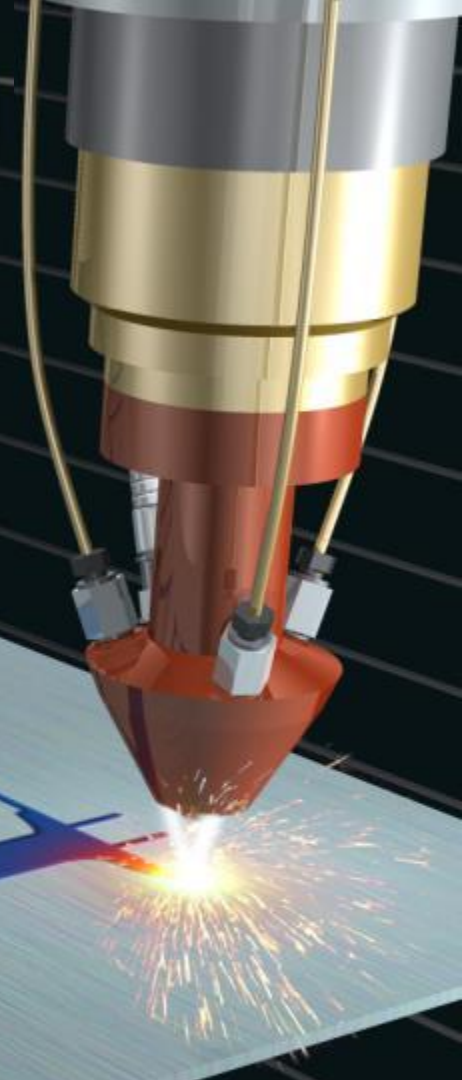


BLUEPRINT FOR ACTION

ASME Mechanical Engineering Education
Leadership Summit
March 15, 2014

The Role of Engineering Education in the U.S. Advanced Manufacturing Partnership (AMP) 2.0

Mike Molnar
Advanced Manufacturing
National Program Office
www.manufacturing.gov



Agenda

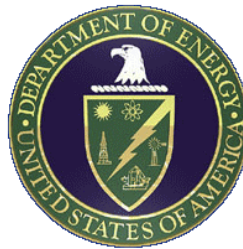
A laser cutting machine is shown in the background, cutting a metal plate. The machine is positioned on the right side of the frame, and a bright orange laser beam is visible at the point of contact with the metal. The metal plate has a blue grid pattern on it. The background is a light gray with a subtle grid pattern.

- 1. The National Network for Manufacturing Innovation**
2. Academic Participation in the NNMI
3. AMP 2.0 and Future Engineering Education

Interagency Advanced Manufacturing National Program Office (AMNPO)



Executive Office of the President



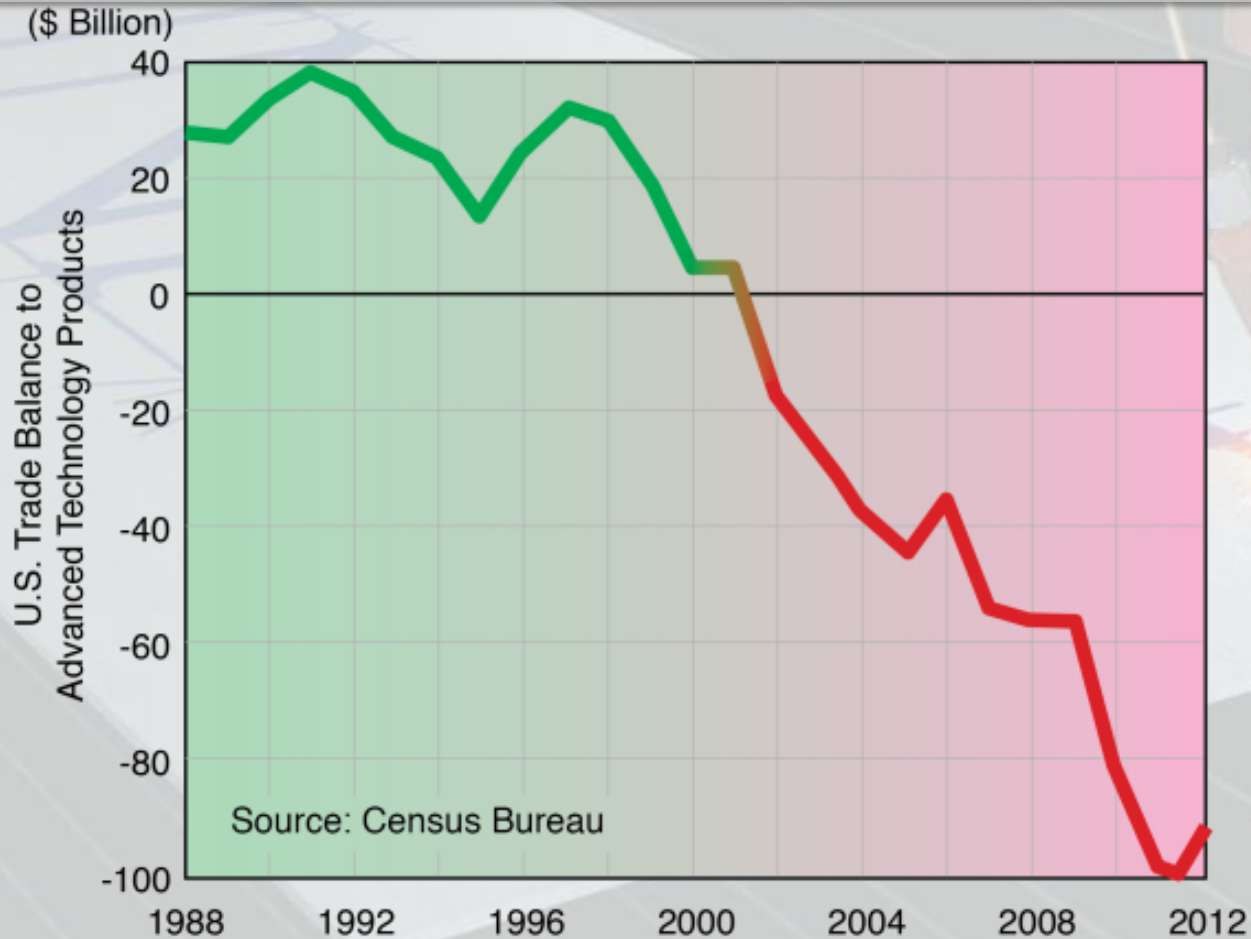
Advanced Manufacturing National Program Office
(housed at DOC - NIST)

U.S. Trade Balance of Advanced Technology

Swung to historic deficit, lost 1/3rd of workforce

- **11%** of U.S. GDP, **12 million** U.S. jobs
- **~ half** of U.S. Exports
- Nearly **20%** of the world's manufactured value added

U.S. Trade Balance for Advanced Technology
Manufacturing Products (\$ Billions)



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



President's Council of Advisors on Science and Technology Advanced Manufacturing Partnership Steering Committee

18 Leaders from Industry and Academia

Robert Birgeneau
Chancellor



Steering Committee Co-Chairs

Susan Hockfield
President Emerita



Andrew Liveris
President, Chairman & CEO



Bob McDonald
President



Jared Cohon
President



John Hennessy
President



Wendell Weeks
CEO



Paul Otellini
CEO



Louis Chenevert
CEO



G.P. "Bud" Peterson
President



Richard Harshman
CEO



Alan Mulally
CEO



William Weldon
CEO



Curt Hartman
Interim CEO, VP & CFO



Mary Sue Coleman
President



Douglas Oberhelman
CEO



David Cote
CEO



Wesley Bush
CEO



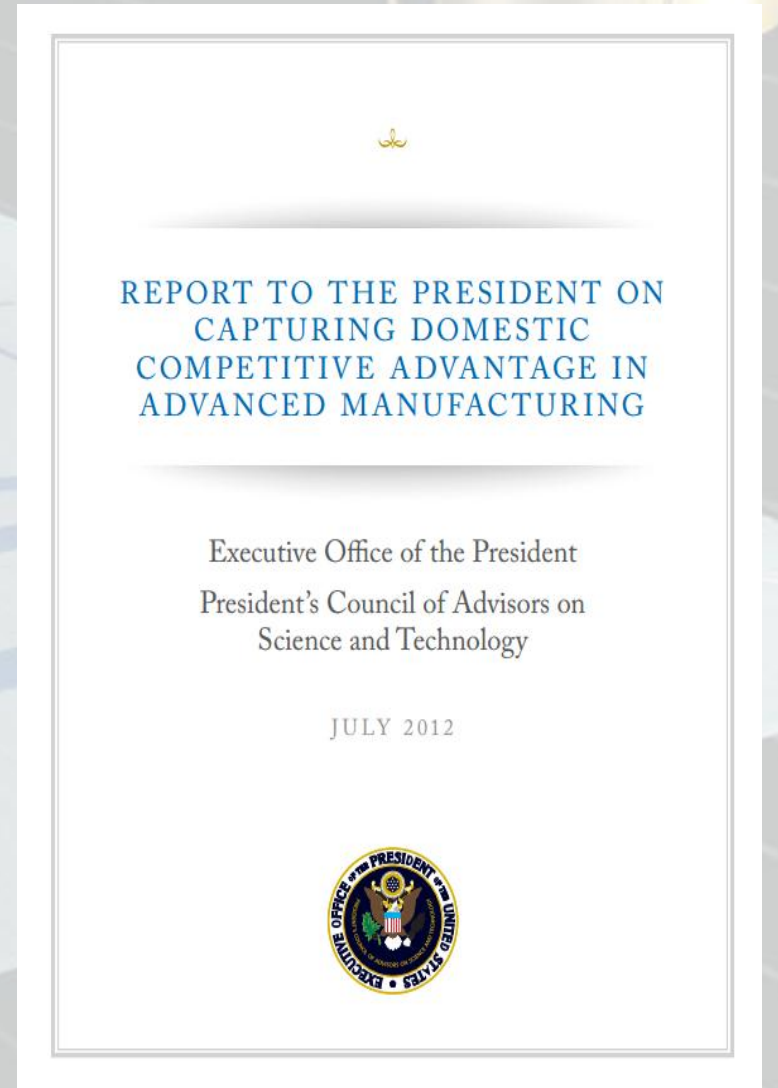
AMP Mission and Results

AMP Mission:

- Encourage approaches that sustain and grow U.S. leadership in advanced manufacturing, making the U.S. a magnet for jobs and investment; fostering broad, long-term collaboration among industry, academia, and government partners to drive advances in U.S. innovation and workforce capabilities.

