National Network for Manufacturing Innovation

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GUIRR
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Interagency Advanced Manufacturing National Program Office (AMNPO)

Advanced Manufacturing Partnership (AMP)

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

Advanced Manufacturing Agency Leaders (NSTC)

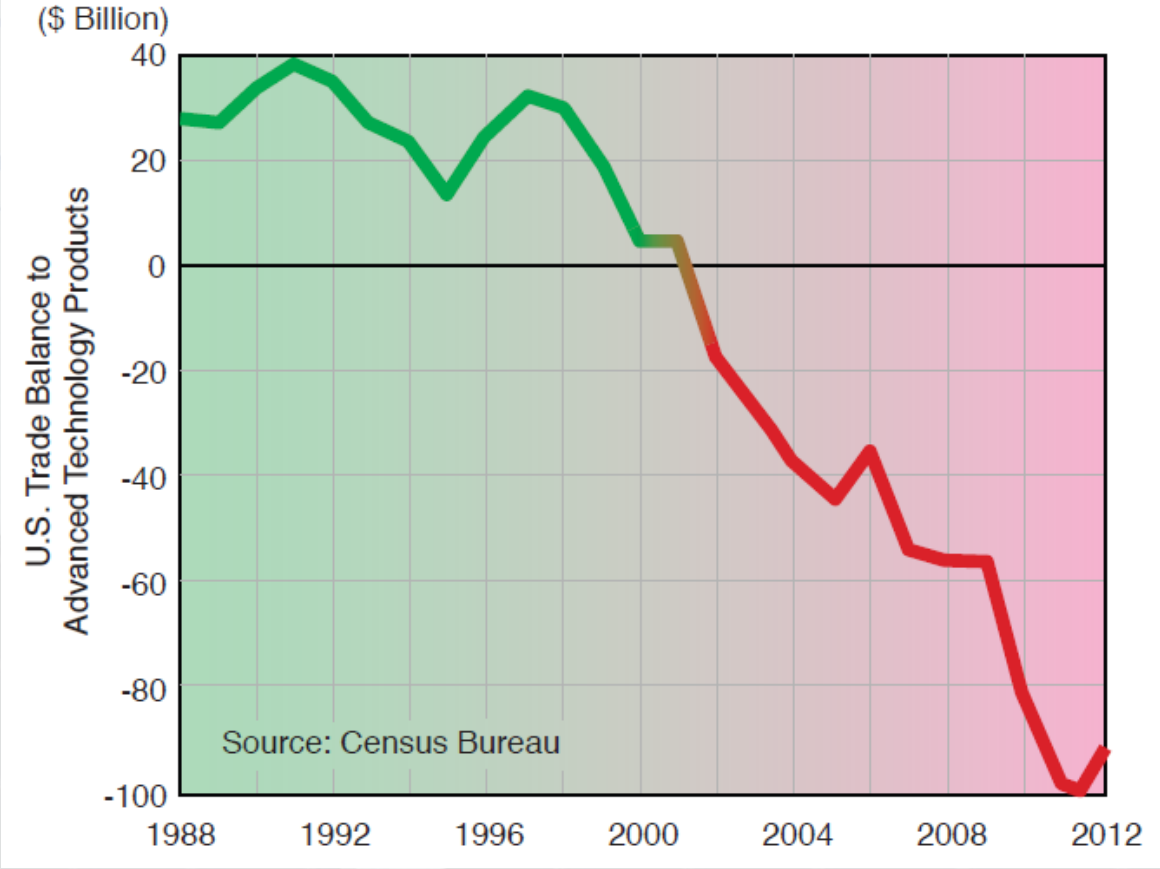
Agenda

- **US Manufacturing Challenge**
- The Missing Middle – NNMI Positioning
- NNMI Design
- NNMI Characteristics
- Next Steps

U.S. Trade Balance of Advanced Technology

- 12% of U.S. GDP
- 12 million U.S. jobs
- 60% of U.S. engineering and science jobs

- 47% of U.S. Exports
- Nearly 20% of the world's manufactured value added

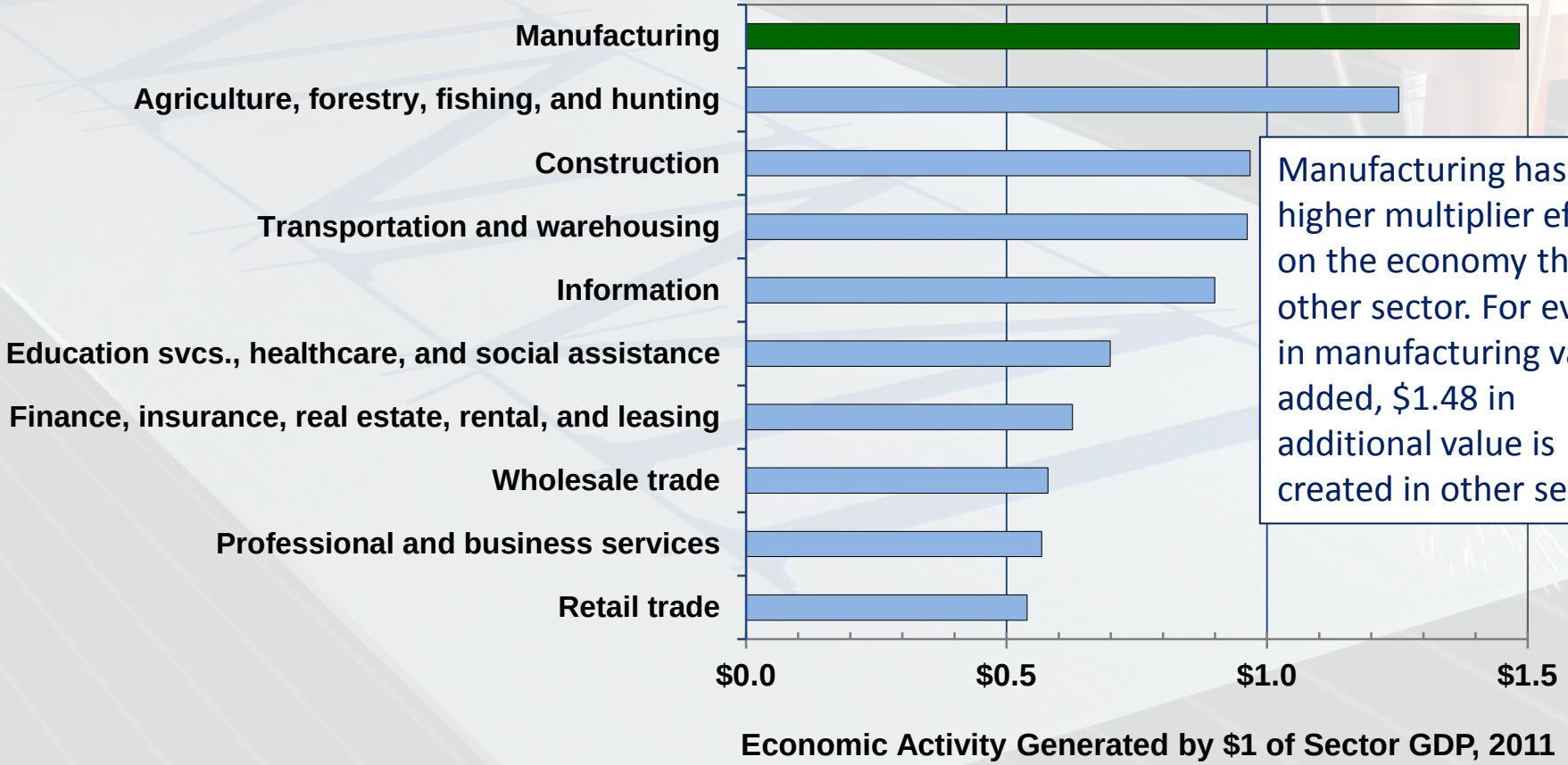


Products invented here, now made elsewhere - not driven by labor cost

NIST Gallery

Manufacturing Economic Impact

Manufacturing drives jobs throughout the economy, including in services



Manufacturing has a higher multiplier effect on the economy than any other sector. For every $1 in manufacturing value added, $1.48 in additional value is created in other sectors.

