

National Network for Manufacturing Innovation

**Dr. Frank W. Gayle
Deputy Director**

Advanced Manufacturing National Program Office

***Innovation in Materials & Manufacturing
TMS 2013, San Antonio, Texas***



BACKGROUND

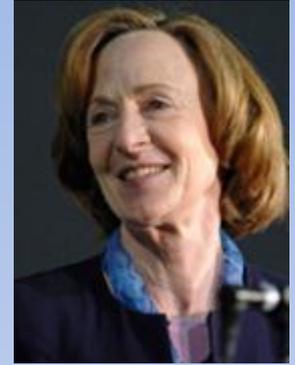
Advanced Manufacturing Partnership



AMP Co-chairs

Andrew Liveris
CEO, Dow Chemical

Susan Hockfield
President, MIT



AMP report released July 17, 2012 on whitehouse.gov

- 16 Recommendations in three areas: innovation, talent, and policy

Two early actions announced by Administration:

- 1) Coordinated “whole of government” effort via **Advanced Manufacturing National Program Office**
- 2) Pursue the “missing middle” via **manufacturing innovation hubs**

BACKGROUND

Interagency Advanced Manufacturing National Program Office (AMNPO)



Advanced Manufacturing Partnership (AMP)

Advanced Manufacturing National Program Office
(housed at DOC - NIST)

Agency Leaders in Advanced Manufacturing (NSTC)

Today

- **NNMI Milestones and Vision**
- The Missing Middle Challenge – NNMI Positioning
- NNMI Design Process
- Institute Design
- NNMI Characteristics
- Next Steps



Vision of the NNMI



**President Obama at Rolls-Royce Crosspointe
Petersburg, VA, March 9, 2012**

\$1 billion proposal:

“institutes of manufacturing excellence where some of our most advanced engineering schools and our most innovative manufacturers collaborate on new ideas, new technology, new methods, new processes.”



**Advanced Manufacturing National Program Office
Innovation in Materials & Manufacturing
TMS 2013, San Antonio, Texas**

State of the Union Address, Feb. 12, 2013

Our first priority is making America a magnet for new jobs and manufacturing.

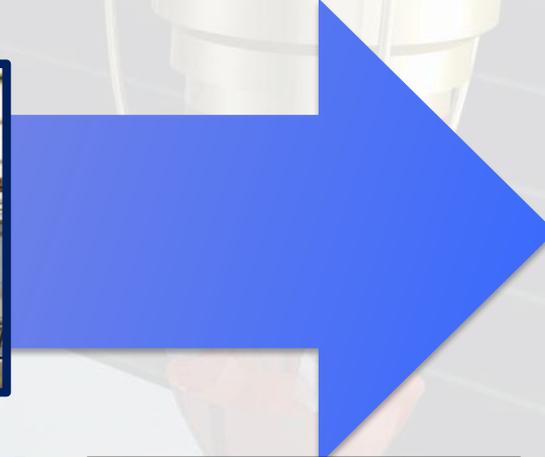
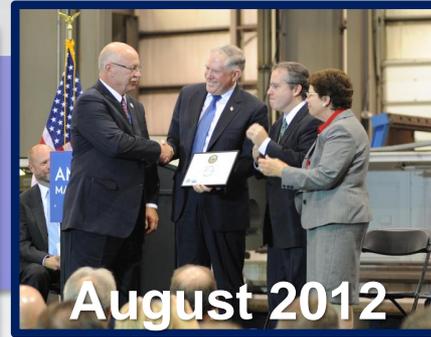
After shedding jobs for more than 10 years, our manufacturers have added about 500,000 jobs over the past three. Caterpillar is bringing jobs back from Japan. Ford is bringing jobs back from Mexico. And this year, Apple will start making Macs in America again.

There are things we can do, right now, to accelerate this trend. Last year, we created our **first manufacturing innovation institute** in Youngstown, Ohio. A once-shuttered warehouse is now a state-of-the-art lab where new workers are mastering the 3D printing that has the potential to revolutionize the way we make almost everything. There's no reason this can't happen in other towns.

So tonight, I'm announcing **the launch of three more of these manufacturing hubs**, where businesses will partner with the Department of Defense and Energy to turn regions left behind by globalization into global centers of high-tech jobs. And I ask this Congress to help create **a network of 15 of these hubs** and guarantee that the next revolution in manufacturing is made right here in America. We can get that done.

– President Barack Obama

Policy Milestones



June 2011

REPORT TO THE PRESIDENT ON
ENSURING AMERICAN
LEADERSHIP IN ADVANCED
MANUFACTURING

Executive Office of the President
President's Council of Advisors
on Science and Technology

JUNE 2011



February 2012

A NATIONAL STRATEGIC
PLAN FOR ADVANCED
MANUFACTURING

Executive Office of the President
National Science and Technology Council

FEBRUARY 2012



July 2012

REPORT TO THE PRESIDENT ON
CAPTURING DOMESTIC
COMPETITIVE ADVANTAGE IN
ADVANCED MANUFACTURING

Executive Office of the President
President's Council of Advisors on
Science and Technology

JULY 2012



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




Advanced Manufacturing National Program Office
Innovation in Materials & Manufacturing
TMS 2013, San Antonio, Texas

Proposed NNMI Scope

- Up to 15 linked regional clusters of manufacturing innovation across the country, each with a unique focus
- Shared approaches to infrastructure, intellectual property, contract research, and performance metrics



Credit: B. Young/NIST

As nodes of a network, the Institutes for Manufacturing Innovation complement each other's capabilities