Inaugural AMP achievements:

- Issued 16 recommendations across:
 - Enabling innovation
 - Securing the talent pipeline
 - Improving the business climate
- Spurred critical national initiatives, including the **National Network for Manufacturing Innovation (NNMI)**



The “Scale-up” Gap or Missing Middle



Basic R&D

Common terms
The “valley of death”
The “missing Bell Labs”
The “industrial commons”



Commercialization

Funding/
Investment

High

Low

Government and
universities

GAP

Private
sector

Manufacturing-innovation process

Basic
manufacturing
research

Proof of
concept

Production
in
laboratory

Capacity to
produce
prototype

Capability in
production
environment

Demonstration
of production
rates

The NNMI Story Today...

15 Institutes + Pilot



Full-size Institutes



Vision of 45 Institutes



6 x 2014 Institutes



March
2012



Additive
Mfg Pilot

January
2013



Power Electronics

January
2014



Digital Mfg
& Design



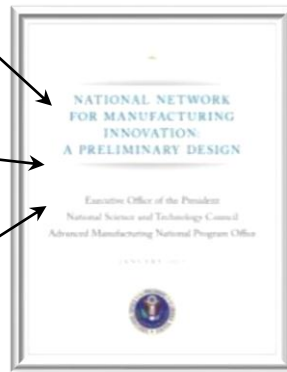
Light-
weight
Metals



PCAST/AMP Call
for NNMI



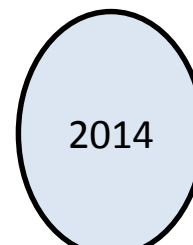
Public Comment



NNMI
Framework



2014



2014



2014

**Congressional
Authorization**

Formation of
Network and
More New
Institutes

Designing, Building and Growing the NNMI Presidential Initiative and Pilot

15 Institutes + Pilot



Size Institutes



Vision of 45 Institutes



6 x 2014 Institutes



Additive Mfg Pilot

January 2013



Power Electronics

January 2014



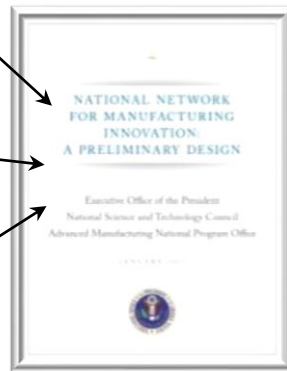
Digital Mfg & Design



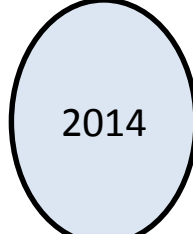
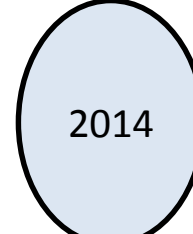
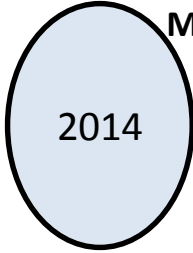
Light-weight Metals



Public Comment



NNMI Framework



Congressional Authorization

Formation of Network and More New Institutes

PCAST/AMP Call for NNMI

National Network for Manufacturing Innovation



“Sparking this network of innovation across the country, it will create jobs and will keep America leading in manufacturing...”

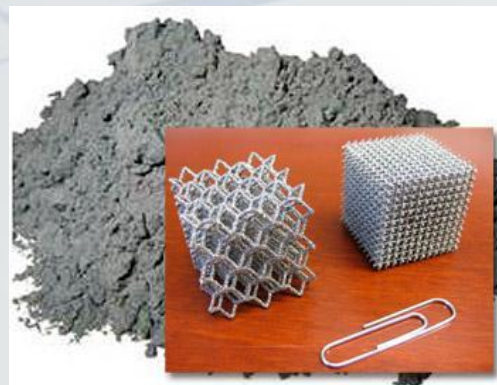
President Obama, March 9, 2012

- 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

Additive Manufacturing Innovation Institute Youngstown Ohio

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
- Ties to many organic facilities
- Tiered membership-based model, low cost to small business and nonprofits

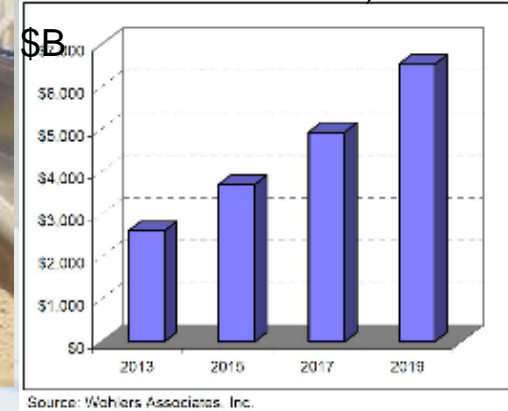


Why Additive Manufacturing?

High Potential for Transformative Impact



Projected AM Sales (products and services)



“20% of output of 3D printers is now final products, rather than prototypes. By 2020 it may be 50%.” – *The Economist* (2011)



Government agency investments and interest

Consumer Product Market

Designing, Building and Growing the NNMI

Public Input and the NNMI Design

15 Institutes + Pilot

Full-size Institutes

Vision of 45 Institutes

6 x 2014 Institutes



March
2012



Additive

January
2013



Power Electronics

January
2014



Digital Mfg
& Design



Light-
weight
Metals



PCAST/AMP Call
for NNMI

Public Comment

NNMI Framework



2014



2014



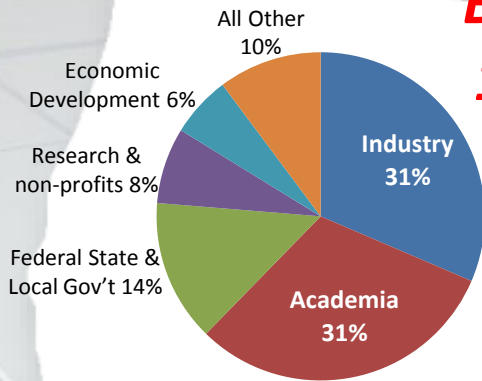
2014

**Congressional
Authorization**

Formation of
Network and
More New
Institutes

Public Engagement on Design Workshops & Request for Information

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



University of Colorado
Boulder, Colorado



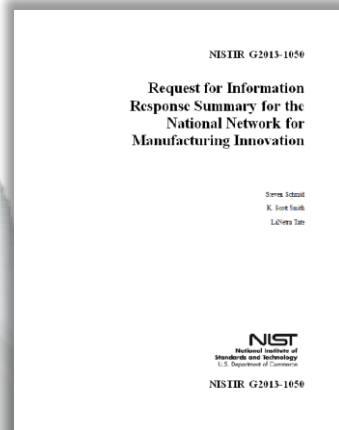
Cuyahoga Community College
Cleveland Ohio