Source: U.S. Department of Commerce, Bureau of Economic Analysis Council on Competitiveness

Manufacturing Innovation Impact

U.S. manufacturers

- Employ over half of all R&D personnel in domestic industry
- Employ over a third of all engineers
- Account for 70% of patents issued to U.S. entities

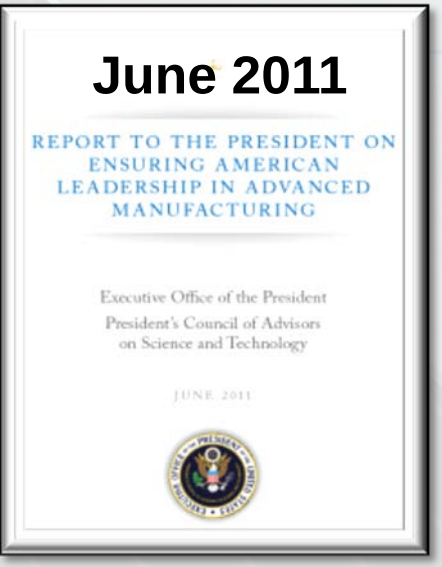
10% of employment

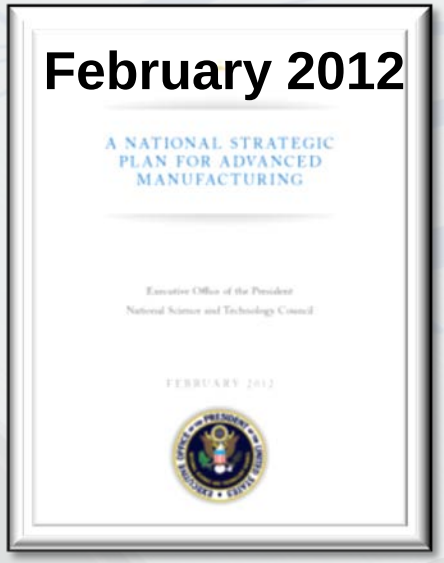
12% of gross domestic product

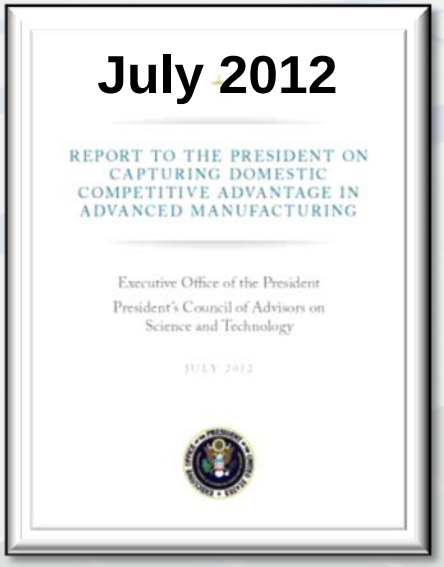
47% of exports

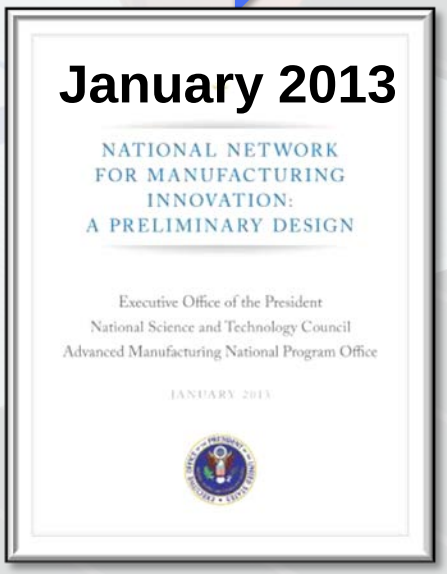
70% of private R&D spend

US Manufacturing Policy Milestones









National Network for Manufacturing Innovation

President Obama announces NNMI, March 9, 2012

"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."

- Up to 15 institutes to underpin regional clusters of manufacturing innovation across the country, each with a unique focus
- Shared approaches to infrastructure, intellectual property, contract research, and performance metrics
- Also announces FY12 pilot institute

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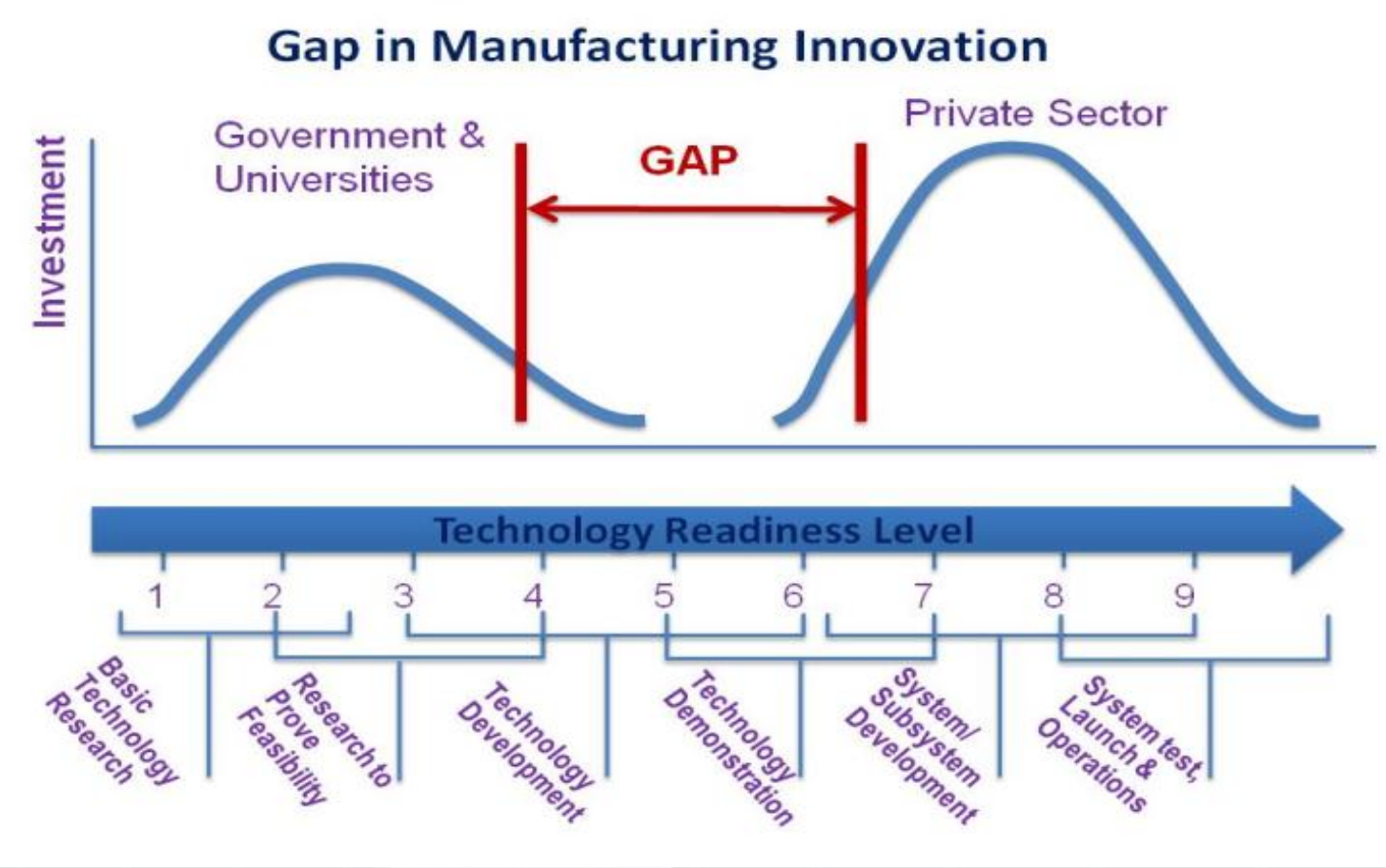
The Missing Middle – Valley of Death

Not about government spend in TRL 4-7 projects!