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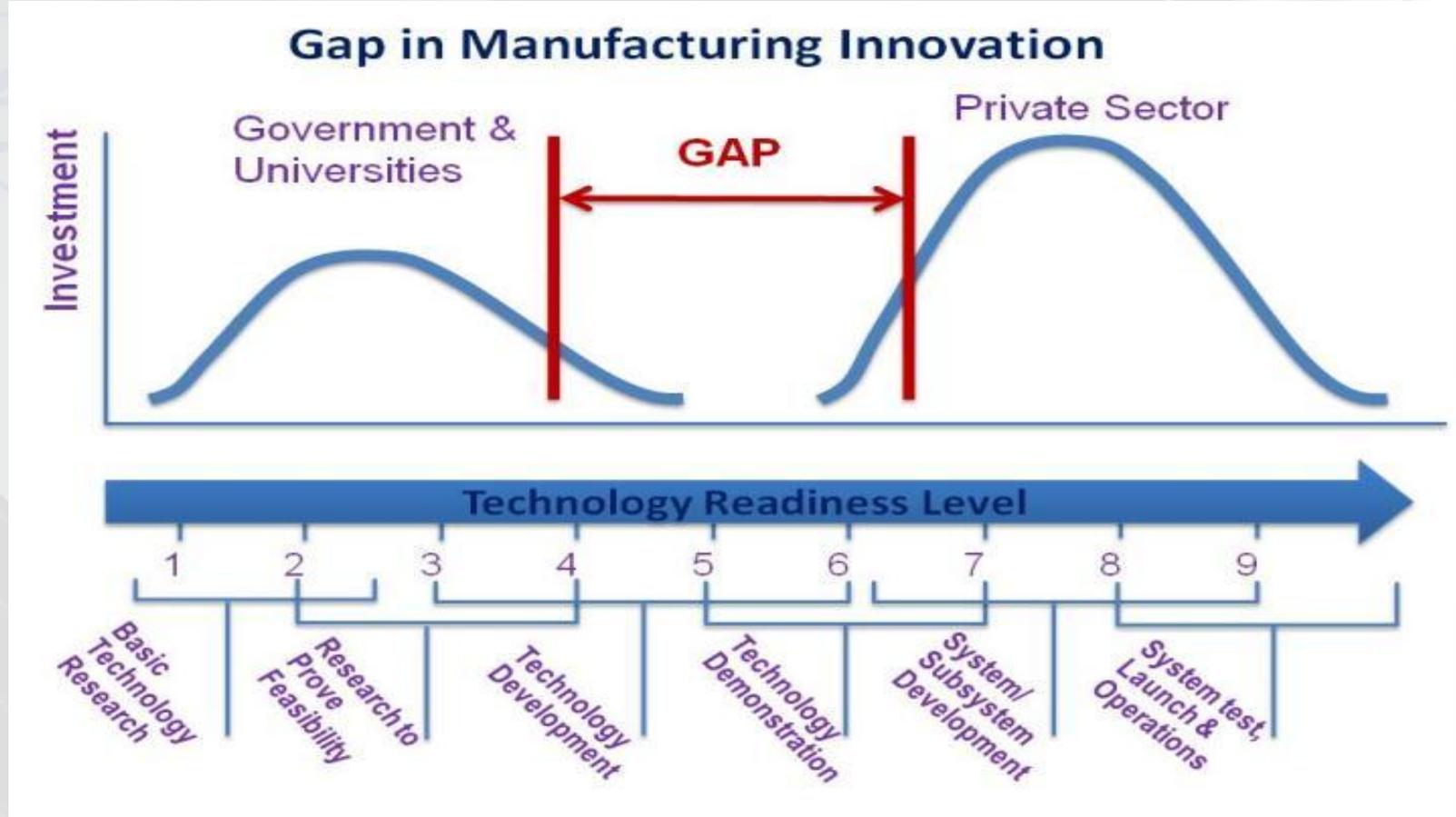
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The Missing Middle - Valley of Death