Rensselaer Polytechnic Institute
Troy New York



National Academies Beckman Center
Irvine California



U.S. Space and Rocket Center
Huntsville, Alabama

The Institute Design

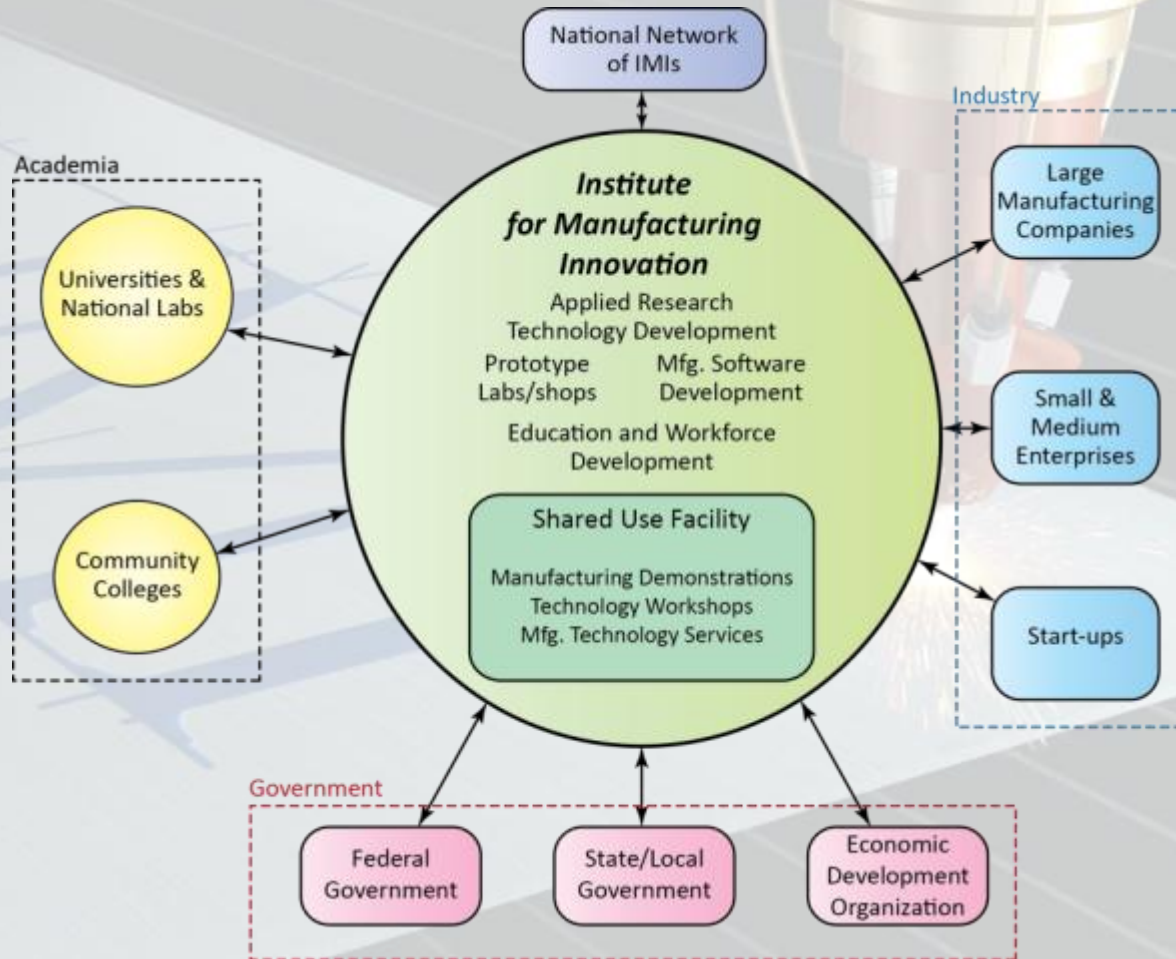
Creating the space for Industry & Academia to collaborate

White House Report
NNMI Framework Design
January 2013

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 Activities

Not just Applied R&D – solutions, access & workforce



Credit: anyaivanova /Shutterstock

Applied Research & Demo projects for

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



Credit: Dmitry Kalinovsky /Shutterstock

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



Credit: withGod/Shutterstock

Small/Medium Enterprises

- Engagement with small and medium-sized manufacturing enterprises (SMEs).

Institute



Source: istockphoto



Credit: Lisa Young/Shutterstock

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

So what does a Manufacturing Innovation Institute actually do?

How does an Industry-Academia Public-Private Partnership plan, develop and "de-risk" new technologies and materials?

How can these help Industry develop new products and processes for sustained competitiveness?



America Makes

Why America Makes?

America Makes creates mechanisms for collaboration...

Pooling Resources / Pooling Risks

Cooperative Development of

- Training
- Assessments
- Case Studies

Cooperative Development of

- Material Specs
- Process Specs
- Material Databases
- Design Rules
- Application Guides



Solving Problems Collaboratively



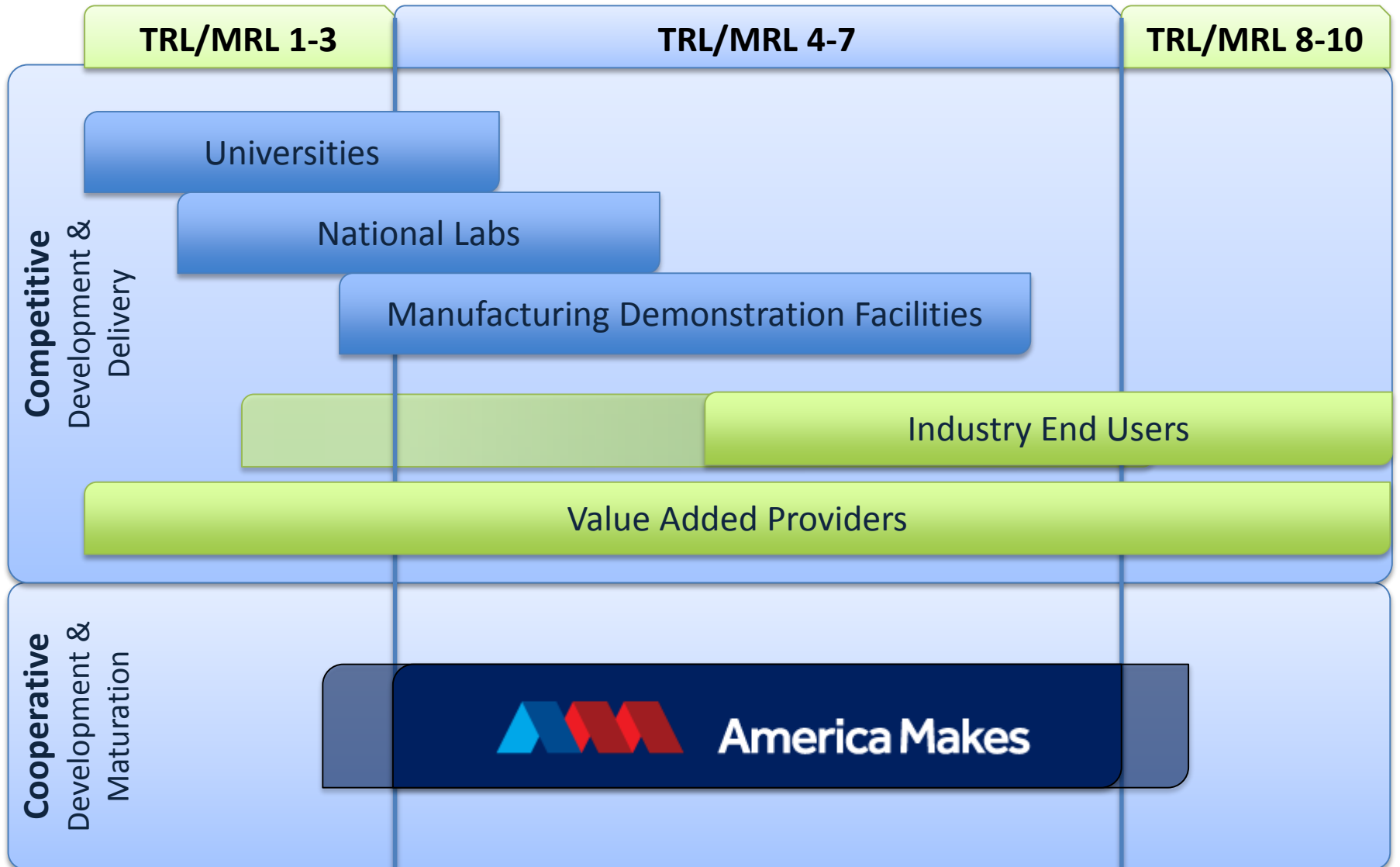
Work Shops, Working Groups,
Projects

Leveraging Community Knowledge

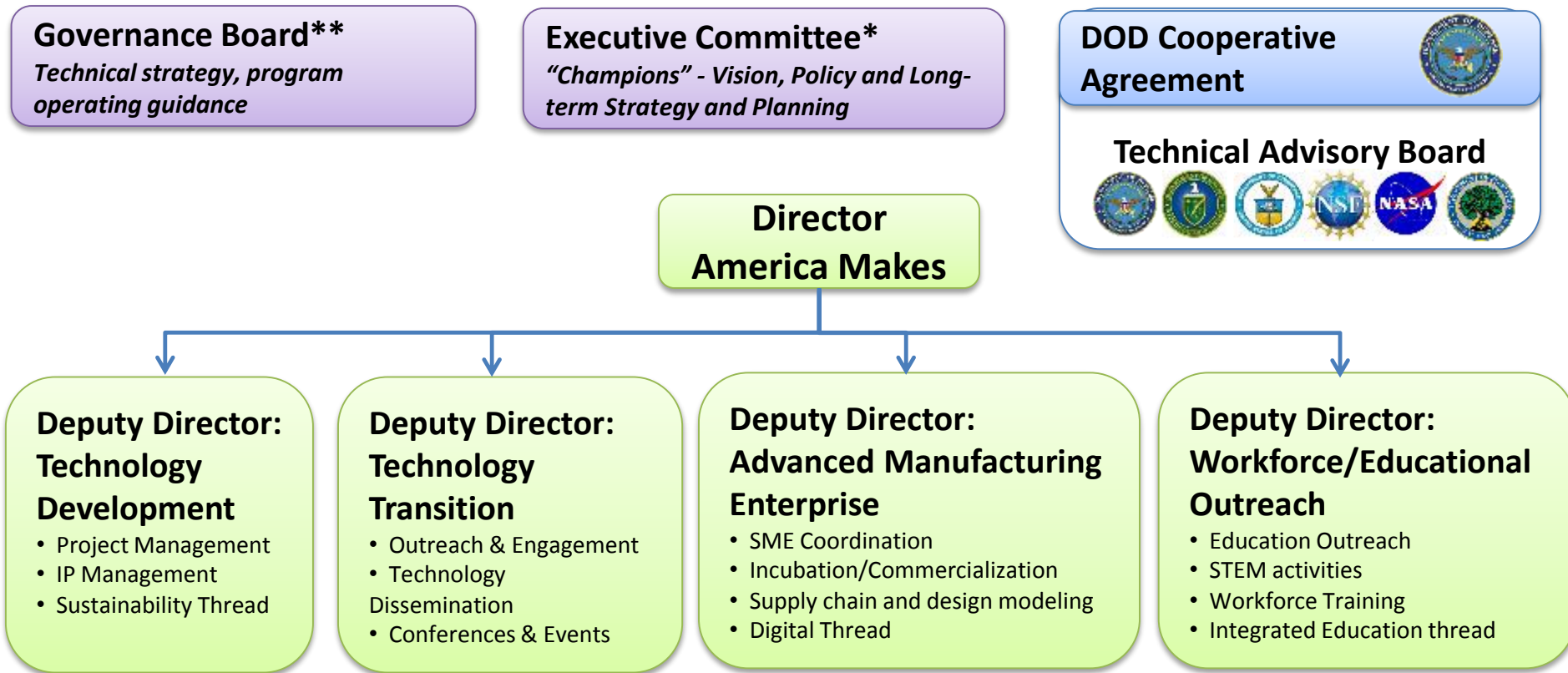


Public/Private Funded Projects
Crowd Funded Projects

Knowledge Base, Online Collaboration Tools, Databases,
Specifications, Application Guides, Curriculum



