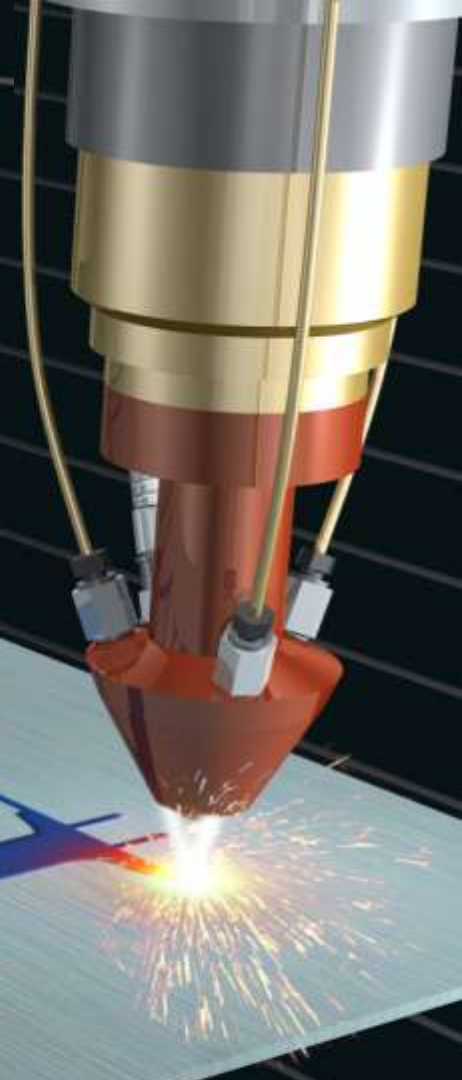


BLUEPRINT FOR ACTION

Energy Outlook Conference
ASERTTI

The Proposed NNMI Design

Steven Schmid, Ph.D., P.E., C.Mfg.E., FASME
Advanced Manufacturing National Program Office



Agenda

- NNMI Milestones and Vision
- The Missing Middle Challenge – NNMI Positioning
- NNMI Design Process
- Institute Design Diagram
- NNMI Characteristics
- Investment Plan and Selection Criteria

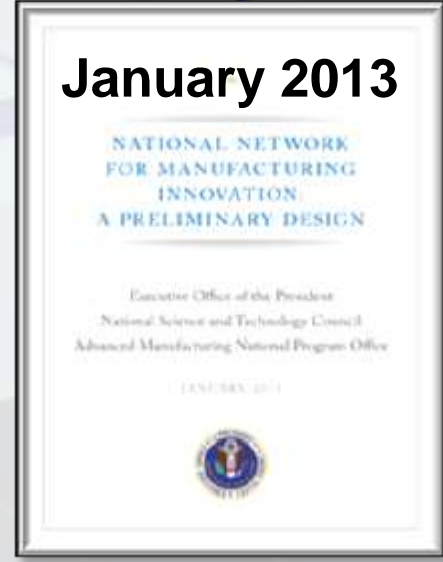
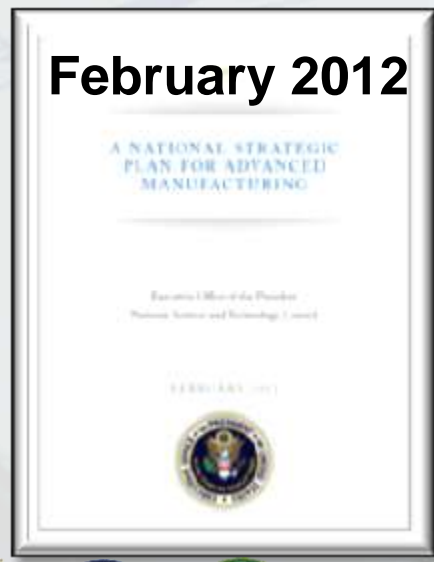


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Policy Milestones



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Vision of the NNMI



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

\$1 billion FY13 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.”