US gap in development in Technology Readiness Level 4-7

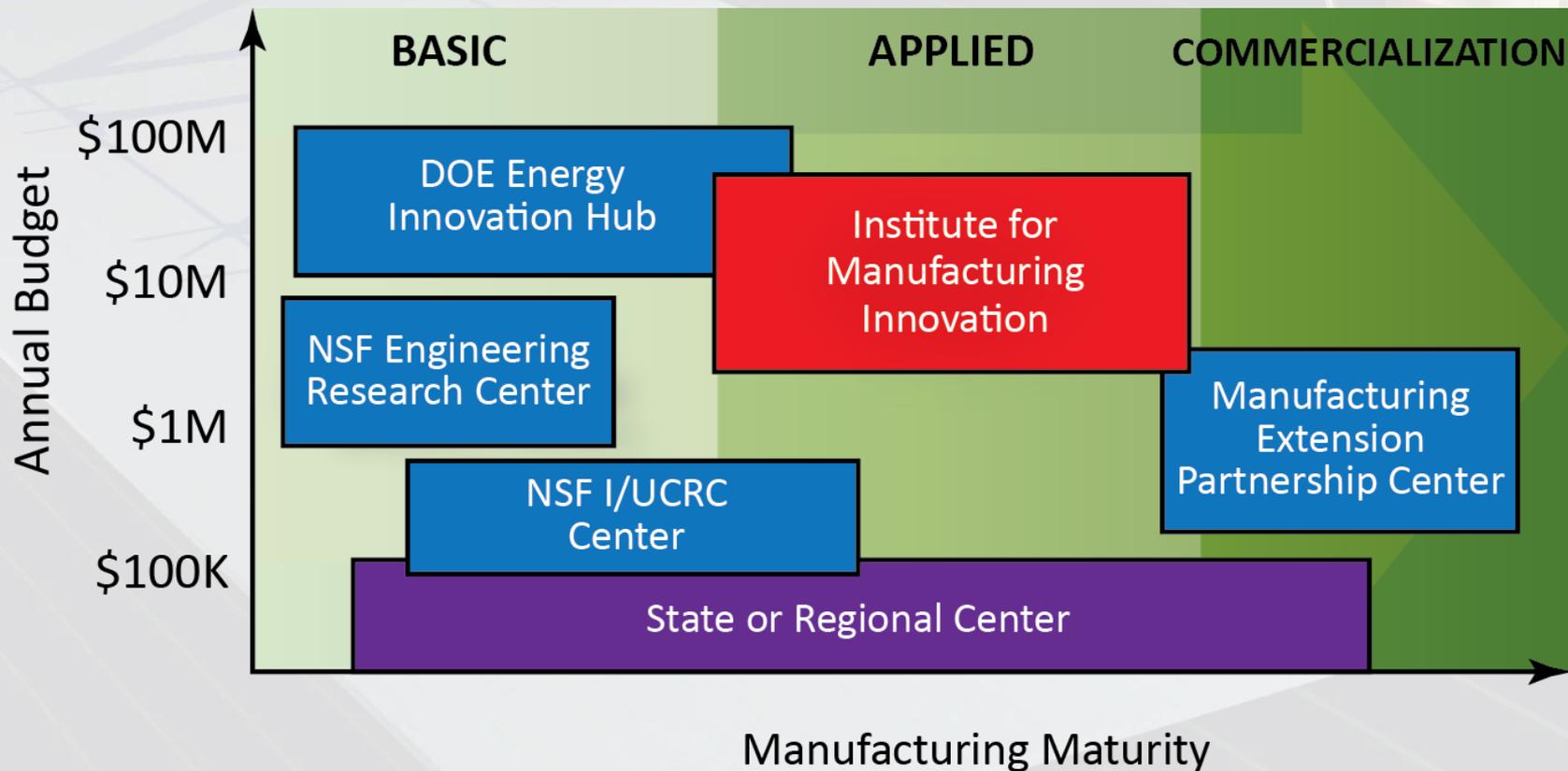


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Focus on Scale Up – The Missing Middle

Basic science
Largely government funded

Commercialization
private sector owned/funded



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Crowdsourcing: Design for Impact Workshops & RFI