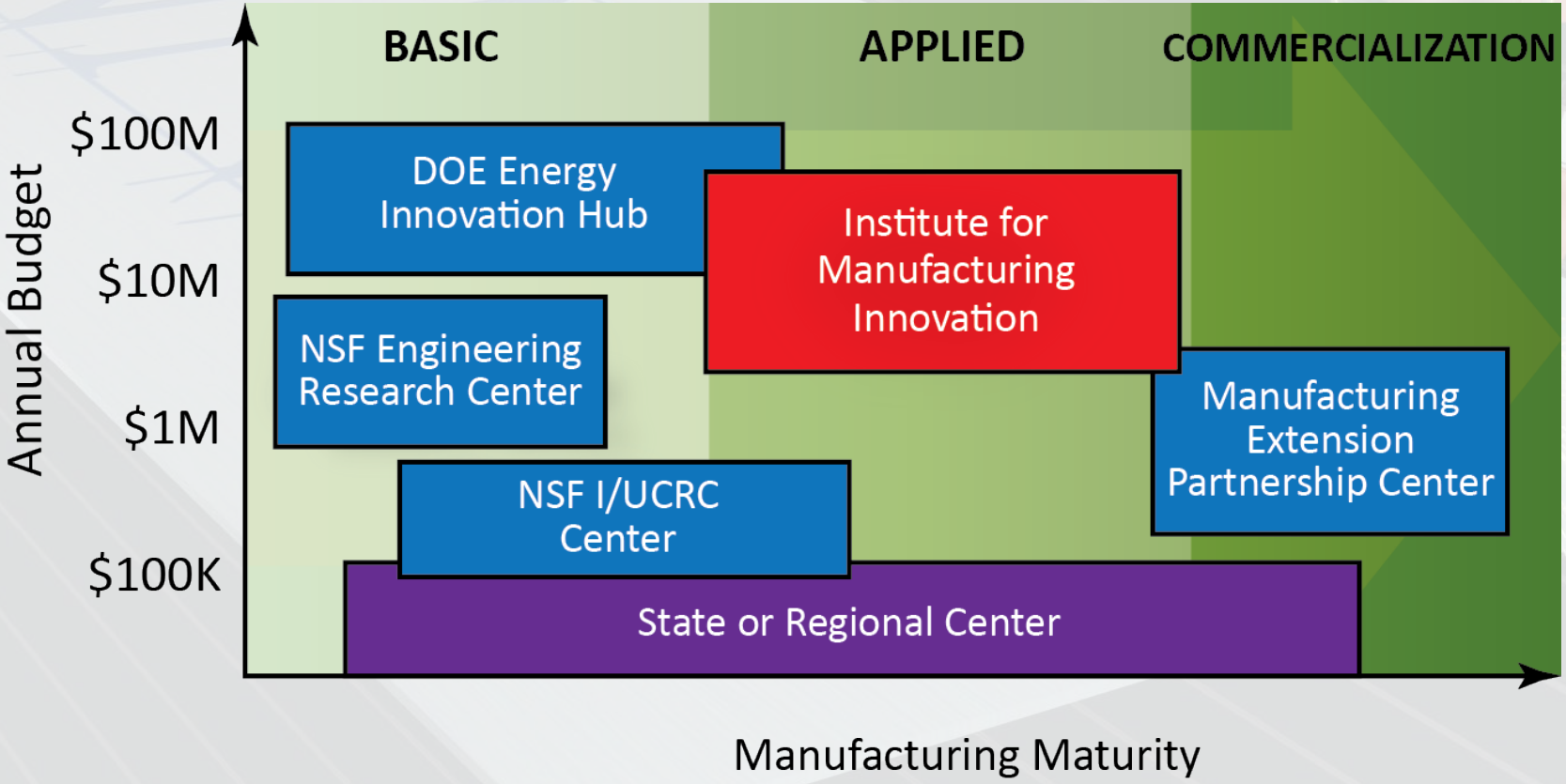


Credit: Jack Hu

Focus on Scale Up – The Missing Middle

Basic science
Largely government funded

Commercialization
private sector owned/funded

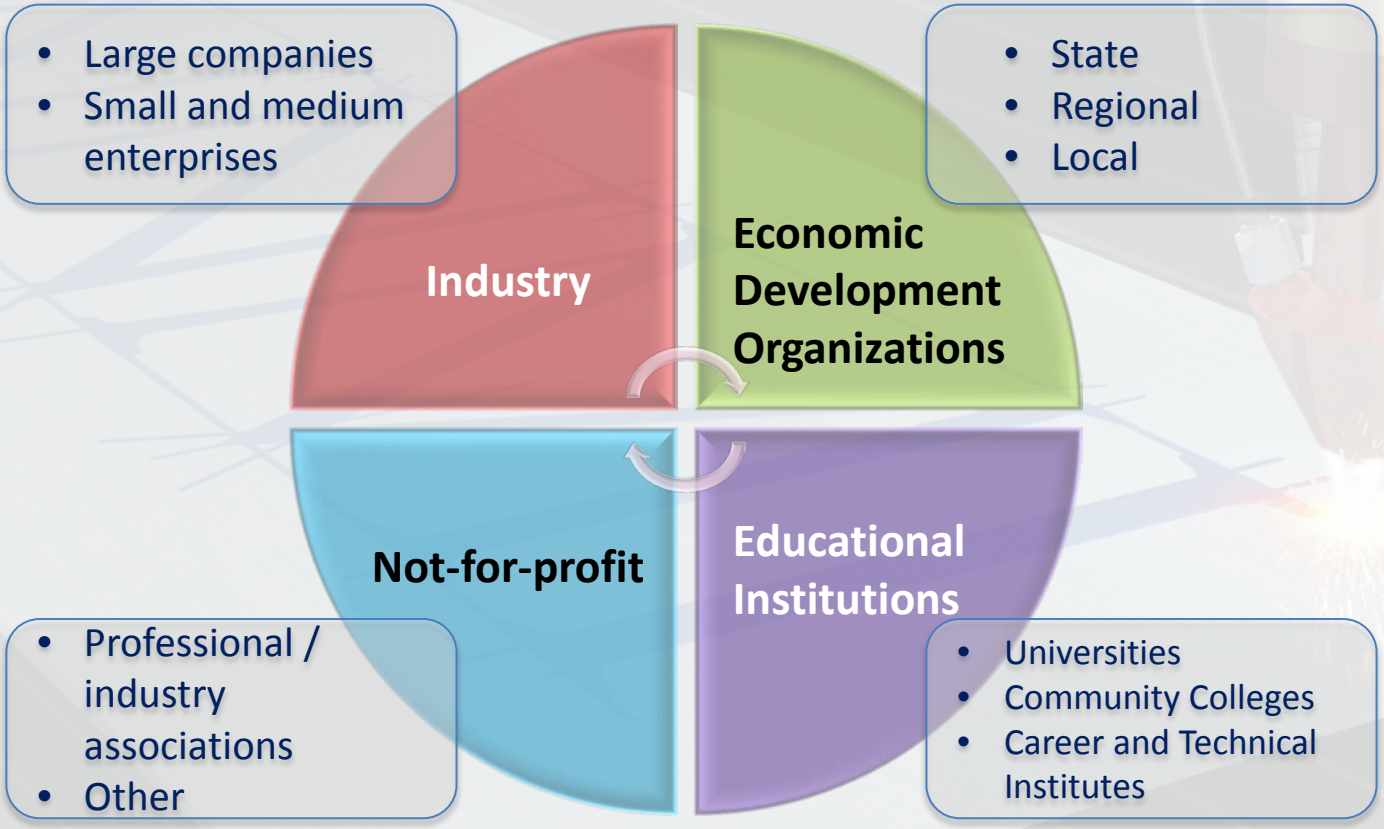


NNMI Positioning: Creating a Partnership Space for Industry and Academia

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.

Partnerships are Essential



Participation and Co-investment by partners is essential

Agenda

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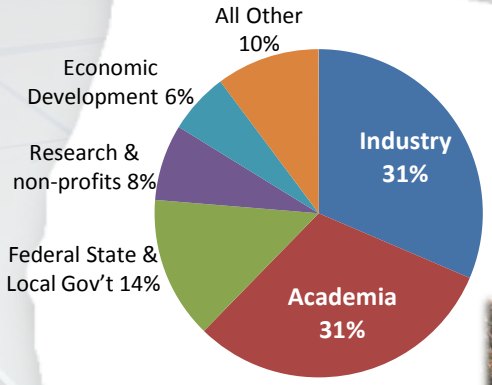
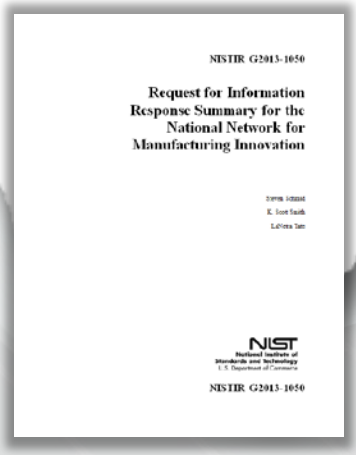
Public Engagement on Design
Workshops & Request for Information

Broad and Diverse Stakeholder Input



University of Colorado
Boulder, Colorado

National Academies Beckman Center
Irvine California



Cuyahoga Community College
Cleveland Ohio

Rensselaer Polytechnic Institute
Troy New York

U.S. Space and Rocket Center
Huntsville, Alabama

NNMI Design Authors: ~1200 strong!

Alfred University
Arizona State University
Association of Public and Land-grant Universities
Case Western Reserve University
City University of New York
Columbia University
Iowa State University
Kansas State University
Kent State University
Lorain County Community College
Macomb Community College & Auto Communities Consortium
National Institute for Pharmaceutical Technology and Education
Pennsylvania State University - Electro-Optics Center
Purdue University
The University of Akron
University at Albany – CNSE
University at Buffalo
University of California Davis - College of Engineering
University of California, Berkeley - College of Engineering
University of Illinois
University of North Carolina at Charlotte
University of Rochester - Center for Emerging and Innovative Sciences
University of Southern California – Information Sciences Institute
University of Texas at Arlington Research Institute
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Omurtag, Yildirim, Robert Morris University
Ozdoganlar, Burak, Carnegie Mellon University
Pasaogullari, Ugur, University of Connecticut
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Popovic, Zoya, University of Colorado
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Rankin, Patricia, University of Colorado, Boulder Campus
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Rennels, Kathay, Colorado State University - Community & Economic Development
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Richardson, Martin, University of Central Florida

