<td>$26-33/kg</td>
<td>&gt;35%</td>
<td>&lt;$11/kg by 2025 ~60%</td>
<td>0.85GPa (123ksi)</td>
<td>96GPa (14Msi)</td>
<td>100,000 units/yr &lt;3min cycle time (carbon) &lt;5min cycle time (glass)</td>
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<tr>
<td>Wind (Blades)</td>
<td>$26/kg</td>
<td>&gt;25%</td>
<td>$17/kg ~35%</td>
<td>1.903 GPA (276ksi)</td>
<td>134GPa (19.4Msi)</td>
<td>10,000 units/yr (at &gt;60m length blades)</td>
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<tr>
<td>Compressed Gas Storage</td>
<td>$20-25/kg</td>
<td>&gt;30%</td>
<td>$10-15/kg ~50%</td>
<td>2.55 GPa (370ksi)</td>
<td>135 GPa (20Msi)</td>
<td>500,000 units/yr (carbon fiber)</td>
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50% Lower cost
Using 75% Less Energy
And reuse or recycle >95% of the material

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$70M Federal investment and more than $180 Non-Federal investment over five years (Over 2:1 cost share) Source: [www.iacmi.org](http://www.iacmi.org)
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 two institute topics announced...

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

8th Pilot Institute Funding Opportunity, 2015
Smart Manufacturing
DOE - $70M federal investment over five years
The Start of a Network...

- Additive Manufacturing
- Power Electronics
- Digital Manufacturing
- Lightweight Metals
- Adv. Composites Manufacturing
- Integrated Photonics Manufacturing
- Smart Manufacturing
- Flexible Hybrid Electronics