Rensselaer Polytechnic Institute
April 25, Troy New York



Cuyahoga Community College
July 9, Cleveland Ohio

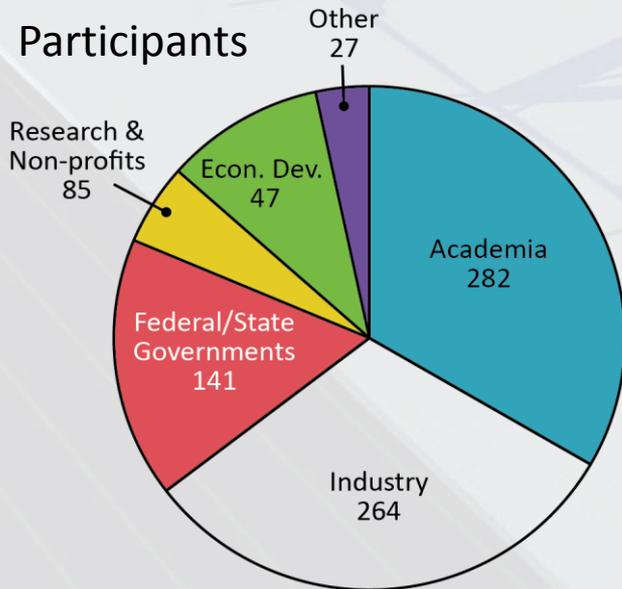


National Academies Beckman Center
September 27, Irvine California



Univ. Colorado
October 18, Boulder, Colorado

Participants



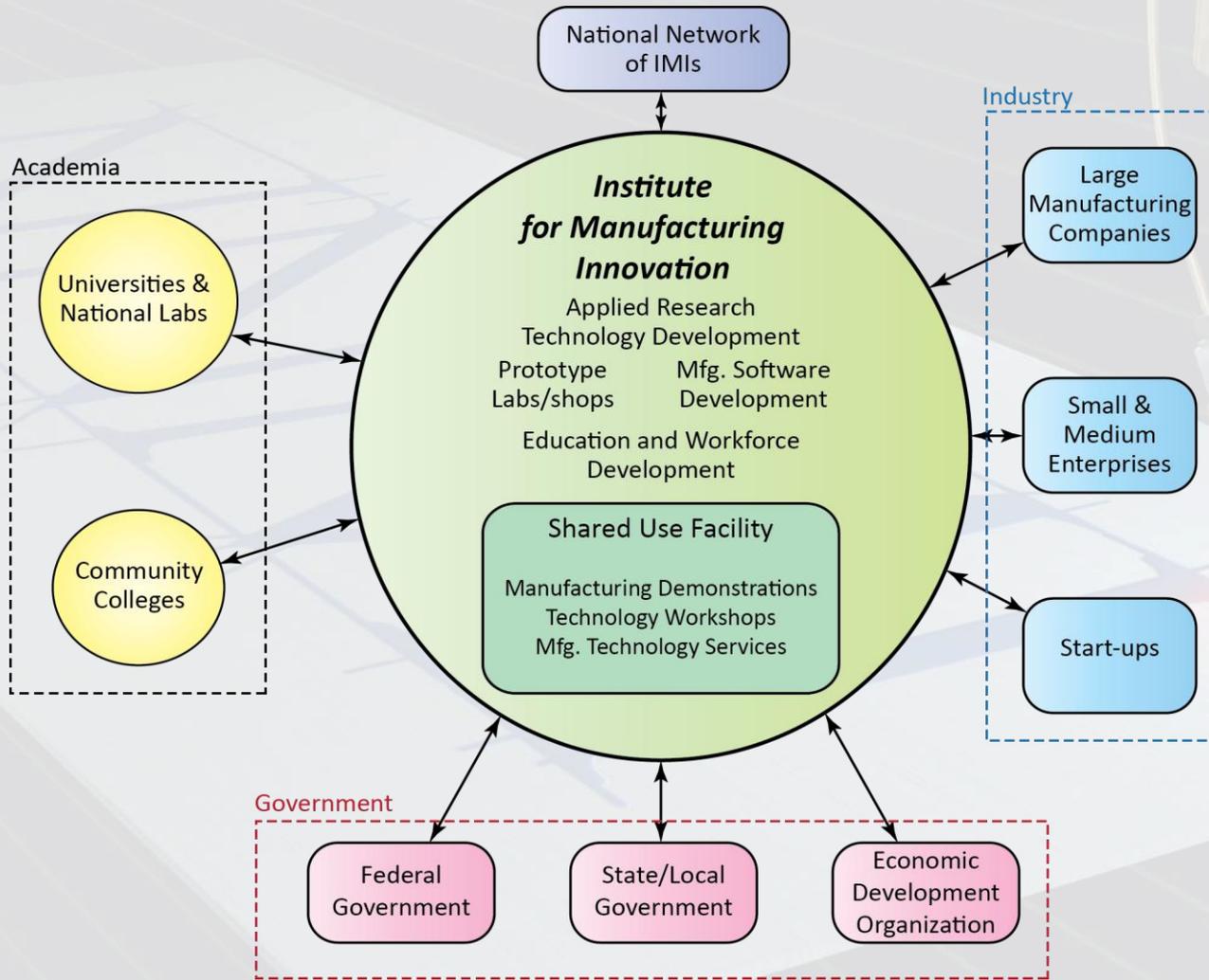
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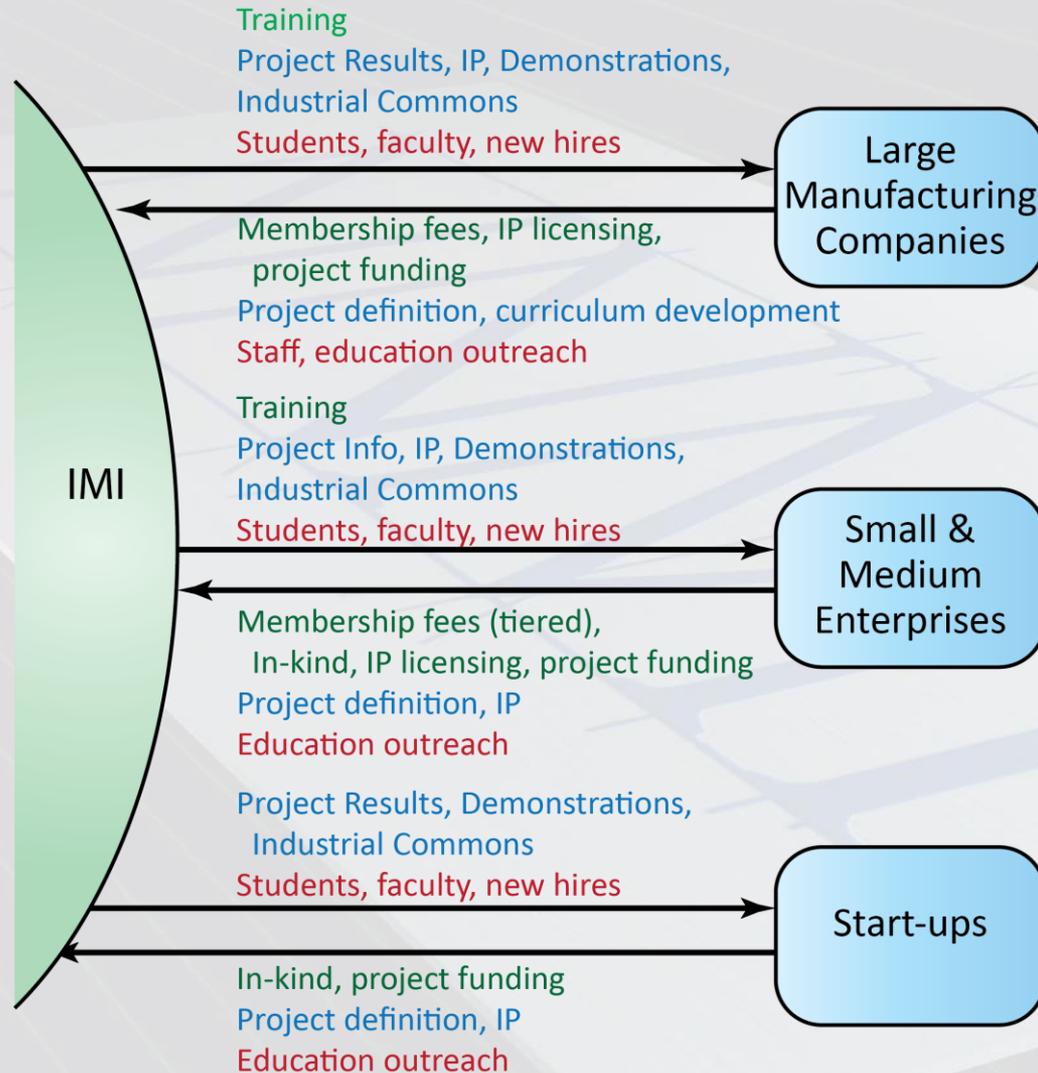
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Institute Structure