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Rupert, Timothy, University of California, Irvine
Samuelsen, Scott, University of California, Irvine
Sanchez, L. Rafael, University of Colorado Denver
Sanfilippo, Matthew, Carnegie Mellon University
Schaaf, Jim, University of California, Davis
Schmidt, Martin, Massachusetts Institute of Technology
Schneider, Dean, Texas Center for Applied Technology
Schorr, Herbert, University of Southern California
Schwam, David, Case Western Reserve University
Sczechowski, Jeffrey, University of Colorado at Boulder
Sellards, Cynthia, Robert C. Byrd Institute
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Sharma, Swati, University of California, Irvine
Shenai, Krishna, University of Toledo
Shephard, Mark, Rensselaer Polytechnic Institute
Shin, Yung, Purdue University
Simoneau, Robert, Keene State College
Sirinterlikci, Arif, Robert Morris University
Smith, Kevin Scott, The University of North Carolina at Charlotte
Sobczak, Bruce, Irvine Valley College, ATEP
Somu, Sivasubramanian, Northeastern University
Spivey, Rich, Ohio Manufacturing Institute
Springs, Stacy, Massachusetts Institute of Technology
Steele, Scott, University of Rochester
Streit, Dwight, University of California, Los Angeles
Sun, Lizhi, University of California, Irvine
Sunday, Doug, Lehigh University
Tackett, Ed, University of California, Irvine
Tang, William, University of California, Irvine
Taub, Alan, University of Michigan
Taylor, Patricia, Thomas Nelson Community College
Theyel, Gregory, California State University
Thompson, Daryl, Salt Lake Community College
Thomson, J. Michael, Cuyahoga Community College
Timmer, Douglas, University of Texas - Pan American
Tinderholm, Duane, CCEFP – University of Minnesota
Torrani, Robert, The Connecticut College of Technology
Tralli, David, California Institute of Technology
Tran, Julie, Smart Manufacturing Leadership Coalition, University of California, Los Angeles
Troxell, Wade, Colorado State University
Tsai, Stephen, Stanford University
Turner, Cameron, Colorado School of Mines
Valdevit, Lorenzo, University of California, Irvine
Vangsness, Jean, University of Massachusetts Lowell
von Maltzahn, Wolf, Rensselaer Polytechnic Institute
von Oehsen, Barr, Clemson University
Vosler, Lynn, Front Range Community College
Vukich, John, Pueblo Community College
Walczyk, Daniel, Rensselaer Polytechnic Institute
Walker, Loren, University of Massachusetts
Wallace, Darrell, Youngstown State University
Wang, Su Su, University of Houston
Wang, Ben, Georgia Institute of Technology
Washington, Gregory, University of California, Irvine
Watkins, James, University of Massachusetts
Webster, Ben, University of Colorado Boulder
Weimer, Alan, University of Colorado
Wen, John, Rensselaer Polytechnic Institute
Werle, Kathleen, Irvine Valley College
Wicks, Frank, Edison Tech Center
Williams Jr, Jimmy, The University of North Carolina at Charlotte
Williamson, Keith, Virginia State University
Wilson, Janet, University of California, Irvine
Wilson, Sarah, Workforce Boulder County
Wright, Paul, Center for Information Technology Research in the Interest of Society, University of California, Berkeley
Wright, Michael, University of Massachusetts Amherst
Yagoobi, Jamal, Worcester Polytechnic Institute
Yehiely, Fruma, Northwestern University
Yu, Xiong, Case Western Reserve University
Yu, Tzu-Yang, University of Massachusetts Lowell
Ziegert, John, University of North Carolina at Charlotte
Ziehl, Paul, University of South Carolina
Zorman, Christian, Case Western Reserve University
BAE Systems Land & Armaments
BioDevice Design
Boundary Systems
DuPont
Eastman Kodak
General Dynamics - Ordnance and Tactical Systems
Liquidia Technologies
Lumetrics
M7-Technologies
Modria Inc.
Mongan Intech Corporation
Optimax
Procter & Gamble
QED Technologies
Robotics Innovation LLC
Rockwell Automation
RP+M
SCRA Applied Research & Development
Stefan Sydor Optics
Abraham, Margaret (Meg), The Aerospace Corporation
Ahbe, Brad, Canton Drop Forge
Albers, Tracy, GrafTech International Holdings Inc.
Albin, Mary, Westinghouse
Alexander, William, Qualtek Manufacturing, Inc.
Alexander, Chuck, Solid Concepts, Inc.
Alexopoulos, Nick, Broadcom Corporation
Alford, Charles, UES, Inc.

Alvarado, Igor, National Instruments Corporation
Alt, Michael, Eastman Kodak Company
Amis, Eric, United Technologies Research Center
Anderson, Brian, Pratt & Whitney Rocketdyne
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Aronson, Jesse, Worksystems, Inc.
August, Zachary, Automated Dynamics
Ba, Saffiate, G2G Consulting
Bibik, Stacey, Stacy Machine & Tooling, Inc.
Biller, Stephan, General Electric Company
Bjurlin, David, LAB Corperation
Black, Sharon, Blacksmith Multimedia, Inc.
Bolcavage, Ann, Rolls-Royce Corporation
Boyce, Scott, The Dow Chemical Company
Bransch, Harald, Yaskawa
Burdick, Bill, GE Global Research
Burney, Brian, Oliver Manufacturing Co., Inc.
Burns, Ralph, Business Growth Services, LLC
Buskens, Rick, Lockheed Martin Advanced Technology Labs
Cameron, Chuck, RadTech International
Carnahan, Dan, Rockwell Automation
Casebolt, Eric, Cell Sign Technologies
Chalamala, Babu, MEMC Electronic Materials, Inc.
Chong, Dianne, The Boeing Company
Christie, Cynthia, Christie Consulting, LLC
Collins, Sunniva, Swagelok Company
Compton, Owen, DuPont
Coniglio, Philip, Long Island for Technology
Cook, Harold, Tooling Innovations, Inc.
Cotchen, Donald, McGraw-Hill Construction
Craig, Steven, UniControl Inc.
Crouch, Drew, Ball Corporation
Daggon, James, Rice Lake Weighing Systems
Decker, Doug, Northrop Grumman Corporation
Deckert, Curt, Curt Deckert Associates Inc.
Dinsmore, Jason, Dinsmore & Associates, Inc.
Ditchendorf, Charles, CIMdata, Inc.
Dolan, Benjamin, RapidTech
Dotson, Dennis, Dotson Iron Company
Drumm, Gregory, Nation Grinding Inc./Nation Coating Systems
Ducoin, David, Lockheed Martin Electronic Systems
Duggan, Jim, Edison Tech Center
Dykstra, William, Temper
Easterbrooks, Don, Canton Drop Forge
Edwards, Doyle, Brewer Science
Elter, John F, Sustainable Systems LLC
El-Wardany, Tahany, United Technologies Research Center
Esman, Ronald, MITRE Corporation
Feiereisen, William, Intel
Fish, Chris, McAllister & Quinn
Flite, William, Lockheed Martin
Frank, Melissa, FirstEnergy
Freeze, Brent, Sorlox Corporation
Fulton, Michael, Surface Optics Corporation
Galiazzo, Michael, Regional Manufacturing Institute
Gardner, Brian, Chomarat
Garone, Joe, Long Island for Technology
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Gies, Jason, Firehole Composites
Gonzalez, Ray, TGD
Goswami, Kisholoy, InnoSense LLC
Graham, Lawrence, PCCAirfoils
Green, Albert, Kent Displays, Inc.
Greenspon, Judy, NPI Services, Inc.
Grimes, Thomas, LNE Group LLC
Grischuk, Walt, Ora Technology
Guerra, Nick, Perfekta Aerospace
Gurumurthy, Prasanna, LuK USA
Gustafson, Daniel, NextEngine
Guymon, Lance, Wolf Robotics
Hackmon, Ernest, Topgallant Energy
Hagerty, Brian, Reactor Institute
Hainsey, Robert, Electro Scientific Industries
Hanes, Hugh, Materion Brush Inc.
Harney, Paul, Perkins+Will
Harricharran, Kunwar, Battelle Production and Field Support
Hartney, Christopher, Jacobs Technology
Hatch, Mark, TechShop
Hatkevich, Steve, American Trim, LLC
Havelock Jr., Samuel, Federated Precision, Inc.
Hayashi, Steven, GE Global Research
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Kania, John, Applied Materials, Inc.
Karpuk, Michael, TDA Research, Inc.
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Marshall, Blake, SRA International
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Maxwell, James, Dynetics
Mayewski, Dave, Rockwell Automation
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Patterson, Clark, RP+M
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Phillippy, Bob, Newport Corporation
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Poliks, Mark, Endicott Interconnect Technologies, Inc.
Polizzi, Anthony, Rocket Science Tutors
Powell, Katie, Munro Companies, Inc.
Rahman, Derrick, SunVeil Solar Inc.
Ralston, Dennis, KLA-Tencor Corporation
Ramsey, Dougals, Alcoa Inc.
Razum, Joe, GE
Rehkopf, Jackie, Plasan Carbon Composites
Rhoda, Doug, Wolf Robotics
Rini, John, LNE Group LLC
Rivard, Adam, Pratt & Whitney
Roberts, Anthony, Jacobs Technology
Robinson, Ron, IT Data Storage / 3DCAD Printer Corproation
Robinson, Jim, TechShop, Inc.
Rockstroh, Todd, GE Aviation
Rothrock, Ginger, RTI International
Rowlen, Kathy, InDevr
Rustic, Joseph, CTL Engineering
Salihagic, Selma, Ball Aerospace & Technologies
Sanne, Anil, Avittor International Corporation
Sariri, Kouros, FMI
Saunders, Glenn, Upstate New York LRIG, Inc.
Schilling, Patricia, Tugboat Software Inc.
Schorzman, Derek, Liquidia Technologies, Inc.
Schramko, Ken, Lam Research
Schroeder, William, Kitware, Inc.
Shattuck, Jay, Underground Systems, Inc.
Sheet, Lubab, Lam Research Corp
Shiveley, Tom, Innovative Industries
Shrader, Eric, Palo Alto Research Center
Silvashy, Ryan, Falcon Foundry
Singh, Prabhjot, GE Global Research
Smith, Robert, Analytical Mechanics Associates
Smith, Gary, D'Addario & Company, Rico International Division
Snell, Michael, Silfex Corporation
Speir, Ryan, Allineate
Srinivas, Girish, TDA Research, Inc.
Stangle-Castor, Nannette, Fuentek, LLC
Stark, Paul, Manaex
Stellon, Gene, Covidien
Stephen, Jennings, Raydiance
Stimson, Tom, The Timken Company
Strong, Amy, Fuentek, LLC
Sullivan, Rose Ann, TechVision21
Sutton, Craig, Deere & Co
Tackett, Edward, RapidTech, Nat'l Center for Rapid Technologies
Thompson, Dave, AlloSource
Tredway, William, United Technologies Research Center