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



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

Credit: B. Young/NIST



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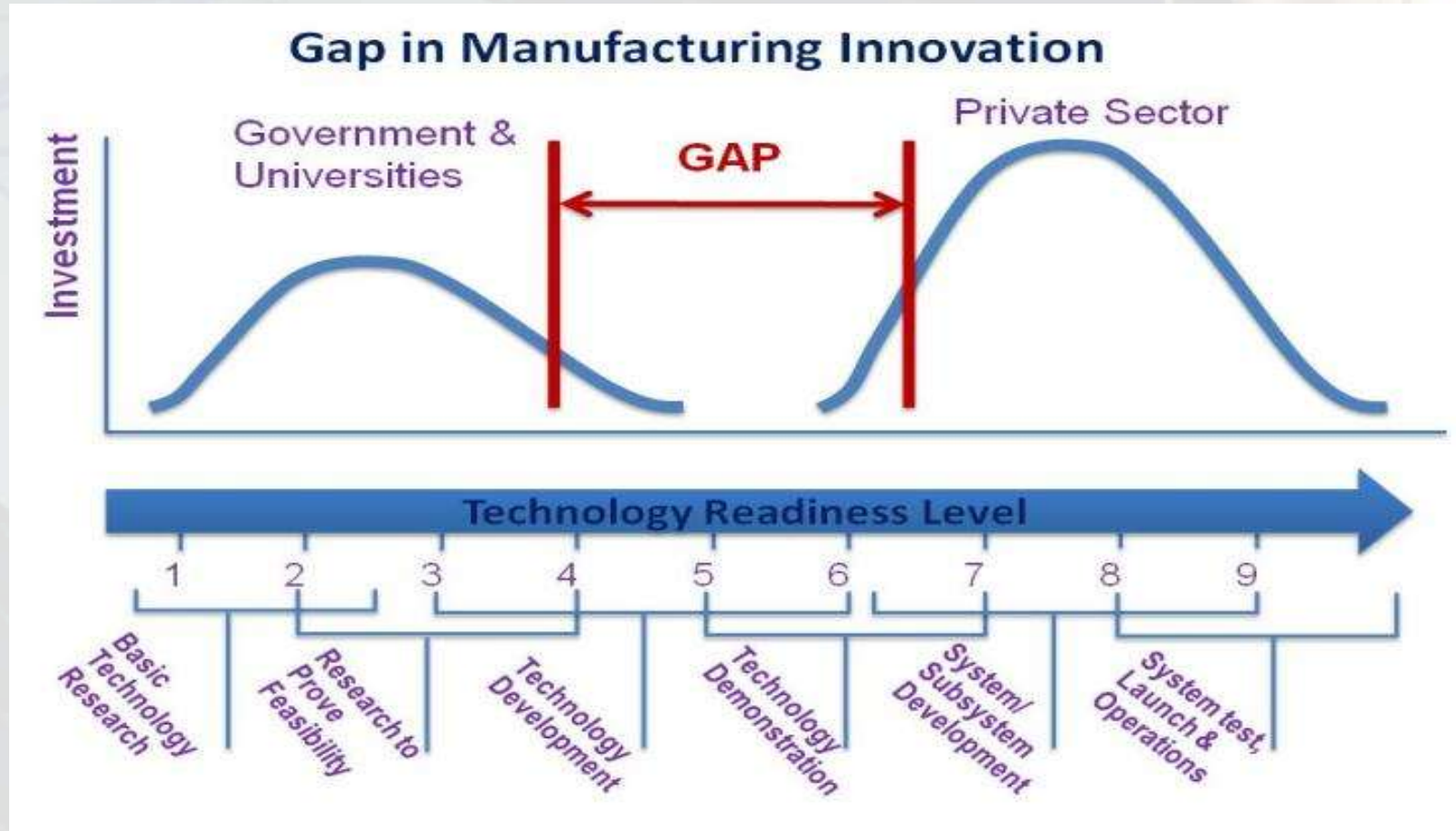
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The Missing Middle - Valley of Death

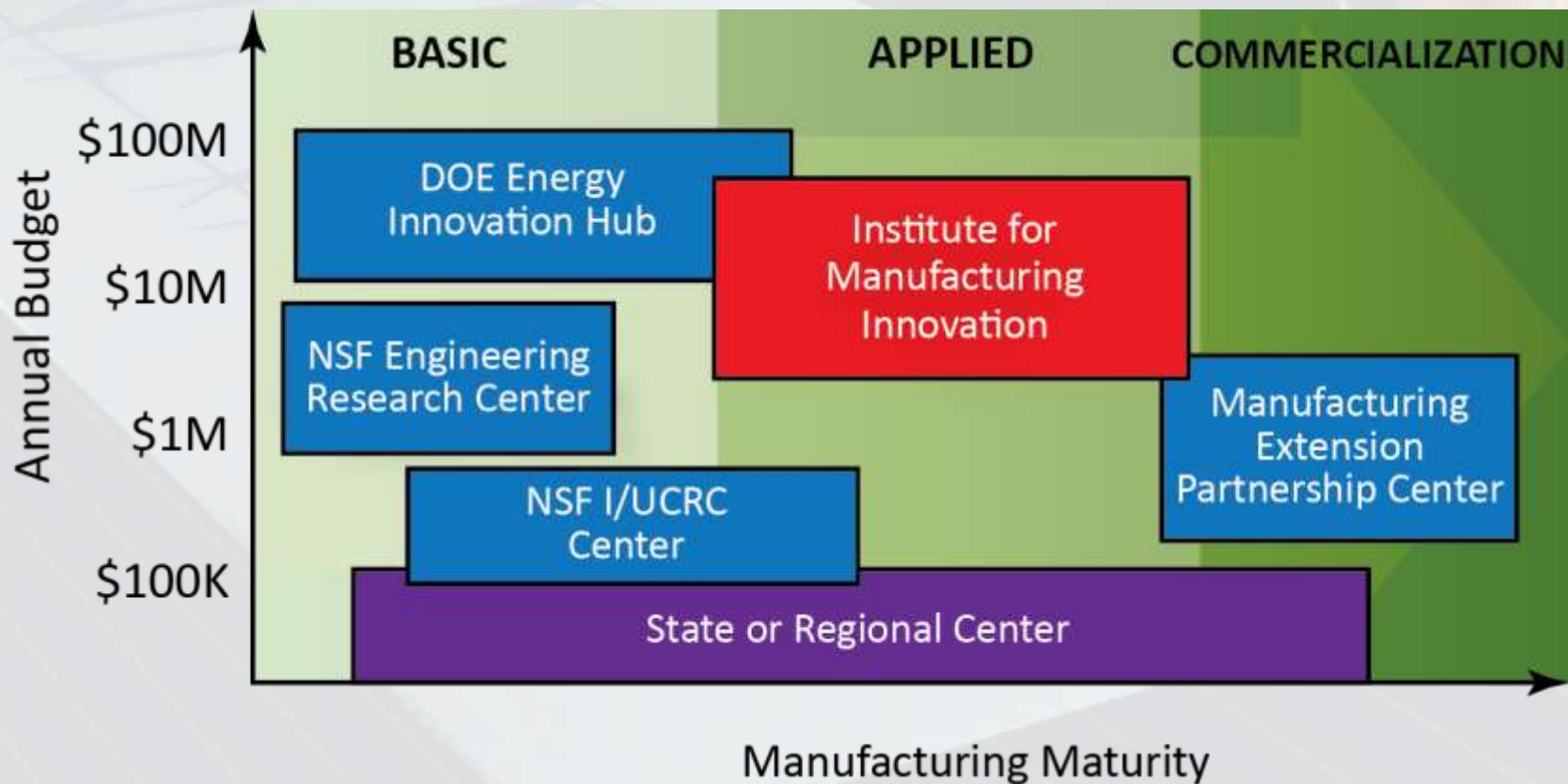
Not about government spend in TRL 4-7 projects!