Governance Structure – Shared Leadership



- ***Executive Committee (11):** Industry, for-profit organization (2), Non-profit association (2), Academic (2), Government (3), At-large (2)
- ****Governance Board (35):** Lead and Full Members, states ex-officio

Membership Benefits

Community

- Formalized community looking to leverage AM Technologies
- Leverage learning curves
- Cooperatively solve similar issues
- Direct future equipment, material, and software development
- Technical strategy input

Work Force Development

- Pre-K to grey training resources
- Immersive training/learning at America Makes facility



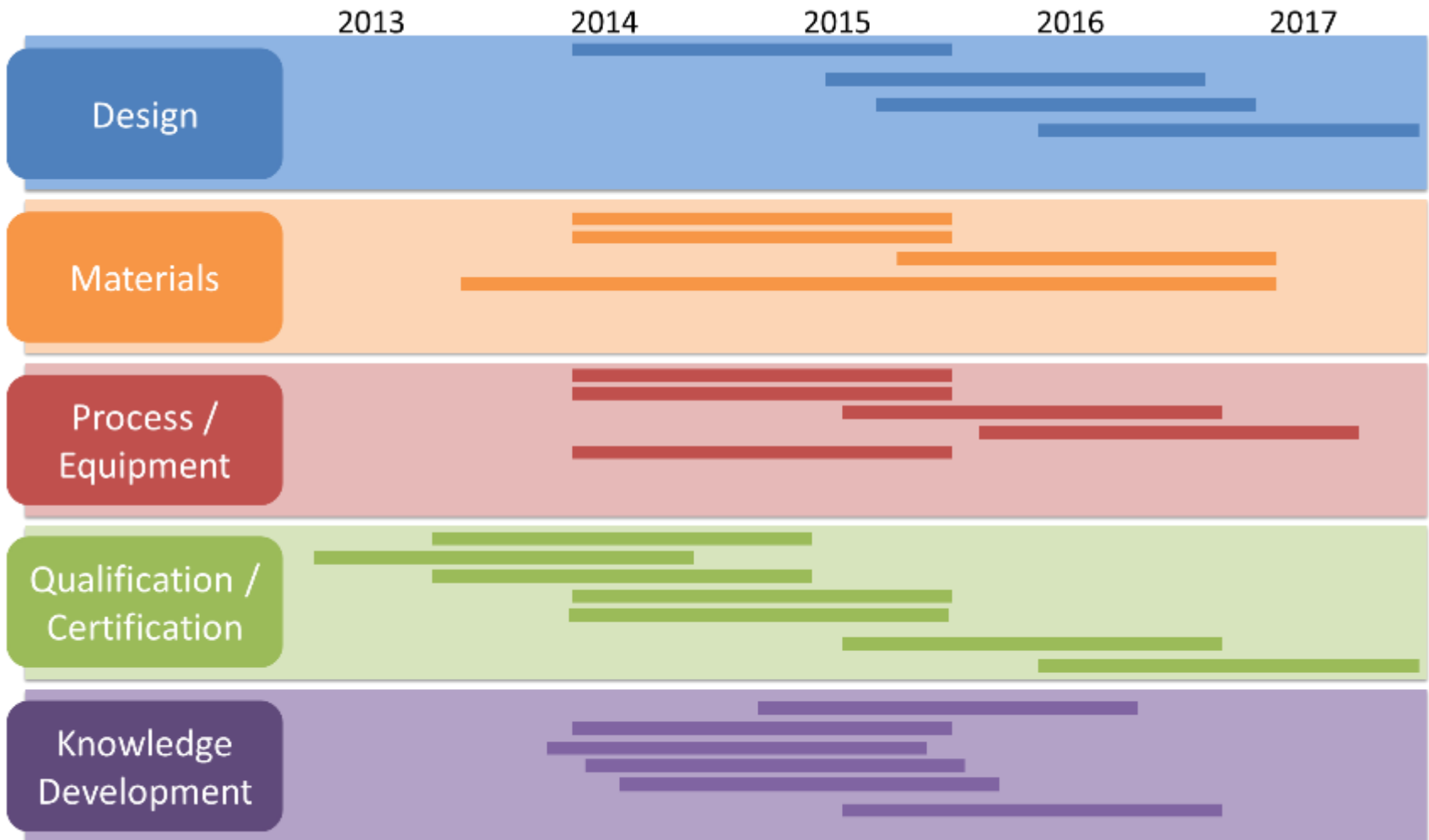
Projects

- Lead America Makes directed project calls
- Team with America Makes & members to win additional government project calls
- Use America Makes resources for targeted company projects

Enterprise Data

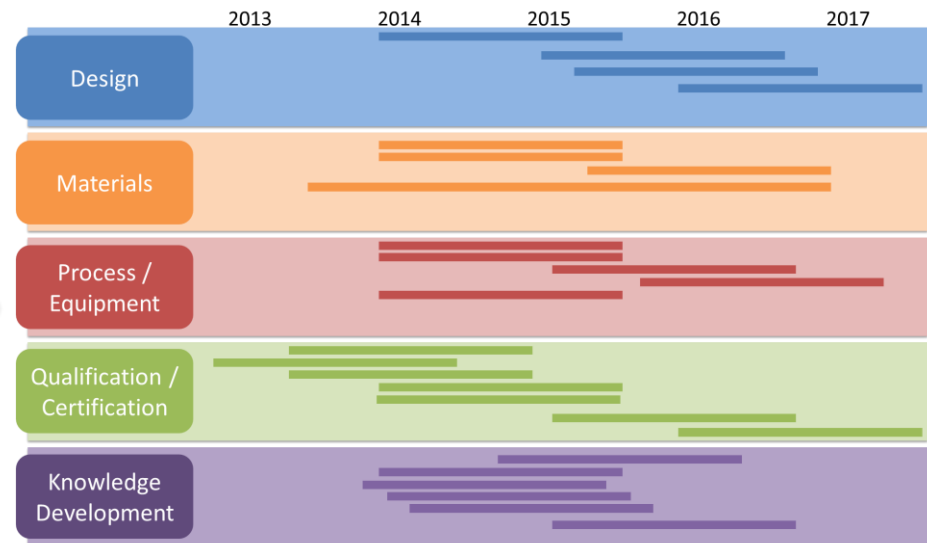
- Processing & Application data
- Material properties
- Supply chain
- Analysis




Technology Roadmap: v1.0



Project Call #2

- Eight *Priority Topics* Selected Based on Crowd-Sourced Roadmapping Process



 Life-Cycle Energy Analysis  Knowledgebase  NAMI Project Call

- Solicitation Issued 8/29/13; Proposals Received 10/31/13
- Announced 15 Project Awards 1/21/14
- Awarding \$9M of America Makes Funding with \$10.3 million matching cost share from awarded project teams = \$19.3M total funding

Designing, Building and Growing the NNMI

New Manufacturing Innovation Institutes

15 Institutes + Pilot



Full-size Institutes



Vision of 45 Institutes



6 x 2014 Institutes



March 2012



Advanced Mfg Pilot

Power Electronics

Digital Mfg & Design

Light-weight Metals

Congressional Authorization

Formation of Network and More New Institutes

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

Public Comment



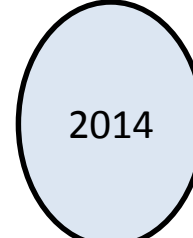
NATIONAL NETWORK FOR MANUFACTURING INNOVATION: A PRELIMINARY DESIGN

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

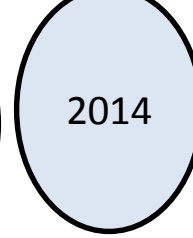
NNMI Framework



2014



2014



2014

PCAST/AMP Call for NNMI

NNMI Vision – 45 institutes



AP Photo/Susan Walsh

“In my State of the Union Address, I also 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

With Congressional Legislation

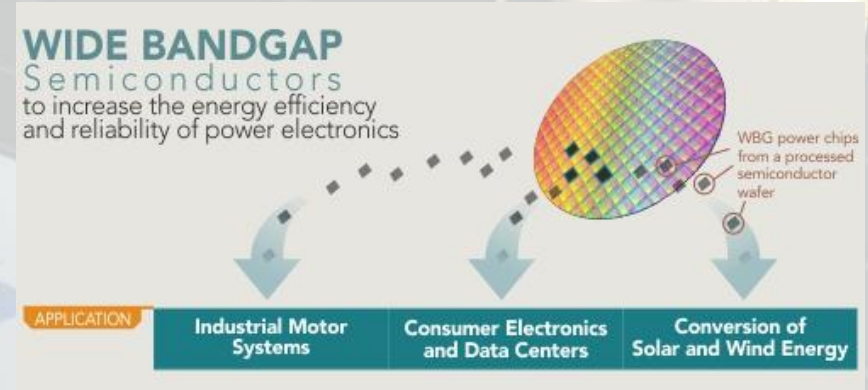
- Open competition on ANY topic proposed by Industry and Academia
- Selection of topics made on merit
 - let best proposals of greatest impact to US industry move ahead
 - Institutes by Administrative Action limited to topics Federal agencies need
- Creates capability for enough institutes to form a value-added network
- Provides stable funding and certainty for consortia – path to sustainability

Next Generation Power Electronics Manufacturing Innovation Institute

\$70M public investment, \$70M match

Lead: North Carolina State University

ABB, Arkansas Power Electronics International, Avogy, Cree, Deere & Company, Delphi Automotive, Delta Products, DfR Solutions, GridBridge, Hesse Mechatronics,, II-VI, IQE, Monolith Semiconductor, RF Micro Devices, Toshiba International, Transphorm, United Silicon Carbide, Vacon, Arizona State University, Florida State University, University of California-Santa Barbara, Virginia Tech, National Renewable Energy Lab, Naval Research Lab



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

State of the Union Announcement 2014 Institutes

We also have the chance, right now, to beat other countries in the race for the next wave of high-tech manufacturing jobs. My administration has launched two hubs for high-tech manufacturing in Raleigh and Youngstown, where we've connected businesses to research universities that can help America lead the world in advanced technologies.