Tymkiw, Andy, Edwards Lifesciences
Ulintz, Peter, Anchor Manufacturing Group
VanDyne, Ed, VanDyne SuperTurbo, Inc.
Vargas, John, Futek Advanced Sensor Technology, Inc.
Venkataraman, Bala, Magni-Power Company
Veres, Janos, Palo Alto Research Center
Viens, Daniel, United Technologies Research Center
Voss, Bob, Panduit Corporation
Vu, Truc, Microsemi Corporation
Wahlig, Bill, Long Island for Technology
Walker, Rae, Axiom Medical Inc.
Welch, Ken, MSC Software
Wenner, Chauncey, United Launch Alliance
Weyer, Greg, LuK USA LLC
White, Christian, iComputer
Willnecker, Gerald, Powdermet Inc.
Winslow, Kyle, McAllister & Quinn
Wolf, Christopher, ITN Energy Systems, Inc.
Wong, Brian, Enevate Corporation
Wosczyna-birch, Karen, Center for Next Generation Manufacturing
Wu, Yutong, APIC
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Zimmer, Stephen, USCAR
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Agenda 2020 Technology Alliance of the Forest Products Industry
Colorado Workforce Development Council
Manufacturing Advocacy and Growth Network
Mid-Columbia Economic Development District
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Bagley, Rebecca, NorTech
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Lecz, Alan, Workforce Intelligence Network
Lee, George, Glimmerglass Ltd.
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Milbergs, Egils, Washington Economic Development Commission
Nafziger, Wendi, Longmont Area Economic Council
Nance, Christopher, Greater Cleveland Partnership
Paytas, Jerry, Fourth Economy
Pfunder, Jack, Manufacturers Resource Center
Pritchard, Peter, Center for Economic Growth
Reinhardt, William, Edison Tech Center
Robey, Claudette, Next Generation_Economy Center
Severson, Peggy, Denver Office of Economic Development
Shakour, Elias, Michigan Economic Development Corporation
Steinmetz, Joe, APS-Development
Stumo, Michael, Coalition for a Prosperous America
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North Carolina Department of Commerce
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SEMATECH
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Smart Manufacturing Leadership Coalition
Society of Manufacturing Engineers
The Maritime Alliance
The Ohio Aerospace Institute
The Security Network
The Solar Energy Consortium
Adams, James, Metal Powder Industries Federation
Aller, Mike, Space Coast Energy Consortium
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Balachandra, Anita, SEMATECH/TechVision21
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McIntyre, Cynthia, Compete. Council on Competitiveness
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Porter, Kweli, Rainforest Recycling Company
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Sattler, Dwayne, Ohio Technology Consortium (OH-TECH)
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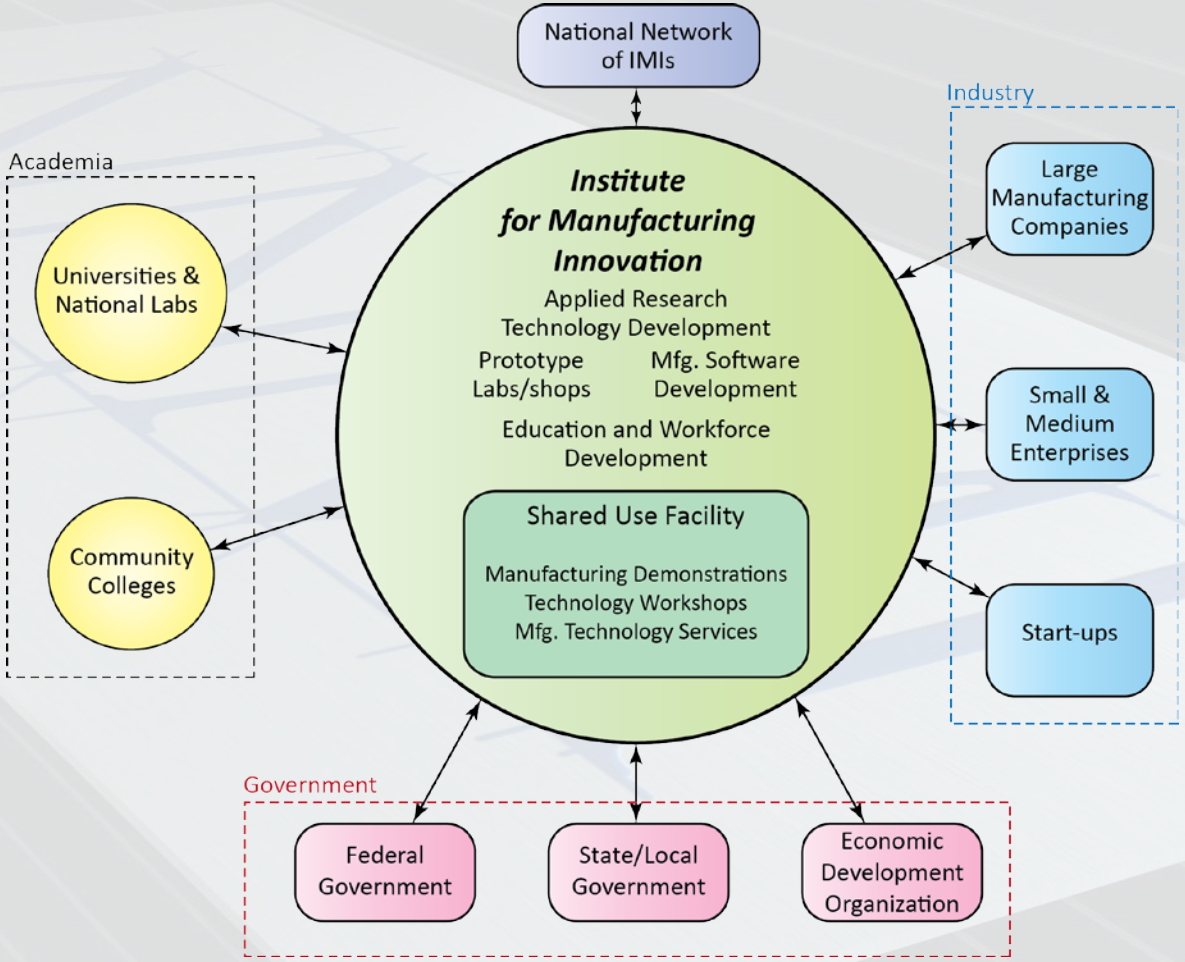
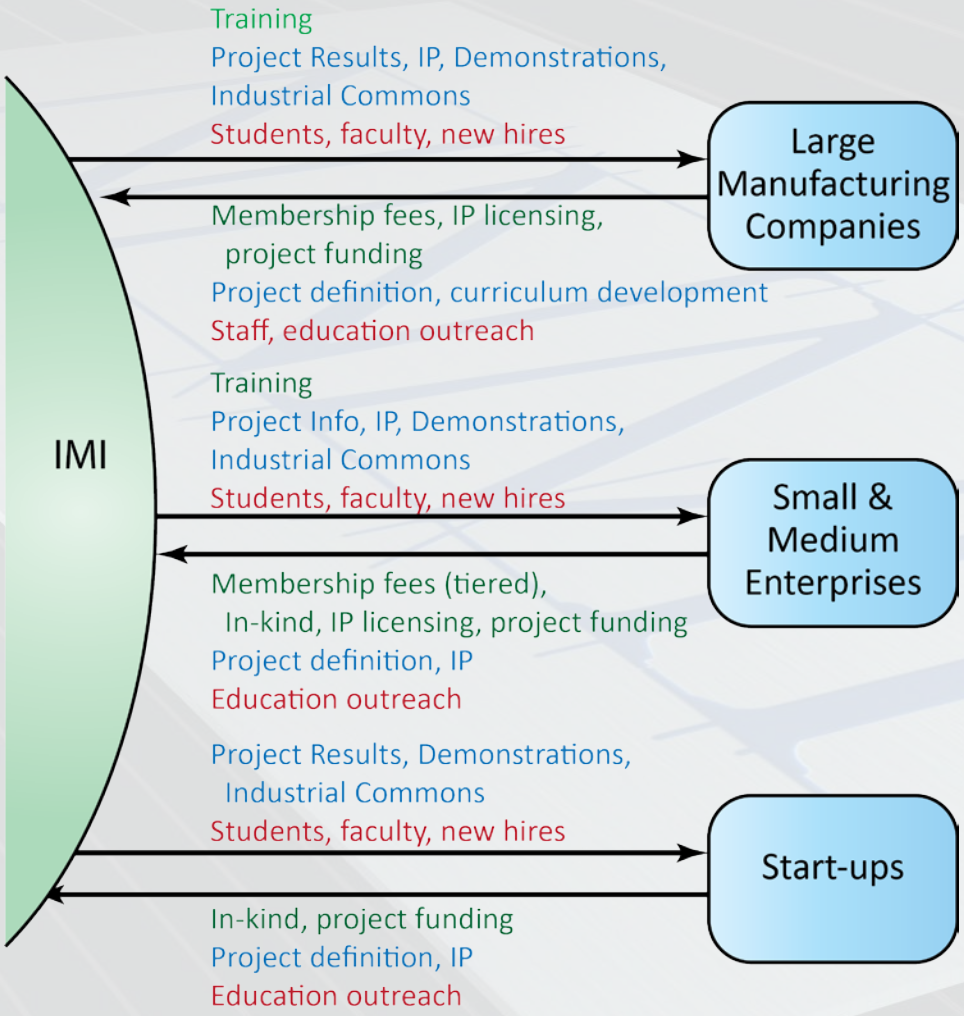
Snow, Dave, Purdue Manufacturing Extension Partnership Center
Srivastava, Anil, TechSolve, Inc.
Taylor, Rebecca, National Center for Manufacturing Sciences
Thompson, Dennis, SCRA
Tieckelmann, Robert, SEMATECH
Vairamohan, Baskar, Electric Power Research Institute (EPRI)
Vaze, Suhas, EWI
Warndorf, Paul, AMT - The Association For Manufacturing Technology
Wellington, Jane, Society of Manufacturing Engineers
Weil, Richard, Cleantech Los Angeles
Whitefoot, Katie, National Academy of Engineering
Wong, Perry, Milken Institute
Chris Cassidy Consulting
JumpStart
The Information Technology & Innovation Foundation
The Motorsports Education Foundation
Berkowitz, Kevin
Buthe, Chris, Lean Enterprise Development
Denning, Mary Kaye, Capital of Know-How
Gartenlaub, Marshall, Technical Employment Training
Gary, Steve, Avery Dennison
Grover, Kristie, BIOCOM Institute