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

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.



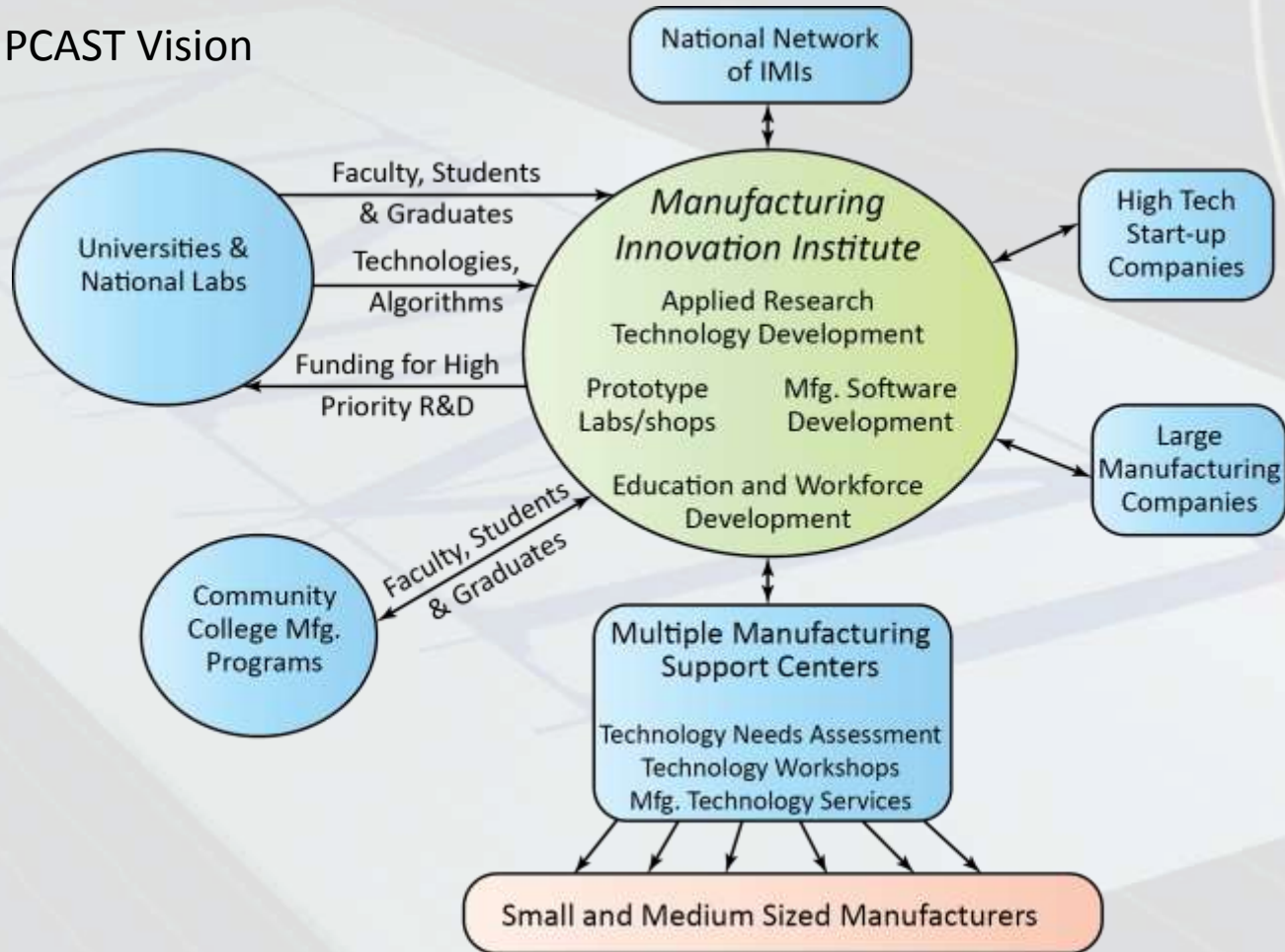
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Institute Structure – Original AMP/PCAST Report Vision

Original PCAST Vision



Crowdsourcing: Design for Impact Workshops & RFI



Rensselaer Polytechnic Institute
April 25, Troy New York



Cuyahoga Community College
July 9, Cleveland Ohio

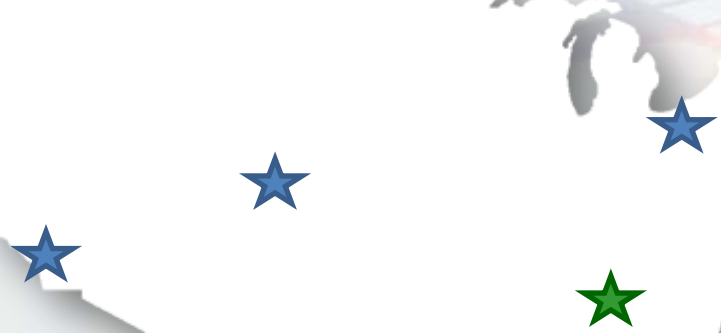
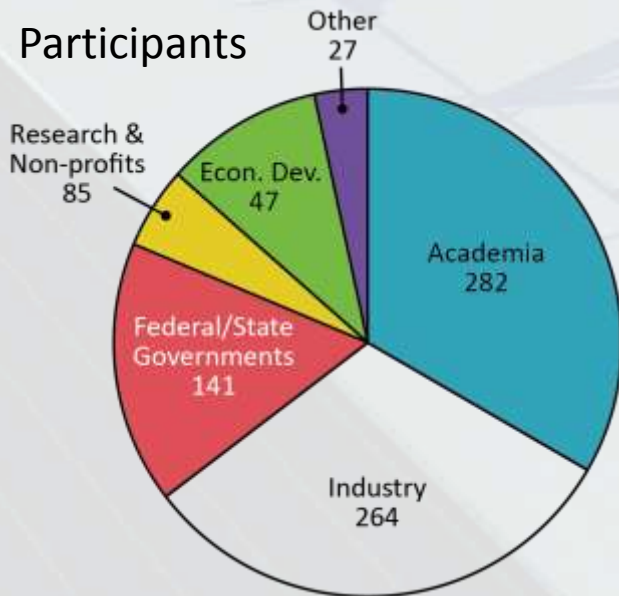