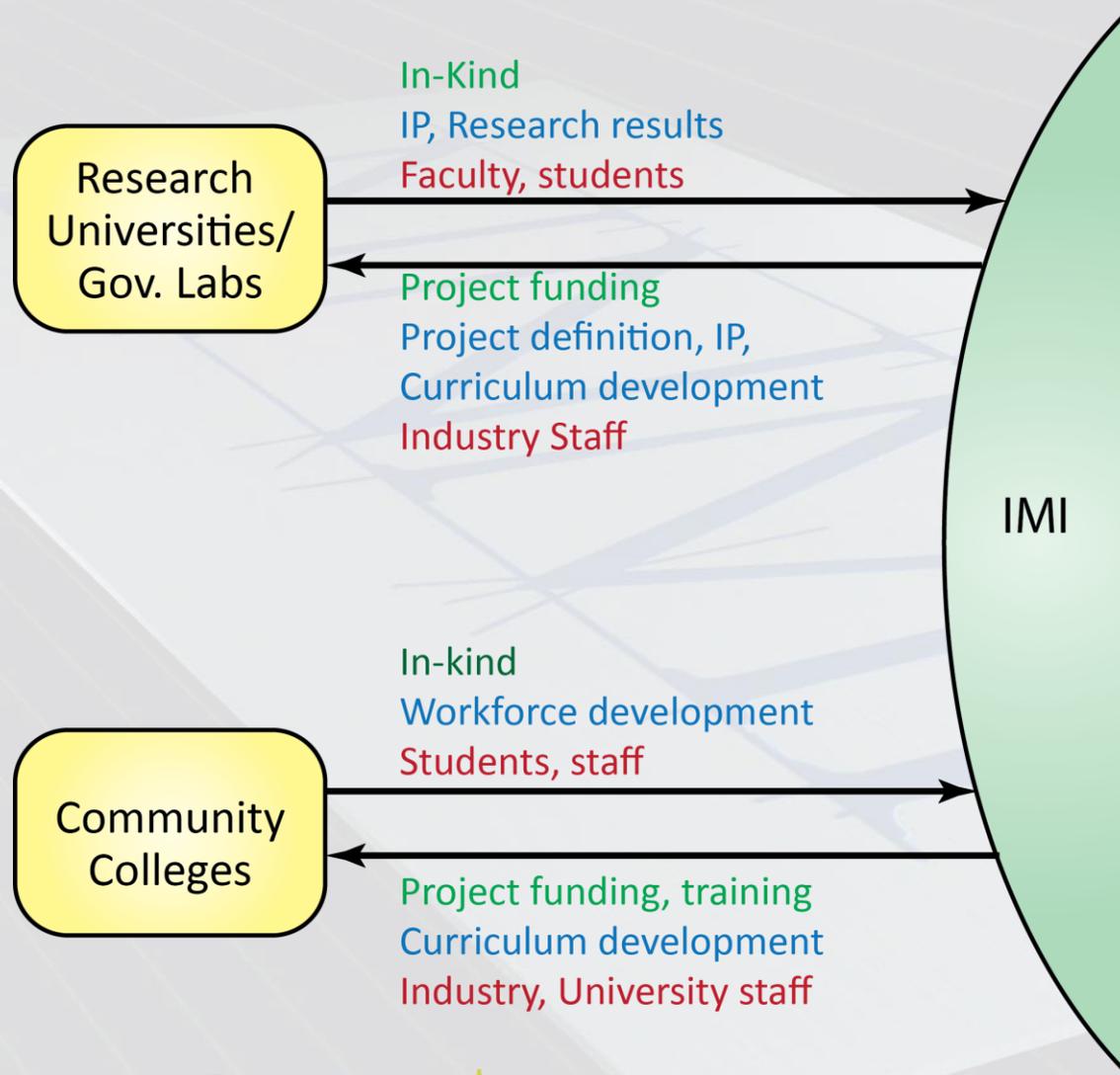
Detail: Industry Interactions



- Interactions are through
 - **funding (green),**
 - **information (blue)** and
 - **personnel (red).**
- Institutes will have a low barrier to entry, and will interact with start-ups and SMEs
- Information transfer is not limited to project results; an Industrial Commons promotes cross-talk.



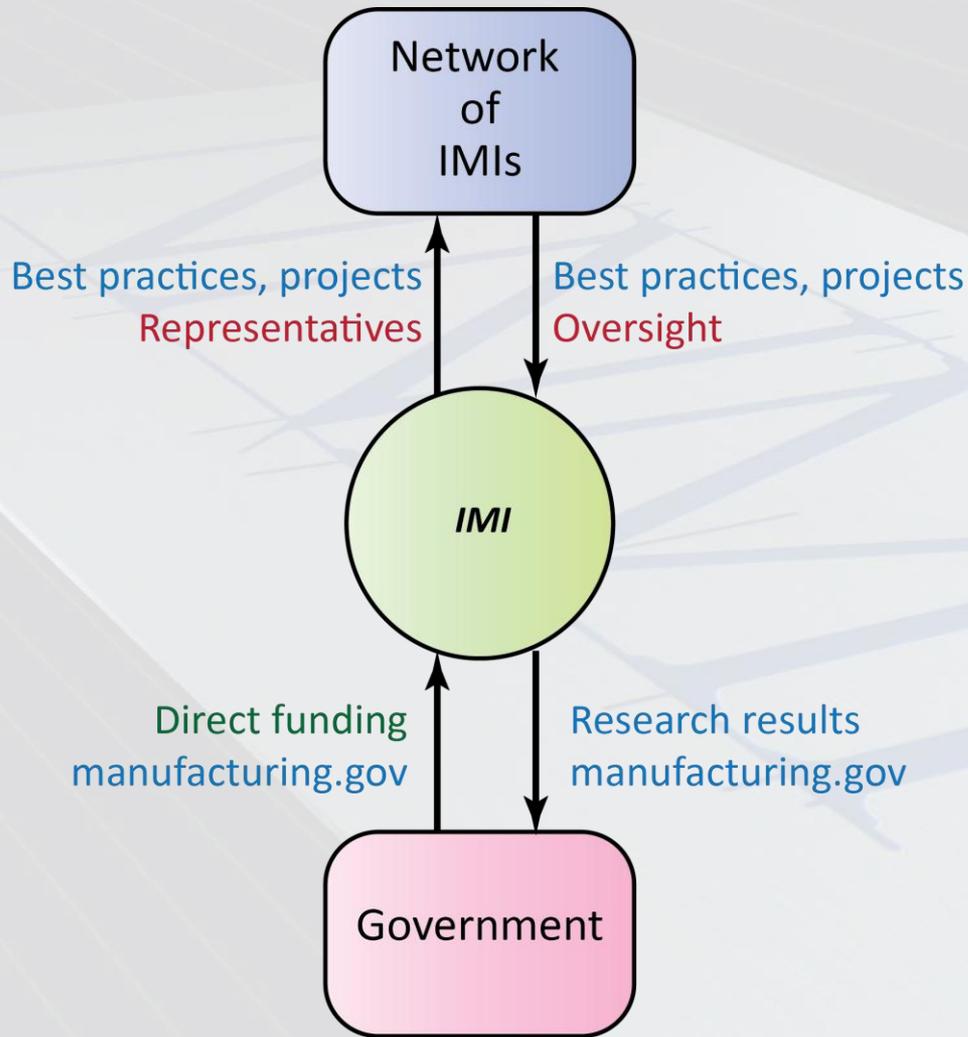
Academia Interactions



- Interactions are through
 - **funding (green),**
 - **information (blue)** and
 - **personnel (red).**
- Community colleges are essential for workforce development tasks.
- Academia interactions are facilitated by the IMI.