Institute Structure

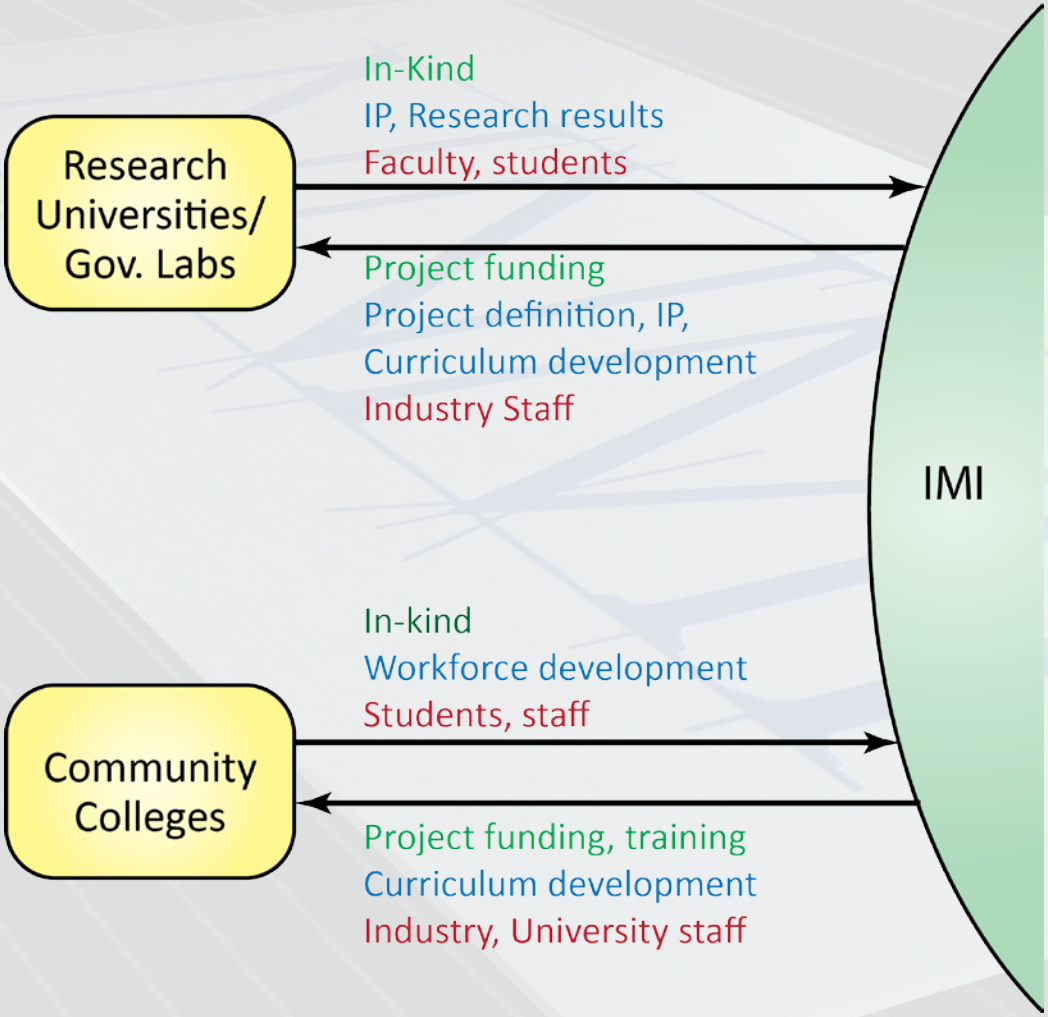


Detail: Industry Interactions



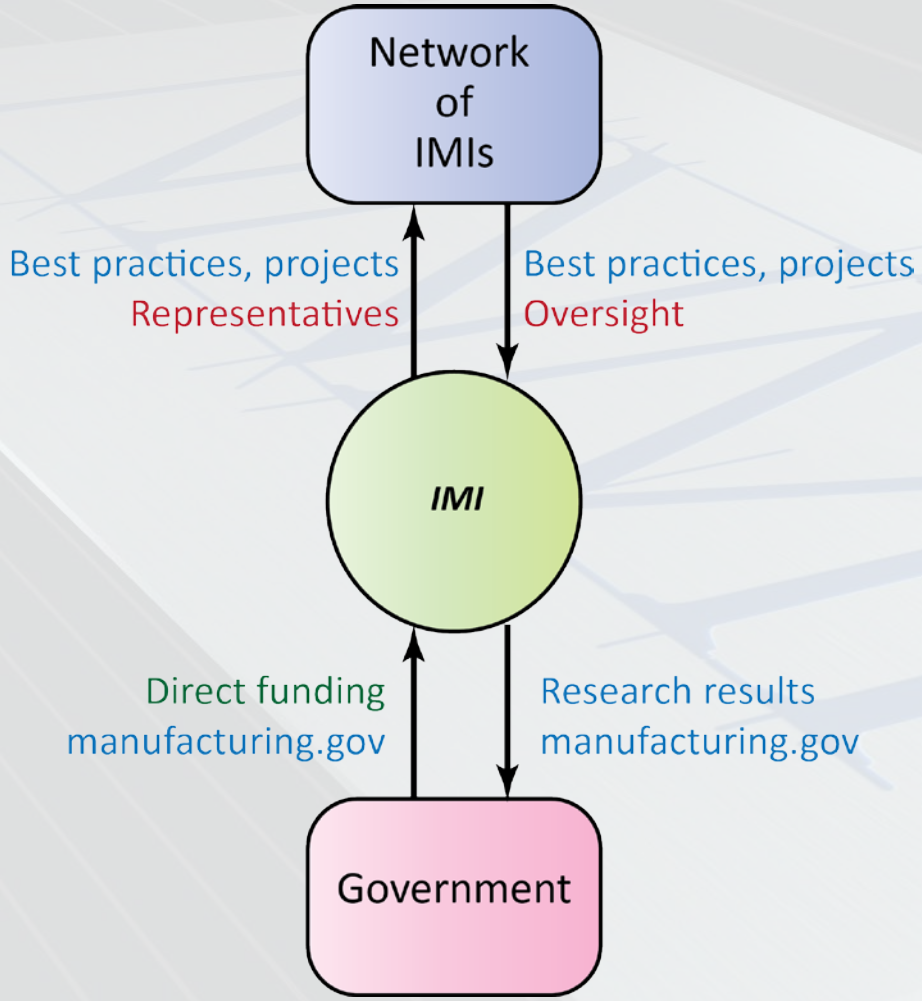
- Interactions are through **funding (green), information (blue)** and **personnel (red).**
- Institutes will have a low barrier to entry, and will interact with start-ups and SMEs
- Information transfer is not limited to project results; an Industrial Commons promotes cross-talk.