National Academies Beckman Center
September 27, Irvine California



Univ. Colorado
October 18, Boulder, Colorado

Participants



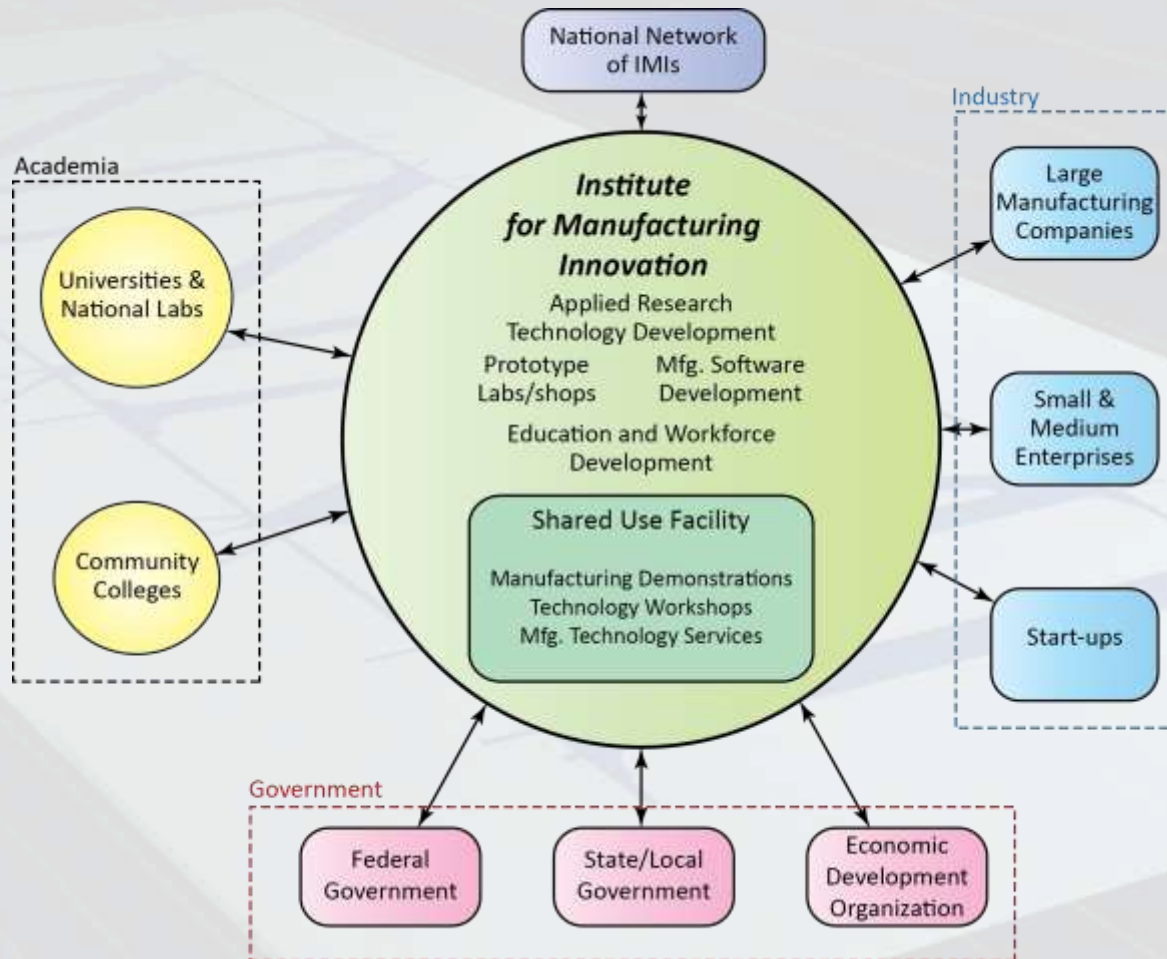
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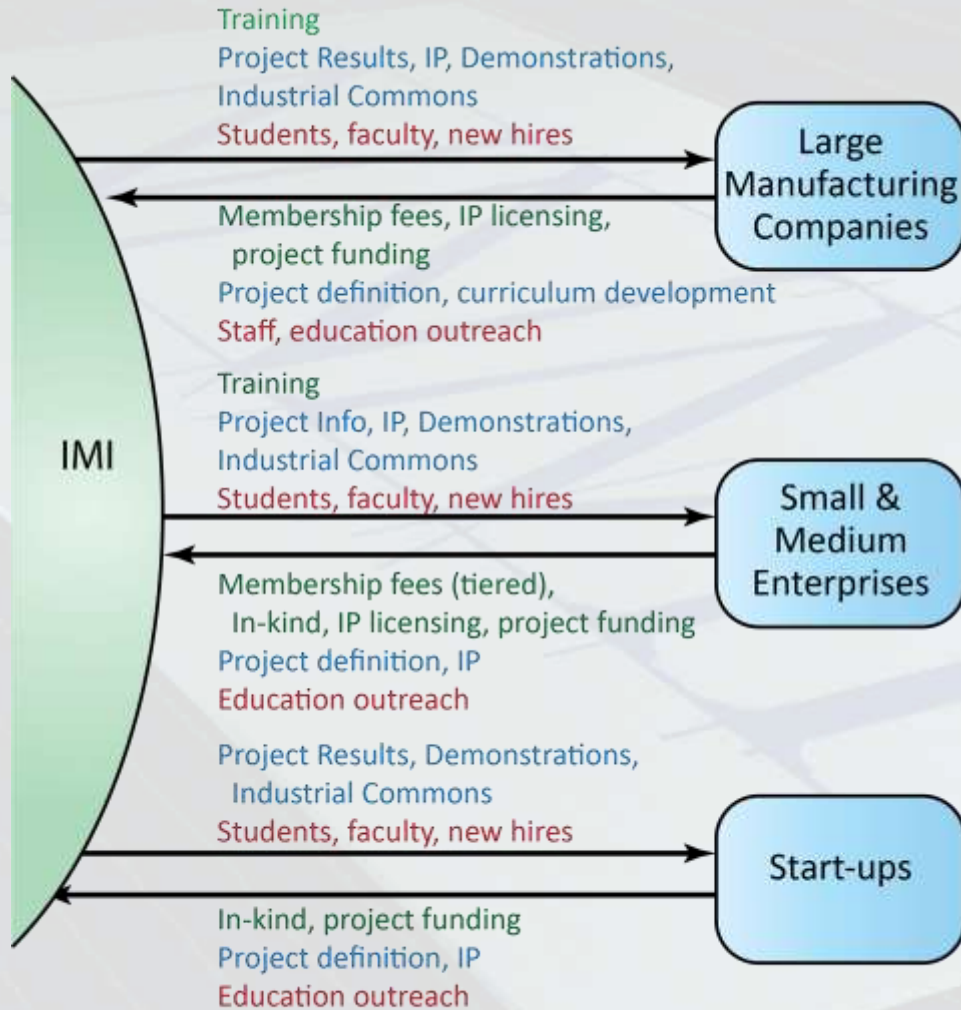
- NNMI Milestones and Vision
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Institute Structure – Post RFI Vision