Tonight, I'm announcing we'll launch six more this year. Bipartisan bills in both houses could double the number of these hubs and the jobs they create. So get those bills to my desk and put more Americans back to work.

President Barack Obama
January 28, 2014

*Six full-scale manufacturing innovation institutes
to be awarded in 2014*

Designing, Building and Growing the NNMI

What was just announced?

15 Institutes + Pilot



Full-size Institutes



Vision of 45 Institutes



6 x 2014 Institutes



March 2012



Additive Mfg Pilot

January 2013



Power Electronics

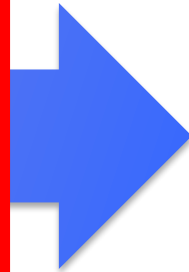
January 2014



Digital Mfg & Design



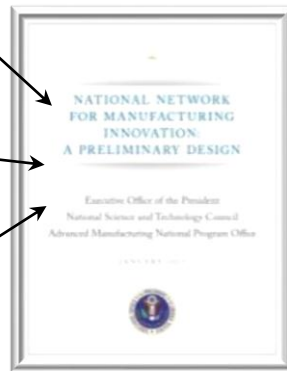
Light-weight Metals



PCAST/AMP Call for NNMI



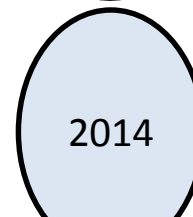
Public Comment



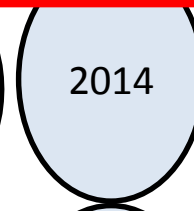
NNMI Framework



2014



2014



2014

Congressional Authorization

Formation of Network and More New Institutes

New Institutes Announced, February 25, 2014

“That’s what these new hubs are all about. They’re partnerships – they bring together companies and universities to develop cutting-edge technology, train workers to use that technology, and make sure research is turned into real-world products made by American workers.”



President Barack Obama
February 25, 2014

Lightweight and Modern Metals Manufacturing Innovation Institute

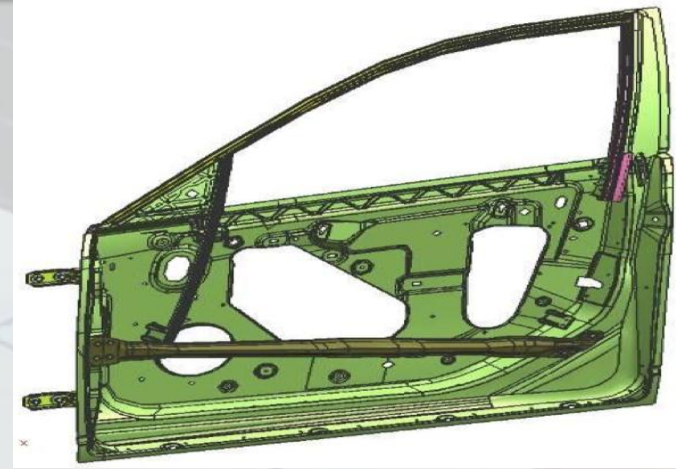
\$70M public investment, \$70M match

Lead: EWI

Hub location: Canton, 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 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

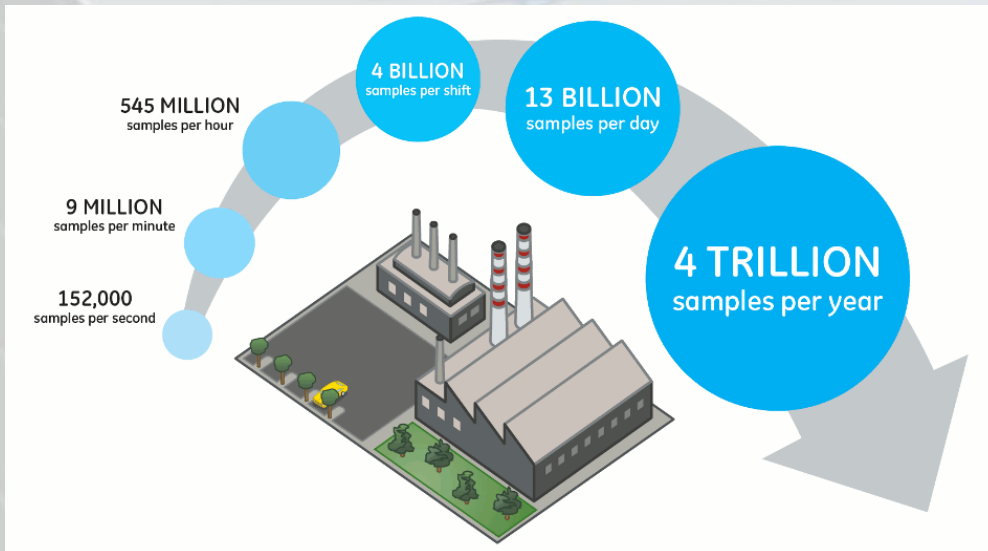
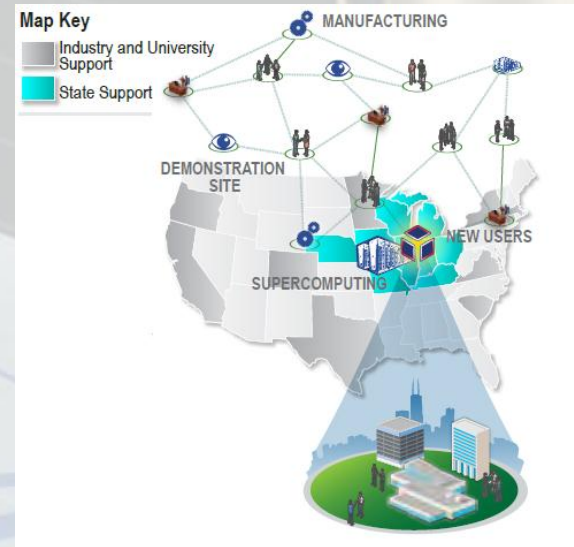
Digital Manufacturing and Design Innovation Institute

\$70M public investment, ~\$240M 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

Funding Opportunity Announcement:

Advanced Composites Manufacturing Innovation Institute

\$70M public investment over five years

Objective

Develop and demonstrate innovative technologies that will, within 10 years, make advanced fiber-reinforced polymer composites at...



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)

Designing, Building and Growing the NNMI

NNMI Next Steps

15 Institutes + Pilot



Full-size Institutes



Vision of 45 Institutes



6 x 2014 Institutes



March 2012



Additive Mfg Pilot

January 2013



Power Electronics

January 2014



Digital Mfg & Design

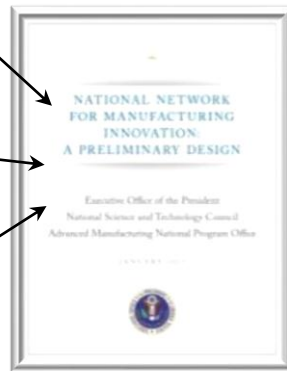


Light-weight

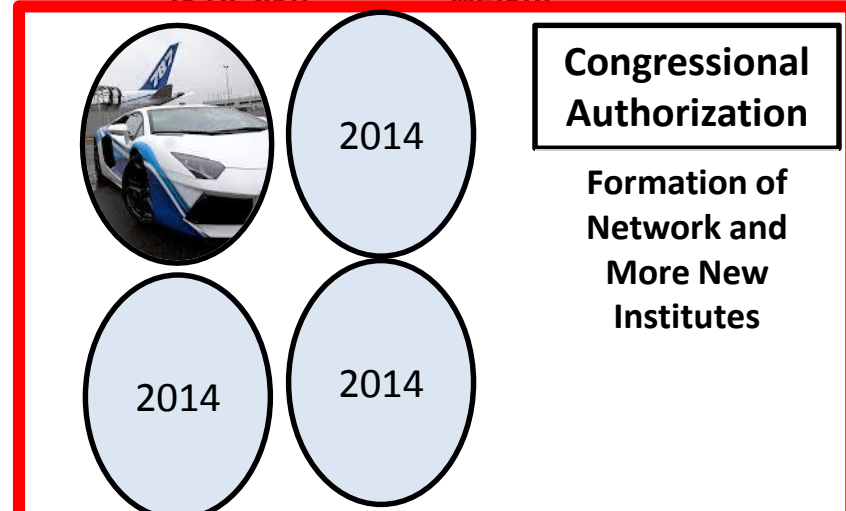


PCAST/AMP Call for NNMI

Public Comment



NNMI Framework



The Start of a Network...