Government and Network Interactions



- Each Institute will participate in the NNMI, web portal.
- Institutes will share resources.
- Institutes will direct projects to other institutes as appropriate.
- Government (federal and state) will provide funding and disseminate research results through manufacturing.gov.



IMI Key Characteristics

- Institutes will be the anchor to a regional innovation ecosystem, with a vision for national and international preeminence.
- Institutes will be partnerships between all stakeholders: industry, academia, government, industry development organizations. Collaboration is critical.
- Each institute will have its own unique focus area, one of:
 - Manufacturing process
 - Advanced Materials
 - Enabling Technology
 - Industry Sector
- Institutes should be proposed by an industry-focused non-profit organization. Focus areas will be ideally be defined by proposing teams.
- Institutes will be self-sustaining after 7 years.



Suggested Technology Focus Areas from the RFI and Workshop

Flexible electronics, nano/micro, lightweight materials, personalized medicine, alternative energy, additive manufacturing, smart machining, pharmaceuticals, modeling and simulation, composite materials, coatings, energy storage, sensors, metal casting, advanced forming, advanced joining, robotics, peening, machining, other surface finishing, coal compact internal burning, convert truck fleets to natural gas, thermoplastic recycling, sensors for harsh conditions, machining, forming, molding, casting, assembly, forgings, joining, surface engineering, electro-optics, nanomanufacturing, miniaturized electronics, design tools and informatics, nanoelectronics, autonomy, superalloys, precision machining, rapid prototyping, organic electronics, nanocomposites, sensors, embedded technologies, remote sensing, renewable energy, strategy development, printed electronics, sustainable manufacturing, bioprocessing, nanomedicine, nanomaterials, micromanufacturing, stoichiometry in thin films and bulk materials, photonic integrated circuits, electro-optic materials and devices, polymeric-based web converting manufacturing platforms, sensors for diagnosis and control of manufacturing, renewable energy, biofuels, nano/bio manufacturing, digital model-based manufacturing, advanced materials, medical technology manufacturing, additive manufacturing, smart manufacturing, advanced/intelligent machining and fabrication, advanced metrology, digital manufacturing, advanced joining, near-net shape technologies, forging, extrusion, rolling, casting, powder, molding, hydroforming, composites manufacturing, advanced nanomaterials, next generation semiconductor technologies, MEMS/NEMS and embedded sensors, energy efficient technologies, dynamic machine tool management, Big Data, robotics, automation technologies, advanced magnets, joining technologies, in-situ metrology, powder metallurgy, electron beam, cryogenic techniques, coatings, repair welding, composites, maritime technologies, photovoltaics, biomimetic engineering (related to solar), materials characterization, laser-based processing, non-destructive evaluation, wafer fab and equipment, ceramics, sustainable manufacturing, digital manufacturing, mechatronics and cyberphysical manufacturing, optics and imaging, electronics assembly, IT systems, metamaterials, rapid prototyping via flexible manufacturing, wide bandgap manufacturing, advanced batteries...

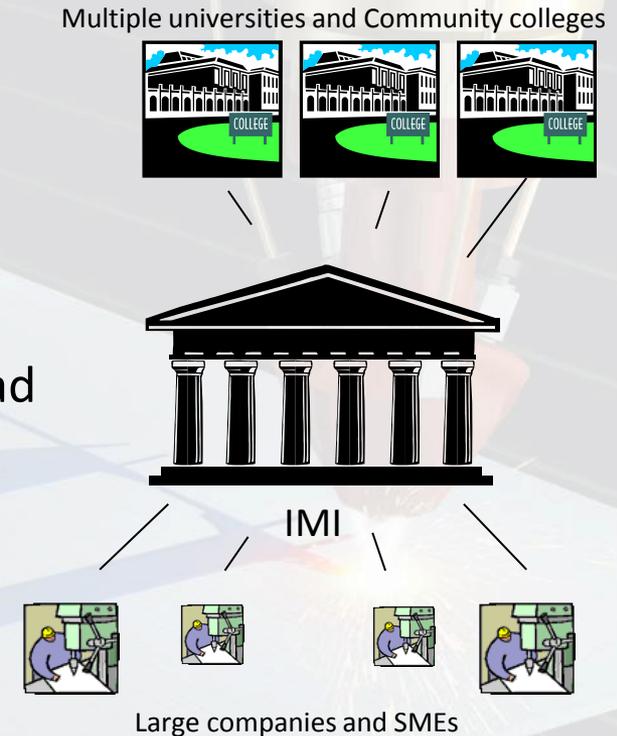
All ideas are viable! Make the technical and business case...



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IMI Proposal

- Proposing teams should demonstrate their focus area is:
 - Has the potential to deliver regional and national improvements in advanced-manufacturing capabilities
 - Meets national needs
- IMIs should leverage existing regional or national innovation ecosystems or catalyze the formation and sustainability of new innovation clusters.
- IMIs will have a specific physical location and a clear lead organization; they will not be distributed or virtual.
- IMIs will have a regional focus with a plan for national and international preeminence.
- Activities will include
 - Applied research, development and demonstration projects
 - Education and training at all levels
 - Development of innovative methodologies and practices.