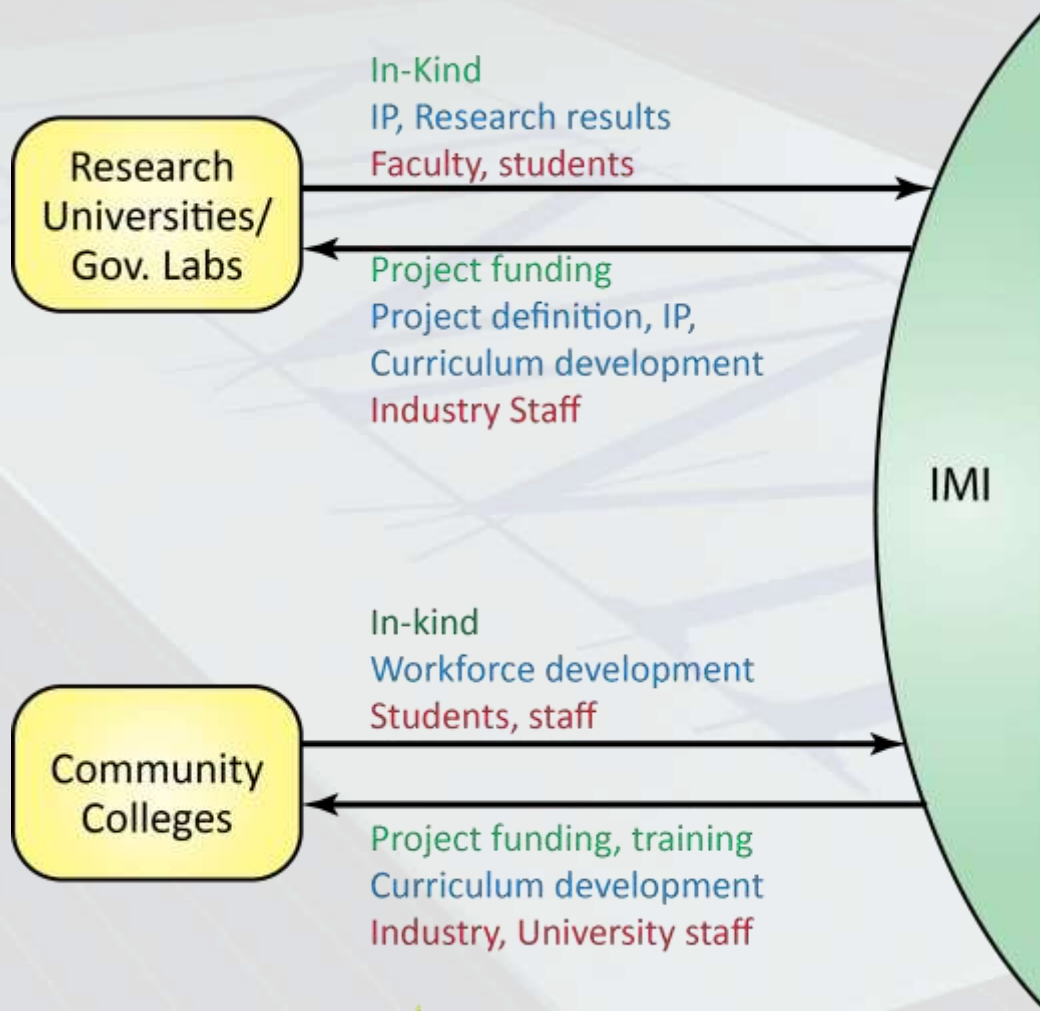
Detail: Industry Interactions



- 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.