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.

Government Is Only Part of the Solution

- Federal investment of $70-120 million, with at least 50% match to establish a presence, at scale, in the “missing middle”.
- Designed to maximize industry impact, through a partnership between all stakeholders.
- Encourage participation of startups and SMEs
- Consortia of research universities, companies, community colleges, and others.
- Establishment of infrastructure for long-term sustainability.

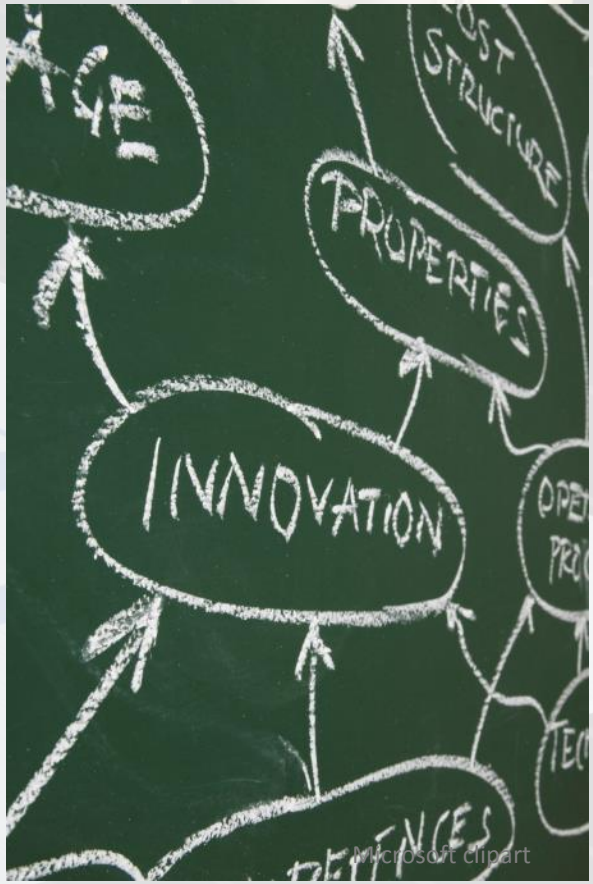
Courtesy of John Vickers, NASA

Agenda

- US Manufacturing Challenge
- The Missing Middle – NNMI Positioning
- NNMI Design
- **NNMI Characteristics**
- Next Steps

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-based non-profit organization. Focus areas will be ideally defined by proposing teams.
- Institutes will be self-sustaining after 7 years.



Suggested Technology Focus Areas from the RFI and Workshop

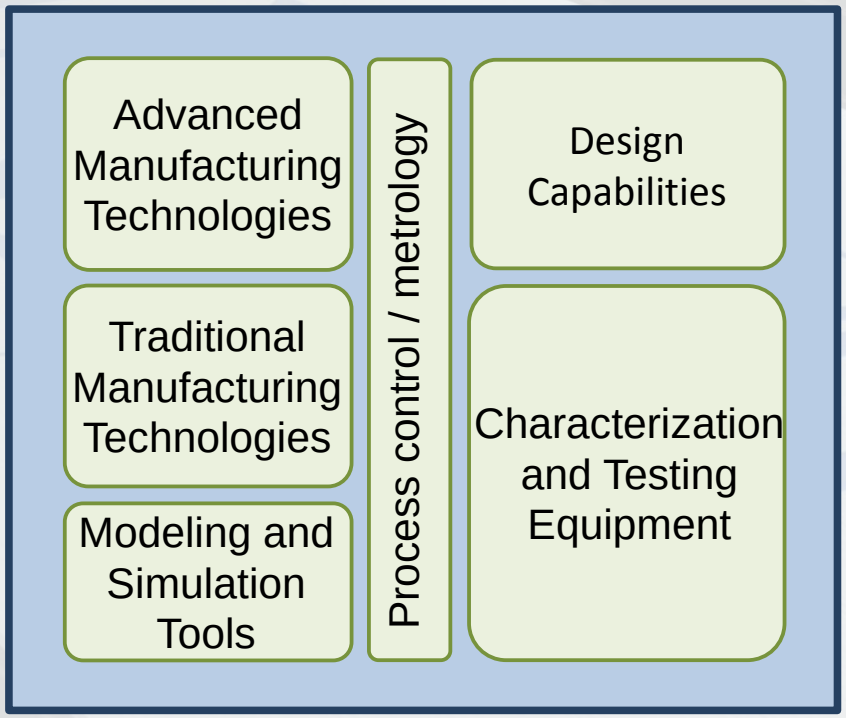
Flexible electronics, nano/micro, lightweight materials, personalized medicine, alternative energy, additive manufacturing, smart machining, pharmaceuticals, modeling and simulation, composite materials ,coatings, energy storage, sensors, metal casting, advanced forming, advanced joining, robotics, peening, 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…

Shared RD&D Facilities

INPUT: Innovators with ***new production-enabling technologies***

INPUT: Innovators with ideas for ***new materials or products***



OUTPUT: Data to demonstrate **business case for manufacturing new materials or products:**

- Processes established
- Production rate data
- Cost estimates based on production data
- Risks understood / quantified
- Partners Identified

OUTPUT: ***Market adoption*** of innovative new production-enabling technologies

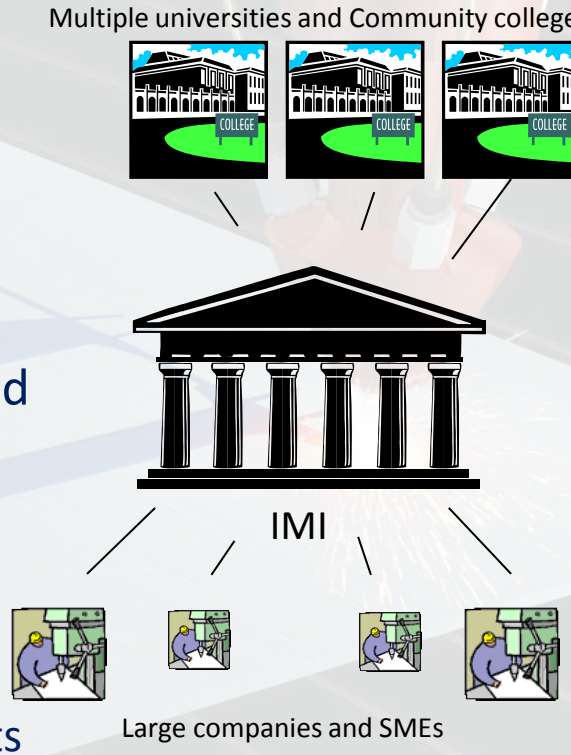
Innovative materials or products to market

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.

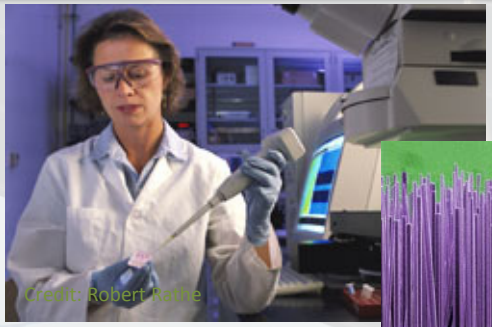
IMI Proposal

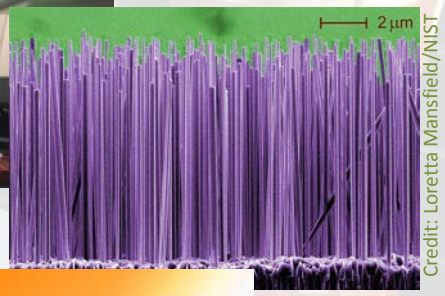
- Proposing teams should demonstrate their focus area:
  - Has the potential to deliver regional and national improvements in advanced-manufacturing capabilities
  - Meets national needs
- IMIs should leverage existing regional or national innovation ecosystems or catalyze the formation and sustainability 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.