**Additive
Manufacturing**



**Power
Electronics**



**Digital
Manufacturing**



**Lightweight
Metals**



Adv. Composites Mfg.

**2014
Solicitation
TBA**

**2014
Solicitation
TBA**

**2014
Solicitation
TBA**

NNMI Bipartisan/Bicameral Legislation

Revitalize American Manufacturing & Innovation Act of 2013

Lead Sponsors



Sen. Sherrod Brown
D Ohio



Sen. Roy Blunt
R Missouri



Rep. Tom Reed
R NY-23



Rep. Joe Kennedy
D MA-4

Senate Commerce Committee Hearing Nov. 13, 2013

House Science Committee, Subcommittee on Research & Technology Hearing Dec. 12 2013

Joint press release: “Their landmark bill would establish a Network for Manufacturing Innovation to position the United States, once again, as the global leader in advanced manufacturing and ensure that the U.S. can out-innovate the rest of the world while creating thousands of high-paying, high-tech manufacturing jobs.”

Potential Future NNMI Topics

Public input identified 135 unique topics

Are you ready to propose your topic?

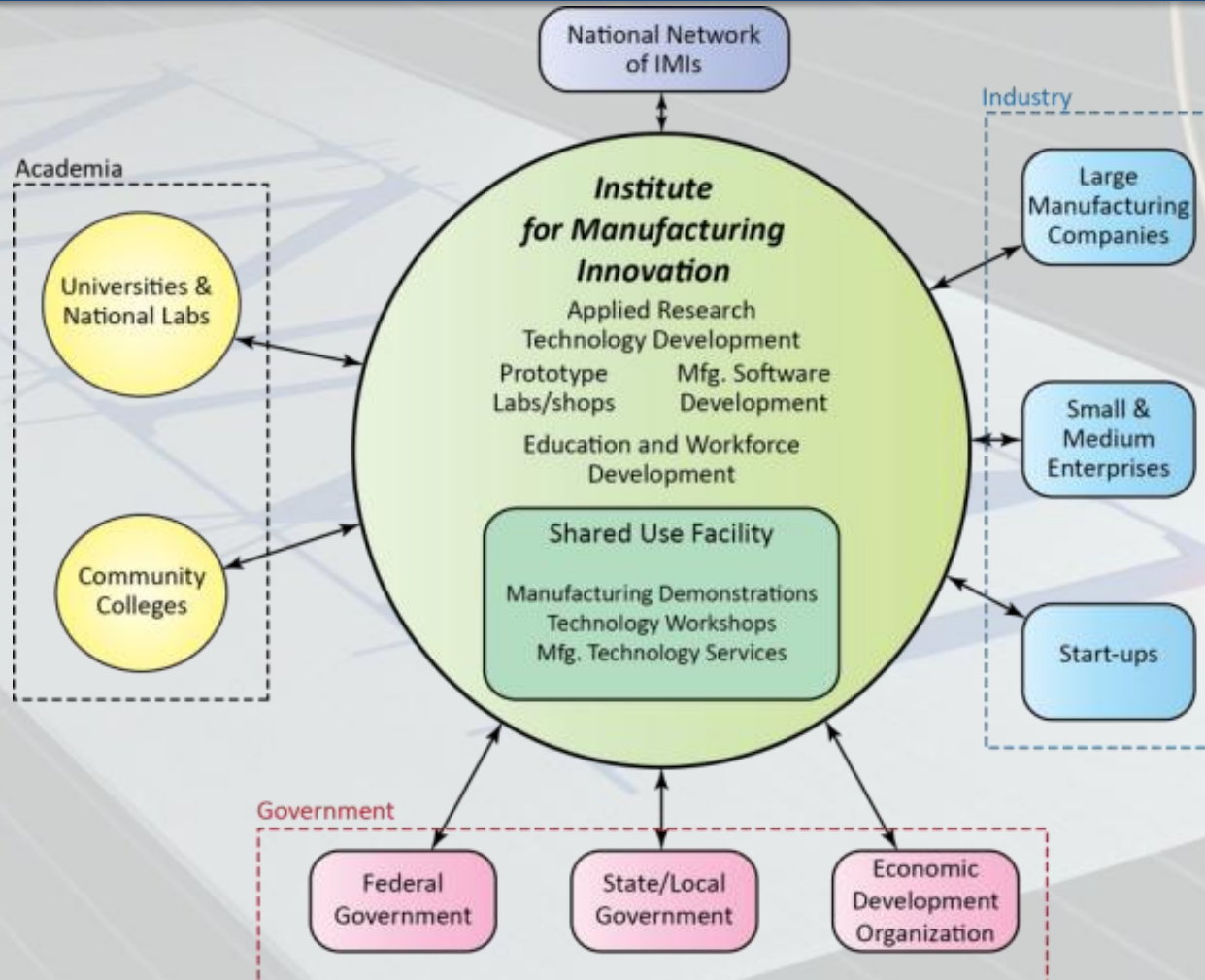
With congressional authorization will come open solicitation.

Agenda

A laser cutting machine is shown in the background, cutting a metal plate. The machine's nozzle is positioned over the plate, and a bright light is visible at the point of contact, indicating the cutting process. A blue grid pattern is overlaid on the metal plate, suggesting a design or manufacturing process.

1. The National Network for Manufacturing Innovation
- 2. Academic Participation in the NNMI**
3. AMP 2.0 and Future Engineering Education