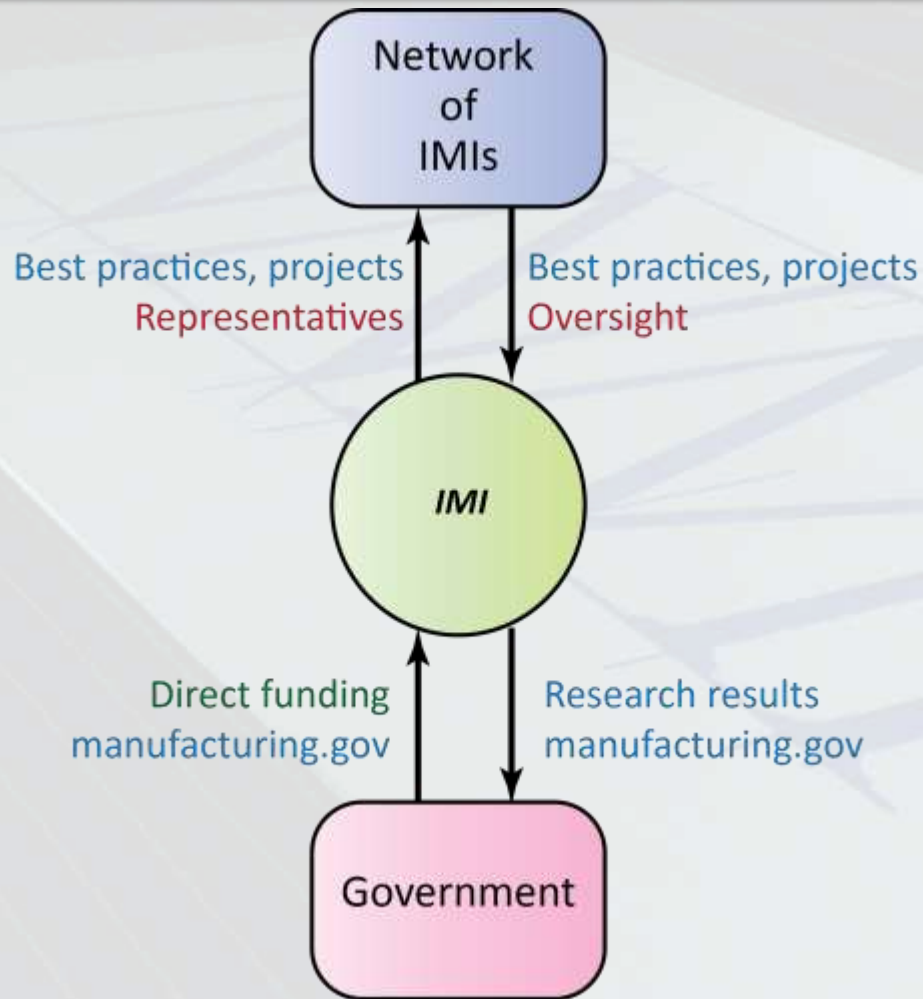
Detail: Academia Interactions



- 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.



Detail: Other 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.



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Broad Public Input

Almost 1000 voices have been heard as part of RFI process. Comments have been reviewed, analyzed, and organized by AMNPO. Consensus has been reached on most issues; some remain. **Information was requested on four major topics:**

- **Technologies with Broad Impact**
- **Institute Structure and Governance**
- **Strategies for Sustainable Institute Operations**
- **Education and Workforce Development**



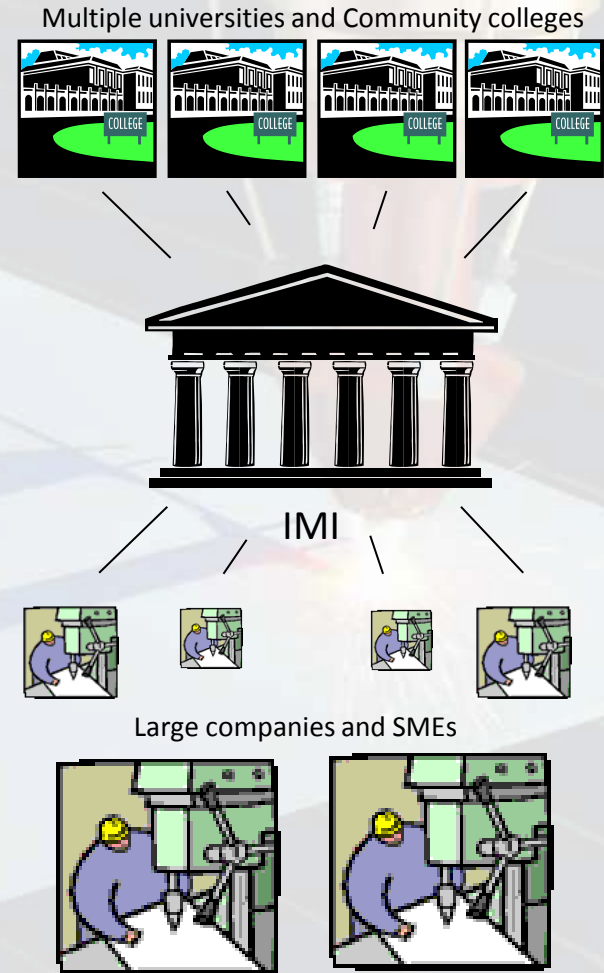
IMI Key Characteristics

- 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 be defined by proposing teams.
- Institutes will be self-sustaining after 7 years.



IMI Key Characteristics (cont.)

- Proposing teams will need to demonstrate that their focus area is:
 - Appropriate for an Institute
 - 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.