Proposed Selection Criteria

- Technology focus
- RD&D plan
- Co-investments
- Broad Impacts
- Partner resources
- Financial Plan
- Education and Workforce Development Plan
- Adequacy of Governance and Oversight



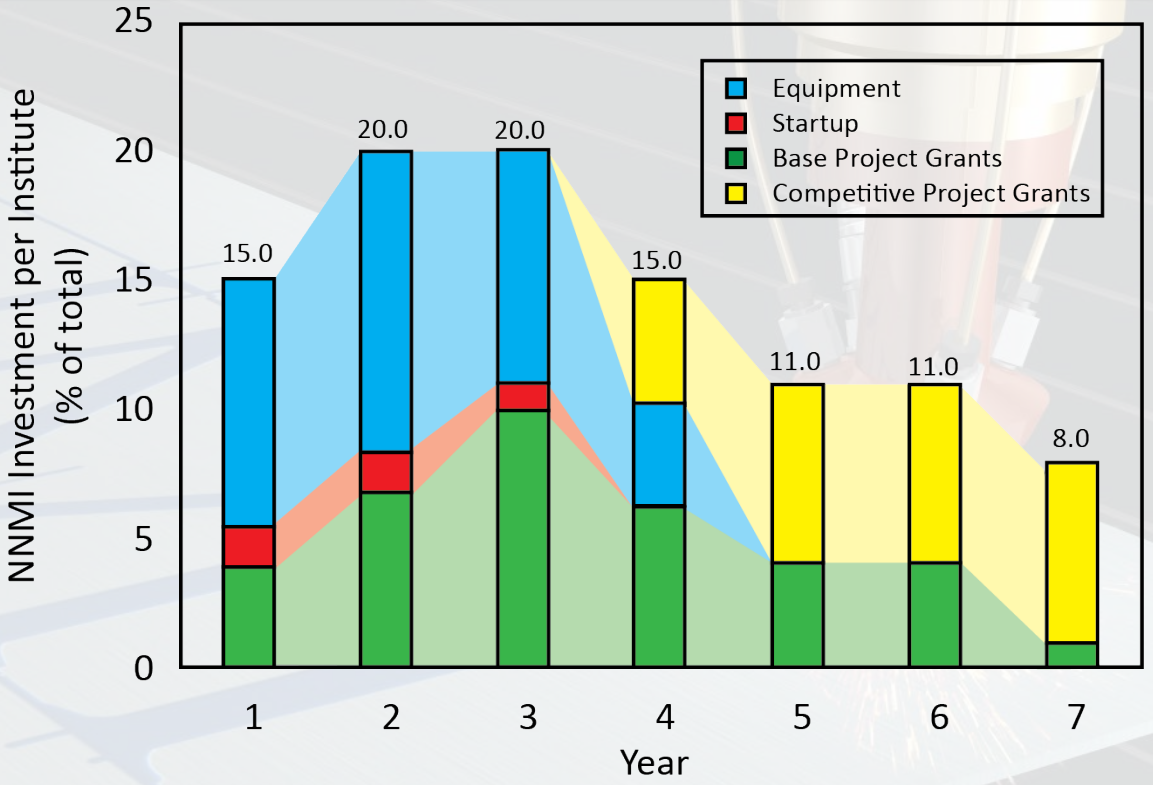


Example Spending Plan – Federal Funds

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

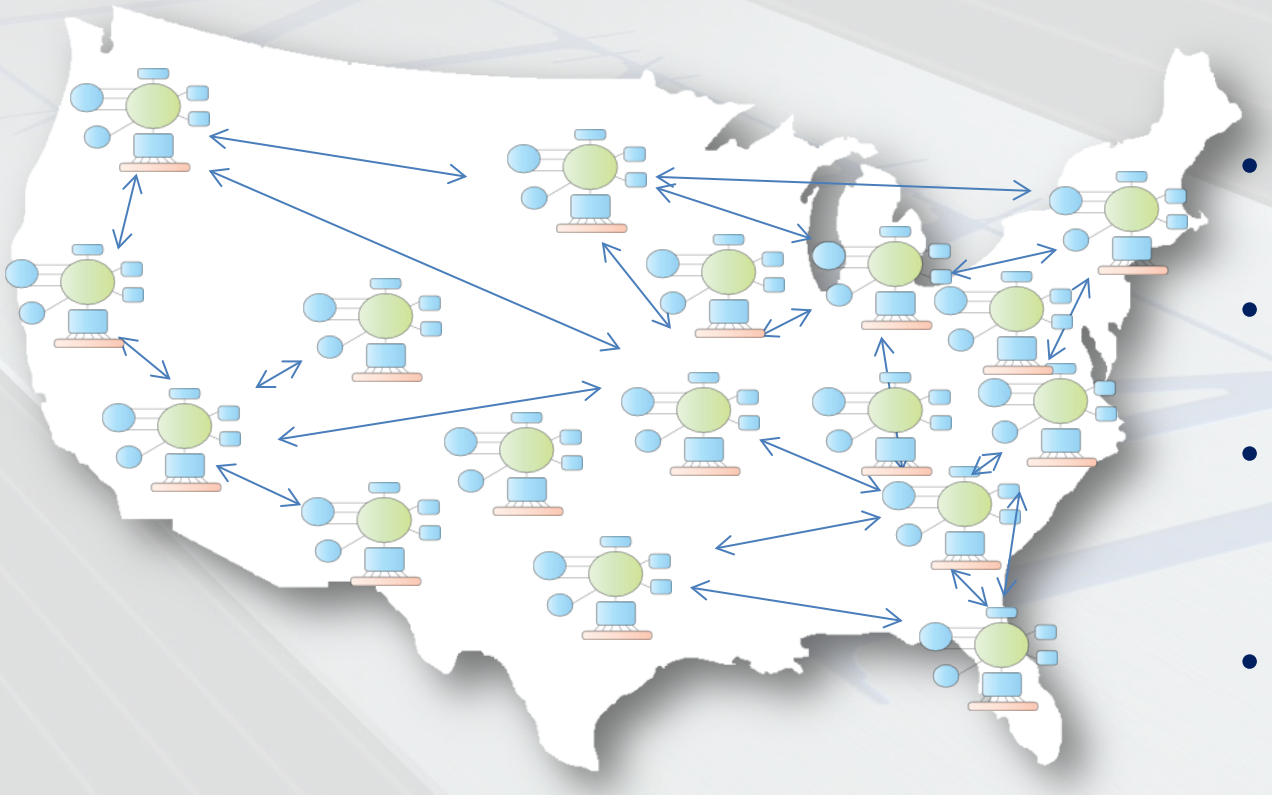
Categories:

- 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)

Importance of Creating the Network



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

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

Agenda

- US Manufacturing Challenge
- The Missing Middle – NNMI Positioning
- NNMI Design
- NNMI Characteristics
- **Next Steps**

SOTU Announcement

Our first priority is making America a magnet for new jobs and manufacturing.
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 Departments 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 fifteen of these hubs and guarantee that the next revolution in manufacturing is Made in America.

President Obama
State of the Union Address, February 13, 2013

Next Generation Power Electronics Manufacturing

Wide bandgap (WBG) semiconductors

- operate at much higher temperatures, voltages, and frequencies compared to Si.
- allow for smaller, lighter, faster, and more reliable power electronic components.
- enable more efficient distribution and use of electric power.
- need cutting-edge manufacturing processes that can produce high-quality, affordable devices.

	Material	Chemical Symbol	Bandgap Energy (eV)
	Germanium	Ge	0.7
	Silicon	Si	1.1
WBG	Silicon Carbide	SiC	3.3
WBG	Gallium Nitride	GaN	3.4

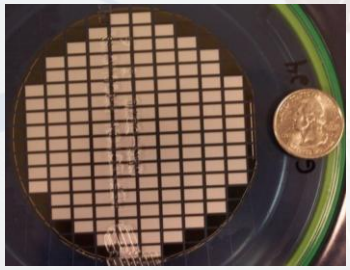


Image source: DOE Oak Ridge National Laboratory

iStock/19221337, 18866928, 15649881

Poised to revolutionize the next generation of power electronics and clean energy innovations.

Lightweight and Modern Metals Manufacturing Innovation (LM3I) Institute

DOD

NASA

DOD

- New structural alloys face tremendous barriers to application due to lack of design guides and certifications as well as cost and scale-up challenges.
- The goal is to develop an advanced lightweight-metal supplier base for the U.S. to compete in the global market.
- Enable DOD to realize significant fuel reduction, increased payloads, and greater speed and agility of manned, unmanned, and soldier systems as well as benefits for commercial applications and energy savings.

Digital Manufacturing and Design Innovation (DMDI) Institute

- The DMDI Institute will provide the proving ground to link promising information technologies, tools, standards, models, sensors, controls, practices and skills , and then transition these capabilities to the industrial base for full-scale application.
- For example, proving and progressing intelligent electro-mechanical design and manufacturing capabilities from laboratory to prototype factory environments would improve production efficiencies and costs.
- Focus is the smart and comprehensive use of the ‘digital thread’ throughout design, production and support.

Big Data Insight Group

Apriso

Next steps

- Solicitations and awards for three full scale manufacturing institutes this year
- DOE's Clean Energy Manufacturing Initiative
- DOC's solicitation for AMTech (Advanced Manufacturing Technology) Consortia Program
  - New program with initial funding in FY13
  - Grants for industry-led roadmapping and R&D consortia development
- NNMI design actively continues

Thank you

For questions or comments, please contact the

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