NNMI: Creating the Partnership Space for Academia and Industry

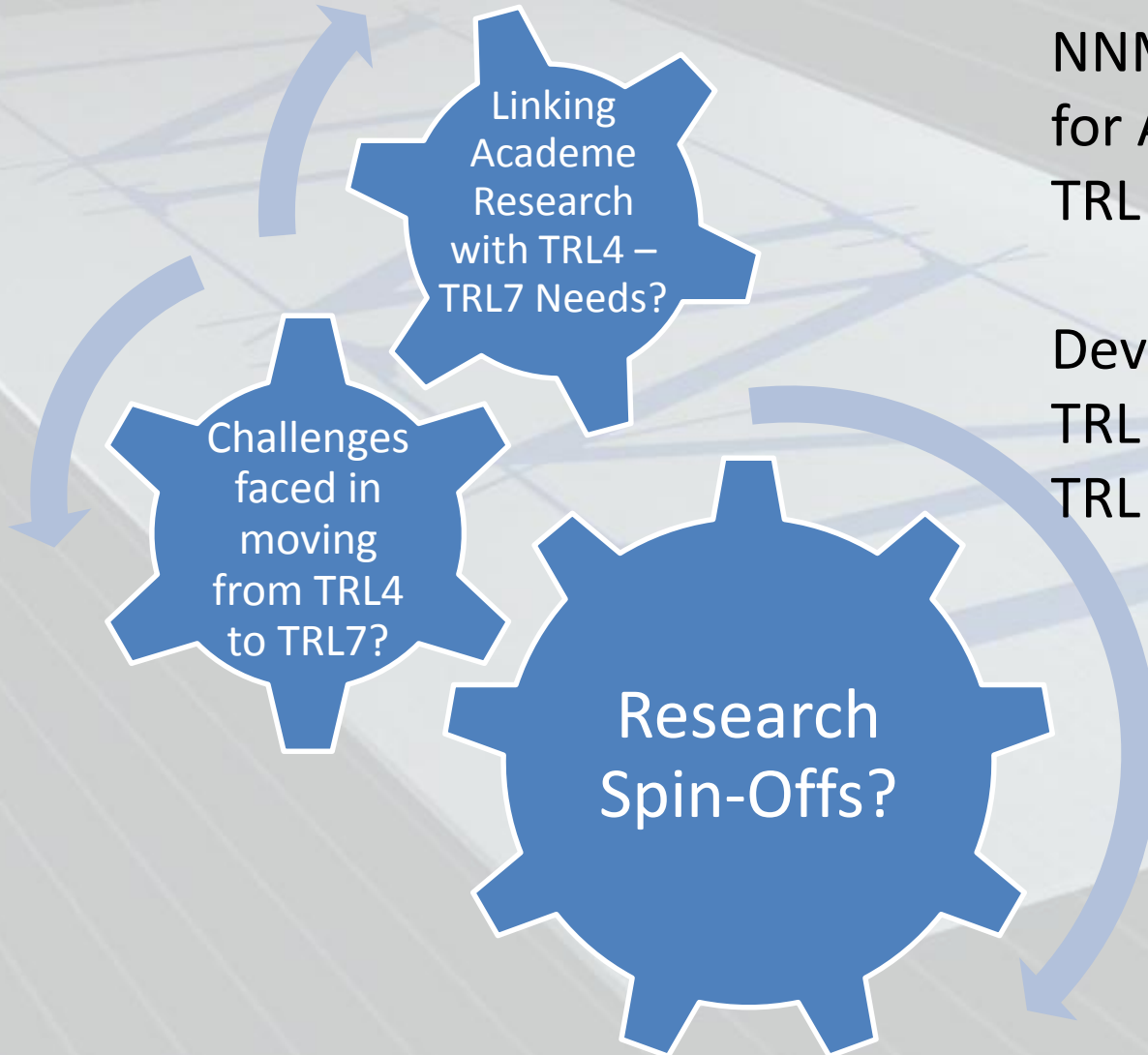


Partnership: *Industry – Academia – Government*

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

Addressing the Nation's Advanced Manufacturing Needs

– Academe Research linking to Applied/Scale-up R&D –

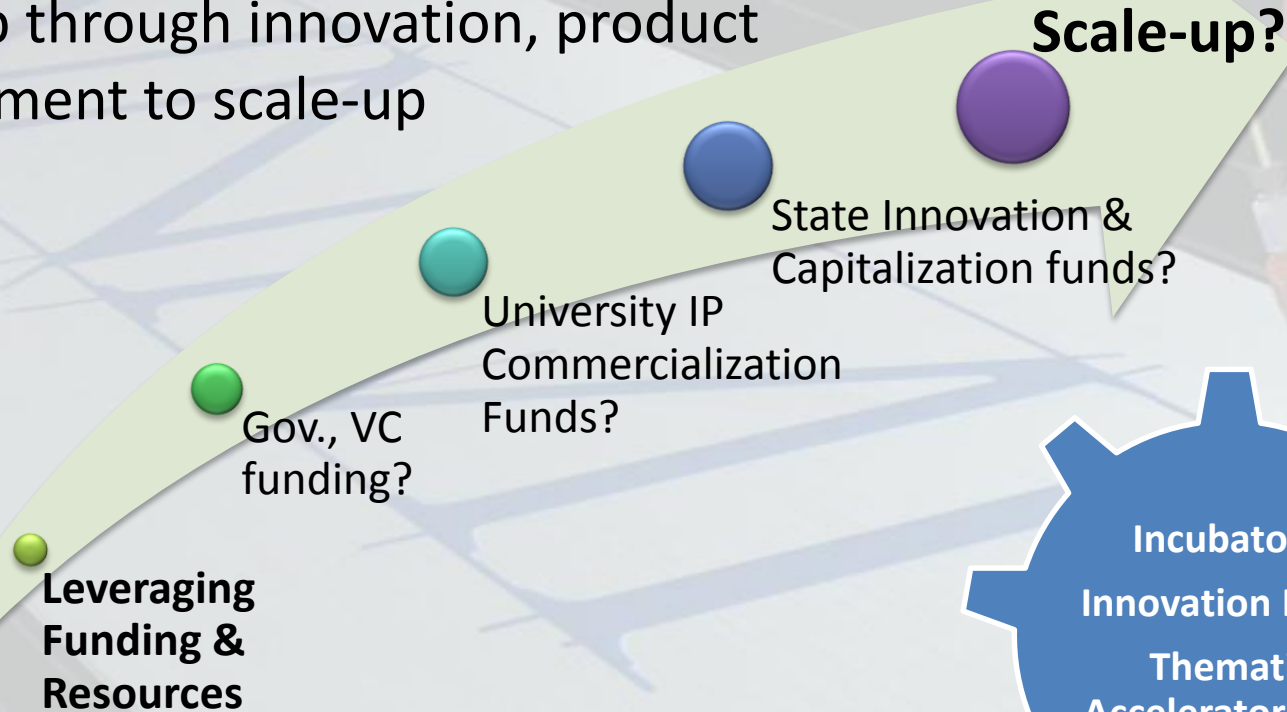


NNMI: New opportunities for Academia in expanded TRL 4-7 R&D

Development challenges in TRL 4-7 gives rise to further TRL 1-3 research

Linked research to scale-up can open doors to new funding opportunities

New avenues for academe in leveraging funds up through innovation, product development to scale-up

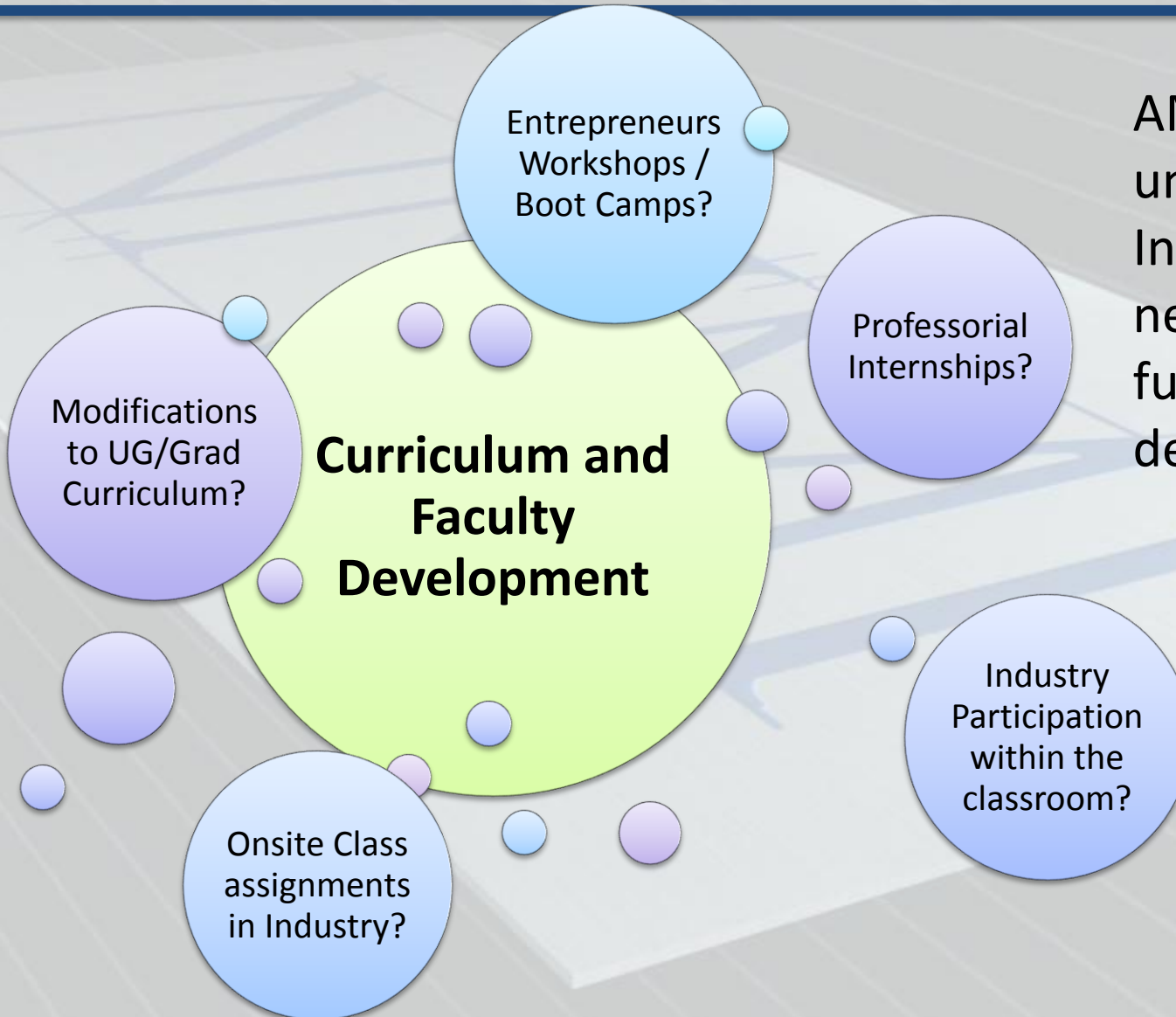


Innovation hubs, Mfg Development Facilities, Incubators provide facilities to connect universities to enhance US supply chain

Supply – Chain

Addressing the Nation's Advanced Manufacturing Needs

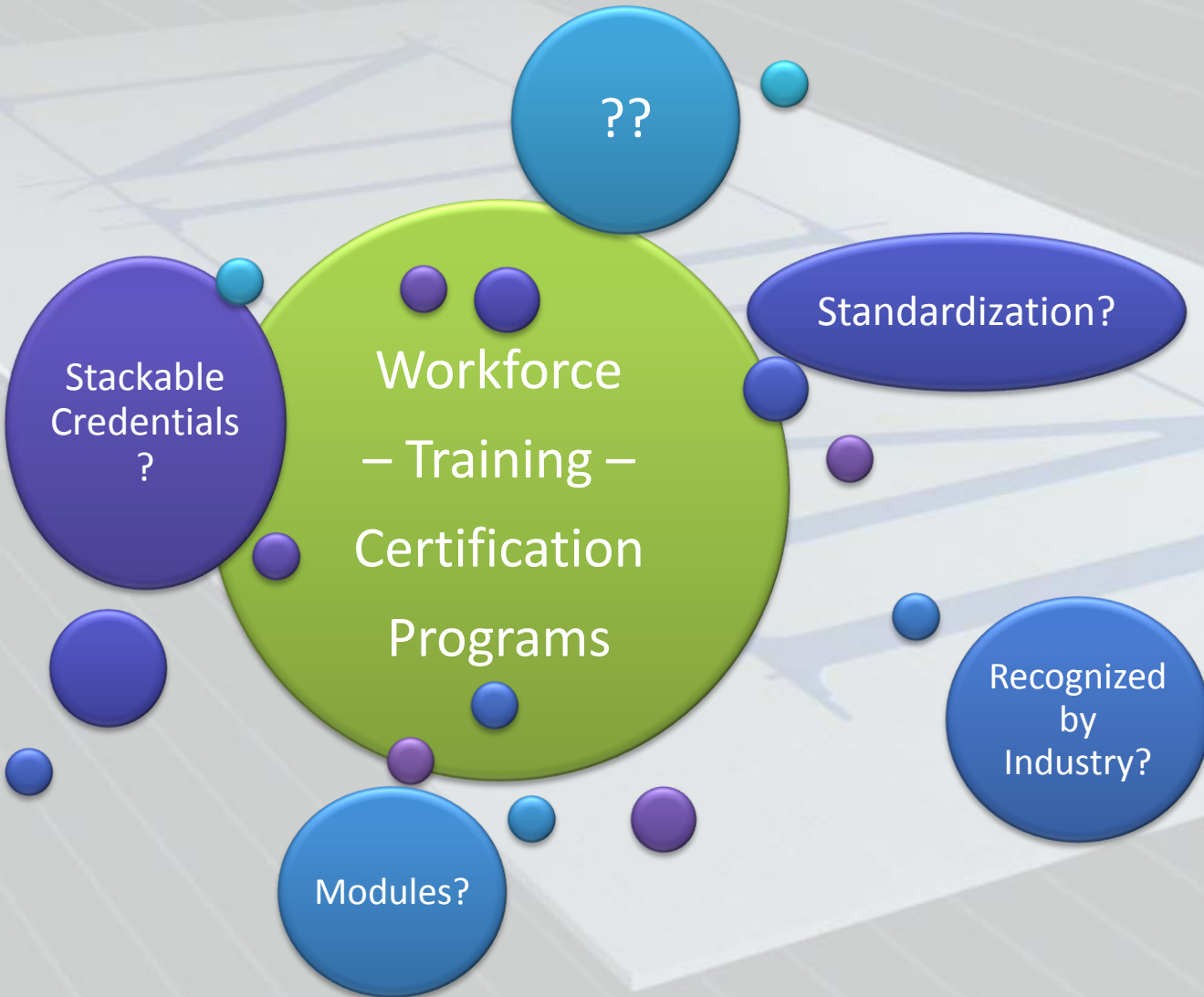
Industry Needs to Future Curriculum and Faculty