Suggested Technology Focus Areas from the RFI and Workshop

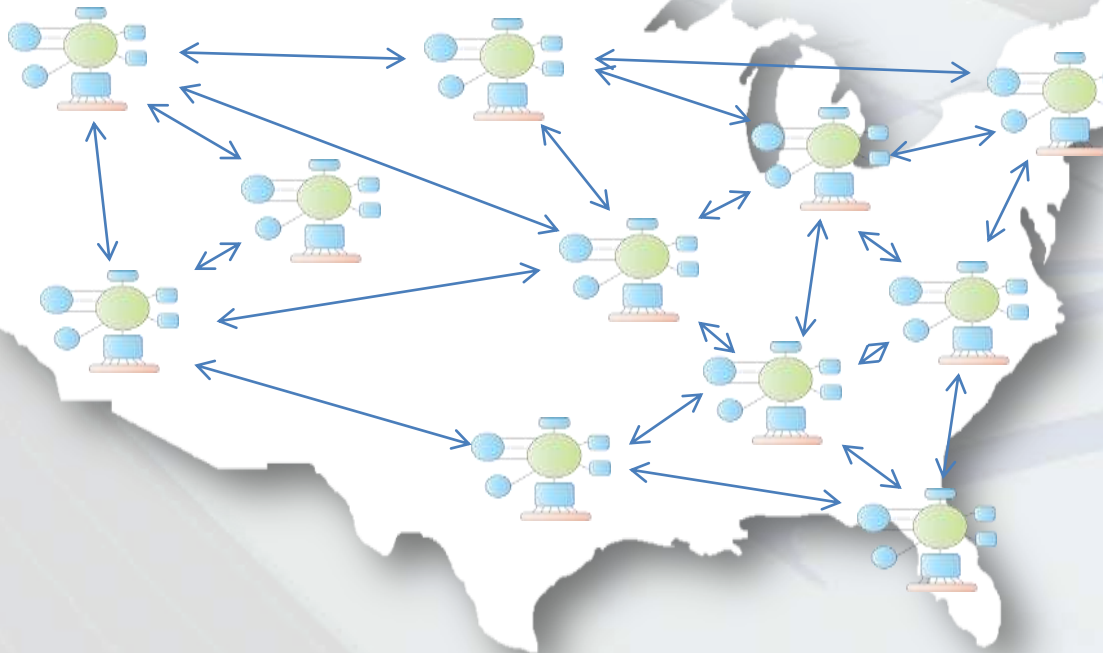
Flexible electronics, nano/micro, lightweight materials, personalized medicine, alternative energy, additive manufacturing, smart machining, pharmaceuticals, modeling and simulation, composite materials, coatings, energy storage, sensors, metal casting, advanced forming, advanced joining, robotics, peening, 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 are potentially fundable; proposing teams will make their best case.



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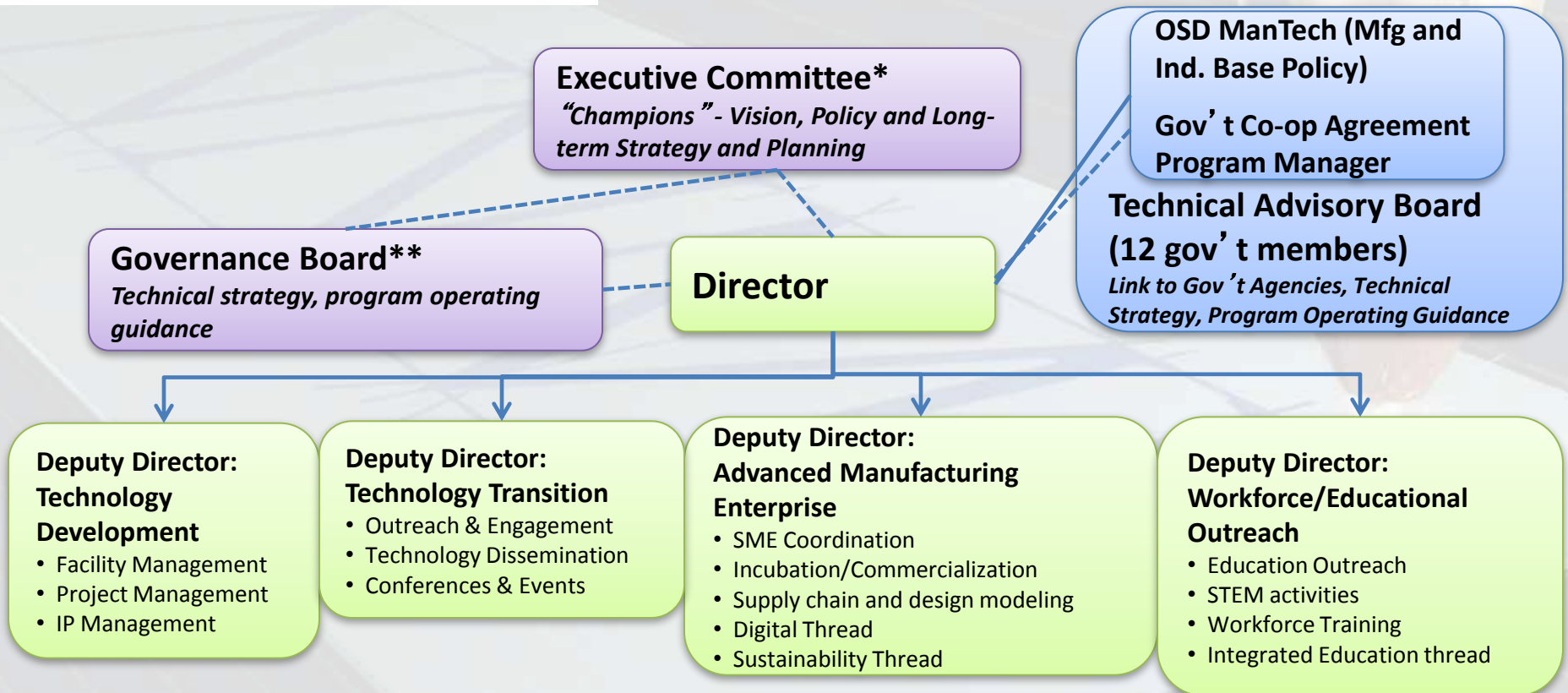
NNMI Characteristics



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



NAMII Institute Structure and Governance



— = Direct Oversight/Responsibility
 - - - = Guidance / Direction

***Executive Committee (11):** Industry, for-profit organization (2), Non-profit association (2), Academic (2), Government (3), At-large (2)