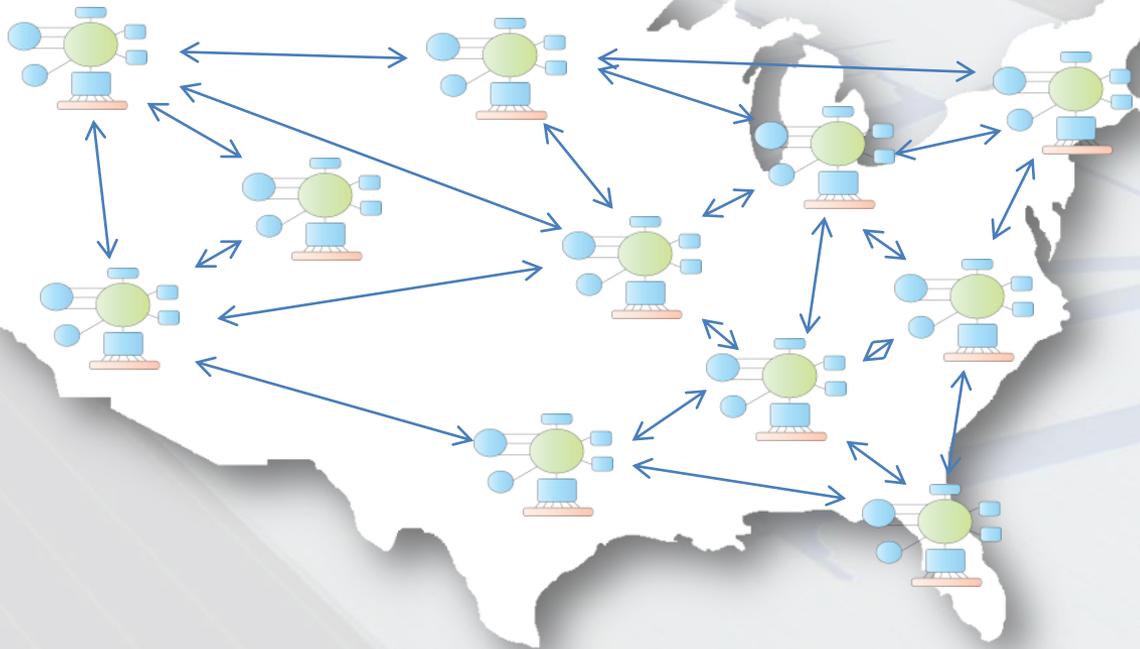


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NNMI Characteristics



- Promote collaboration between institutes
- Provide a forum for sharing best practices
- Establish common IMI Policies when appropriate
- Link activities through the Manufacturing Portal



Workforce Development and Education

- Each Institute will interact with academia (research universities and community colleges) to positively affect manufacturing curricula.
- Applied research, development, and demonstration projects will consider the potential to collaborate with educators as part of the design.
- Institutes will provide shared facilities to local industry, especially SMEs and startups, with the goal of scaling up laboratory demonstrations and making technologies ready for manufacture.
- To support education and training objectives of each IMI, facility sharing must include planning for the uses of facilities for education and training—both for advanced-knowledge workers and mid-level technicians.

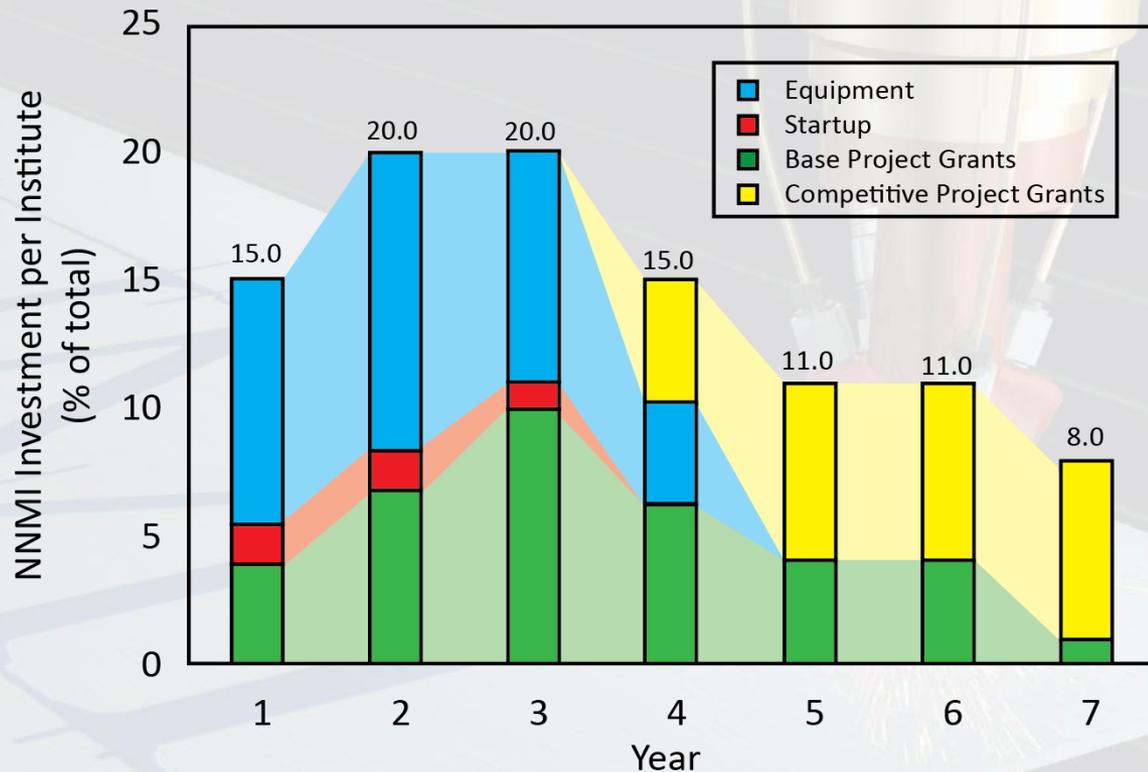


Notional Spending Plan – Federal Funds

Federal Funds: \$70-120 million, over 5-7 years

Categories:

- Equipment, especially in first years
- Startup, administrative costs
- Base project grants, commitment with funded proposal
- Competitive project grants, allows a gate system to reward performance.