AMP: improved understanding of Industry needs/trends to future educational development

Addressing the Nation's Advanced Manufacturing Needs

Workforce Skills Standards to new Programs & Modules



Real need to establish standards that have meaning to employers

Growing trend in stackable, modular credentials

Agenda

A laser cutting machine is shown in the background, cutting a metal plate. The machine's nozzle is positioned over the plate, and a bright light is visible at the point of contact, indicating the cutting process. A blue grid pattern is overlaid on the metal plate, suggesting a design or manufacturing process.

1. The National Network for Manufacturing Innovation
2. Academic Participation in the NNMI
3. **AMP 2.0 and Future Engineering Education**

President's Council of Advisors on Science and Technology Advanced Manufacturing Partnership 2.0

AMP Mission: Encourage approaches that sustain and grow U.S. leadership in advanced manufacturing

19 Senior Leaders -industry, academia & labor

Steering Committee Co-Chairs

Rafael Reif Andrew Liveris



AMP Coordinating Group
DOW, MIT, WH, AMNPO

AMP 1.0 – 16 Recommendations

Pillar I: Enabling Innovation

Pillar II: Securing the Talent Pipeline

Pillar III: Improving Business Climate

AMP 2.0 focused on Implementation kickoff Sept 30, 2013

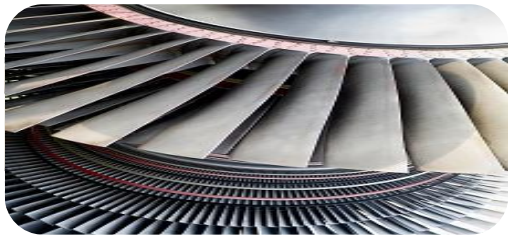
- Regional engagement and outreach
- Implementation on national initiatives
- Five active Working Teams to issue “letter-reports”

AMP 2.0 Working Teams

1. Transformative manufacturing technologies
2. Demand-driven workforce solutions
3. Supporting implementation of NNMI
4. Technology scale-up policy
5. Improving the Manufacturing image

AMP 2.0 – Five Working Teams

1) Technologies



Launching public-private initiatives to advance transformative manufacturing technologies:

- The AMP SC 2.0 will deploy small expert working teams against two to four of the technologies identified in the initial AMP SC report, with the goal of assessing actions and developing technology strategies for sustained U.S. leadership.

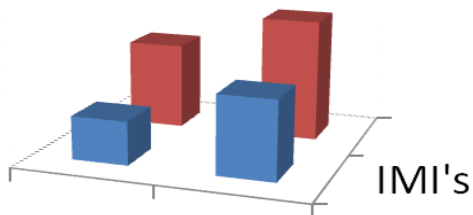
2) Workforce



Scaling best-in-class demand-driven workforce solutions to develop technical skills:

- The AMP SC 2.0 will identify the characteristics of successful partnerships and mechanisms to rapidly scale demand-driven workforce solutions in areas of critical skills need; and identify private sector and federal resources to leverage behind these solutions.

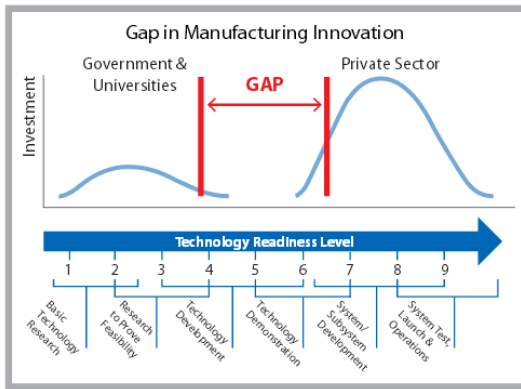
3) NNMI



Supporting implementation of the National Network for Manufacturing Innovation (NNMI): The AMP SC 2.0 provide tactical input on the implementation of the NNMI to ensure that the Institutes and the Network are appropriately geared towards industry needs and that core implementation issues are addressed.

AMP 2.0 - Working Teams (continued)

4) Scale-up Policy



Addressing core advanced manufacturing policy questions related to new technologies:

- Core manufacturing questions have been identified that currently lack clear solutions.
- The AMP SC 2.0 will task working teams to investigate potential solutions to one to two of these central questions, for example:
 - Solutions to unique barriers that inhibit young firms from scaling new technologies in the U.S.
 - Challenges to rapidly deploying new technologies and processes across the U.S. supply chain

5) Manufacturing Image



Driving excitement and engagement from the science and engineering community:

- Last year the AMP SC recognized the value of engaging this community through a series of specific recommendations.
- The AMP SC 2.0 will spearhead initiatives to implement these recommendations, which could include hosting a possible national advanced manufacturing innovation summit or public awareness campaign.

AMP 2.0 Implementation

■ AMP Steering Committee 2.0

- Holding 3 in-person AMP Steering Committee 2.0 meetings (December 3rd, March/April and May/June)

■ AMP 2.0 Outreach and Engagement

- Roundtables (focus groups)
 - Manufacturing Imaging
 - Capital Access – 3 video conferencing nodes: east-to-west
 - Financing Scale Up for Established SMEs
- External Subject Matter Experts (Industry – Academia – Government)
- State and National Government – Governors & Congress

■ AMP 2.0 Regional Meetings [*Hosts*]

- Atlanta, GA – February 3, 2014 [*Georgia Institute of Technology*]
- Akron, OH – April 2, 2014 [*University of Akron / United Steelworkers*]
- Troy, NY – April 24, 2014 [*Rensselaer Polytechnic Institute / Global Foundries*]
- Cambridge, MA – May 16, 2014 [*Massachusetts Institute of Technology*]
- Detroit, MI – June 9, 2014 [*University of Michigan / Northrop Grumman Corporation*]

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

STATEMENT OF WORK
ADVANCED MANUFACTURING PARTNERSHIP
STEERING COMMITTEE



Team 2: Demand-Driven Workforce Development

Led by Siemens and South Central College

- | | |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GOALS | <ul style="list-style-type: none">▪ Scaling best-in-class demand-driven workforce solutions to develop technical skills |
| SCOPE OF WORK | <ul style="list-style-type: none">▪ Increase career pathways and “dual credit” opportunities across education (K-12 schools, community colleges, and Universities) to increase number of qualified technical employees in advanced manufacturing.▪ Increase nationally portable, stackable credentialing systems through certifications and work-based learning elements.▪ Establish internship/apprenticeship models with industry, trade unions, government and high schools or community colleges which can be implemented in regions across the US.▪ Develop practical competency based “bridging modules” for transitioning veterans focused on private sector manufacturing skills certifications and apprenticeships with DOL/GI Bill funding and support. |

REPORT OF PROGRESS

- The work team has divided into four subteams, one focused on each of the four priorities identified in the SOW.
- Important elements of the models include concepts such as: multiple entry and exit points along career pathways, modularized training programs, “regionality” of the effort and importance of partnerships between industry and academia with local “intermediaries”.

Team 5: The Image of Manufacturing

Led by Northrop-Grumman and The University of Michigan

- | | |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GOALS | <ul style="list-style-type: none">▪ Implement the recommendations included in the “Report of the Advanced Manufacturing Partnership Steering Committee Annex 5: Outreach Workstream” |
| SCOPE OF WORK | <ul style="list-style-type: none">▪ Develop a new image for advanced manufacturing▪ Develop an outreach program for supporting the manufacturing image campaign▪ Leverage regional and national meetings |

REPORT OF PROGRESS

- Target Groups have **been identified and prioritized**
 - K-12 communities: parents, teachers and students
 - Technical communities: universities and community colleges
 - Local, State & Federal Policymakers: engaging the manufacturing community to help carry the campaign forward
- Work has begun to **define and focus** messages and outline the associated delivery tactics
 - Messages include: “manufacturing is a career, not just a job” and is rewarding, exciting, creative and innovative, and new adjectives replacing “The Four D’s”
 - Media, social media, video, AD council, regional and national meetings etc.
 - Working with other stake-holders on manufacturing image
- **Building links** to the action plans that are being developed in the Workforce group



Thank you

*For questions or comments, please contact the
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