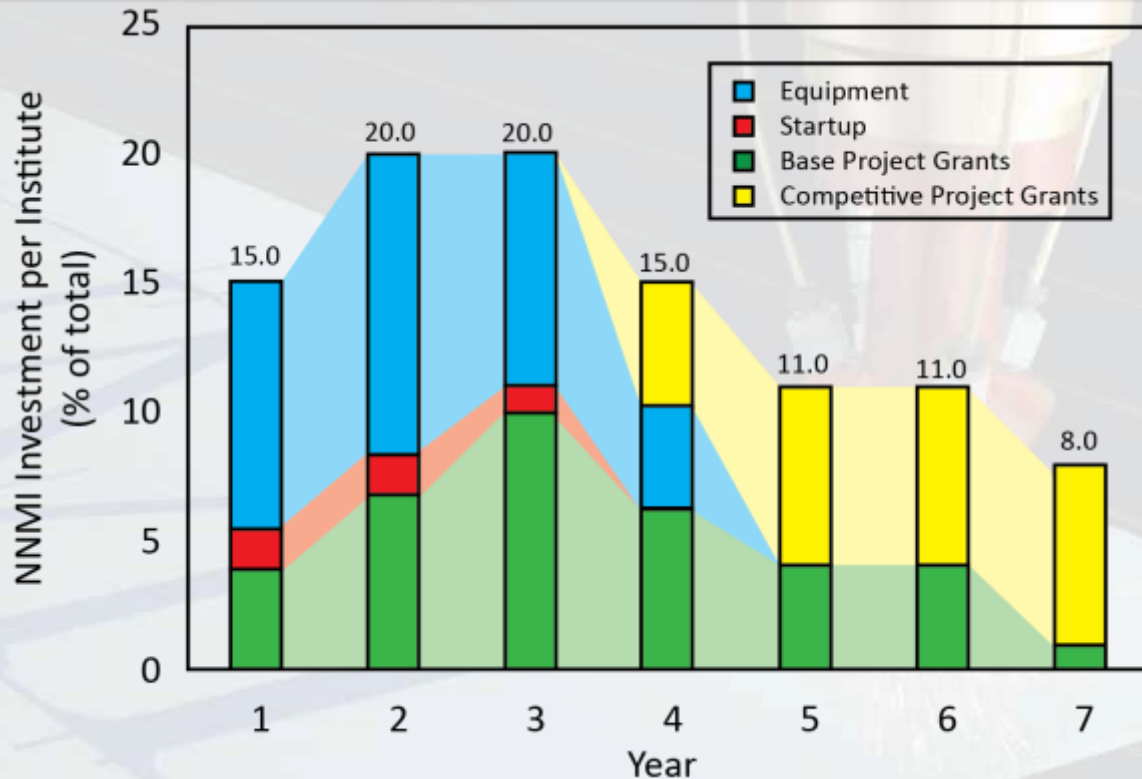
****Governance Board:** All 1st and 2nd Tier Members, small business, MEP director members, states ex-officio

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.



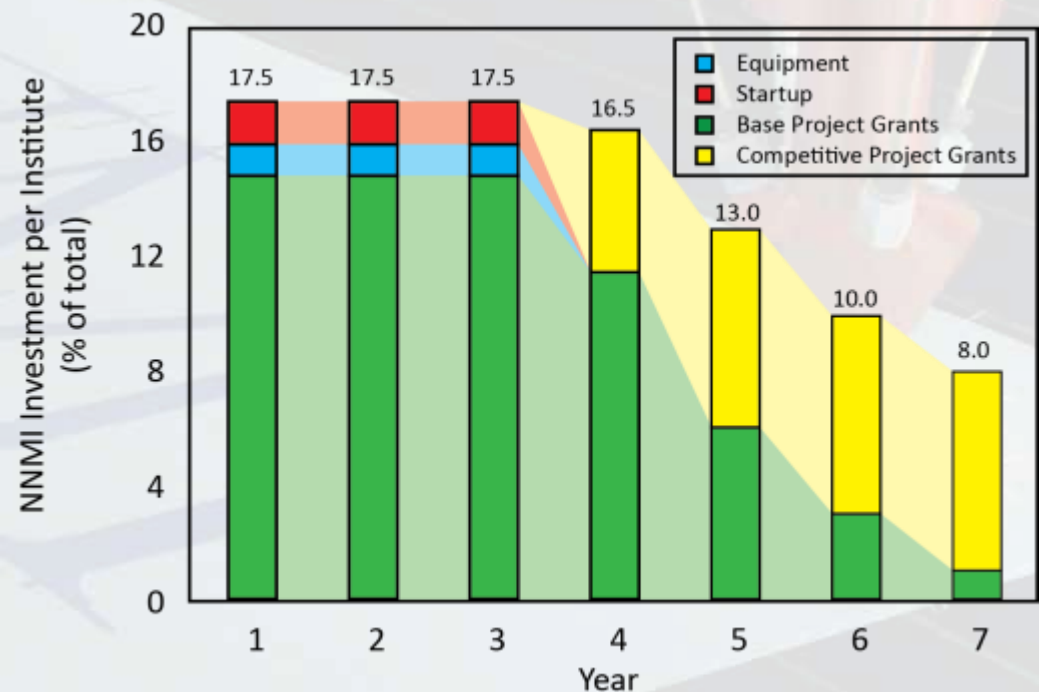
Institute investment of federal-only funds (does not illustrate matching funds or other revenue streams)



Sustainability

- Each Institute should have a plan to be self-sustaining based on diverse funding sources.
- Most of an Institute's funds will be provided by private sources as time progresses.
- The Board of Directors for each Institute will develop policies and procedures for its operation and for revenue generation.
- To encourage sustainability, a portion of funding will be competitively awarded.

Notional spend for a service-intensive Institute (little if no equipment required)



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.



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