Institute investment of federal-only funds (does not illustrate matching funds or other revenue streams)



Summary: Game Changing Characteristics

- Establish a presence, at scale, in the missing middle
- Partnering between all stakeholders
- An Industrial Commons
- Emphasizing/supporting longer-term investments by industry
- Combining R&D with workforce training
- A national network of Institutes
- Overarching mission: Create new U.S. manufacturing capabilities and industries - to grow high paying manufacturing jobs of the future



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- **Next Steps.... ... and a few words on NAMII**



Workshop on the Design of the *National Network for Manufacturing Innovation (NNMI)*

– *Washington, DC, spring-summer 2013*

FY13 “Jumpstart” Institutes – 3 DOE and DOD institutes

– FFO “soon”

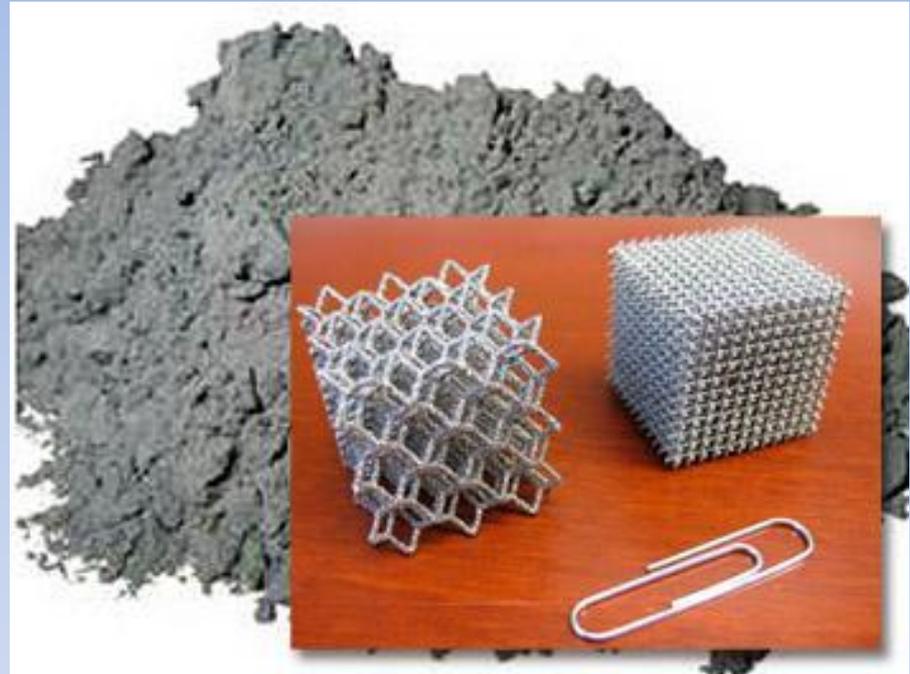
For More Information on
AMNPO,
NNMI, and
FY13 DOE and DOD institutes...

www.manufacturing.gov



Pilot Institute on Additive Manufacturing

2012 Pilot Manufacturing Institute on *Additive Manufacturing*



April 13 May 8 May 16 August 16

SN

BAA

Industry
Day

\$30 M



National Additive Manufacturing Innovation Institute (NAMII), Youngstown OH

Prime Awardee: National Center for Defense Manufacturing and Machining

- \$30 M federal grant
- \$39 M cost share (\$20M from industry)
- Strong leveraging of equipment, existing resources
- Strong business development
- Ties to many organic facilities
- Tiered membership-based model, low cost to small business and nonprofits



Credit: All photos courtesy National Additive Manufacturing Innovation Institute



Industry

AM Materials

Allegheny Technologies
FMW Composite Systems
Lubrizol
Oxford Performance Materials
Plextronix
RTI
Touchstone

AM Equipment

ExOne
Laser Technology Associates
MicroFab Technologies
nScript
Optomec
POM
Sciaky
Stratasys

AM Manufacturing

AlphaMicron
FMW Composite Systems
Kent Displays
Morris Technologies
Paramount Industries

Platform Systems

Boeing
GE Transportation
General Dynamics
Goodyear
Honeywell
Johnson Controls
Kennametal
Lockheed-Martin
Northrop Grumman
OSRAM Sylvania
Parker Hannifin
Timken
Westinghouse Nuclear

Inspection

M-7 Technologies
Stratronics

Software

AST2
Autodesk
IBM

Manufacturing Support

Manufacturing Extension Partners

PA MEP Network (IRCs)
OH MEP Network

Industry Organizations/TBEDs

BFTP
EIO
JumpStart
OAI
Nortech
Wohlers Associates

Workforce Training

North Eastern Ohio

Eastern Gateway CC
Lorain CCC
Youngstown State Univ.

Western Pennsylvania

CC of Allegheny C
Robert Morris Univ.
Westmoreland CCC

Eastern Pennsylvania

Northampton CC
Penn College of Technology
Penn State University

West Virginia

RCBI @ Marshall Univ.

NAMII Initial Regional Partners

NAMII Hub

Northeast Ohio Facility

National Center for Defense Manufacturing and Machining

Government

Army ARDEC
ECDC
ManTech
NETL
NUWC

Manufacturing & Standards Organizations

AMT
MTConnect Institute
NDMEC
NIST
SME

Research Universities*

Carnegie Mellon University
(Automation)
Case Western Reserve University
(Micro/Nano)
Kent State University
(Sensors)
Lehigh University
(Composites)
Penn State University, ARL
(Metal SLS, E-beam)
University of Akron
(Polymer/Ceramic LOM)
University of Pittsburgh
(Medical)

For More Information on AMNPO, NNMI, NAMII, and the 3 new Institutes (DoD, DoE)...

www.manufacturing.gov

Advanced Manufacturing Portal

... changing the face of manufacturing

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[National Additive Manufacturing
Innovation Institute](#)

Events

September 27, 2012
[Designing for Impact III: Workshop on](#)



A cardiovascular stent, currently manufactured using laser cutting, is a candidate for additive manufacturing.

[Welcome to Manufacturing.gov!](#)