Responses to the Request for Information on Proposed New Program: National Network for Manufacturing Innovation (NNMI)

"Technologies with Broad Impact"

1. **What criteria should be used to select technology focus areas?**

    a. The focus areas should have a broad impact, across multiple industry sectors and customer bases. The focus area should also be technology-intensive rather than manual-labor intensive.
    b. If particular technologies are chosen, they should be nearly commercialized and needing only industrial pull to bridge the TRL/MRL4 gap. They should also have strong industrial interest and immediate to near-term application.

2. **What technology focus areas that meet these criteria would you be willing to co-invest in?**

    N/A

3. **What measures could demonstrate that Institute technology activities assist U.S. manufacturing?**

    a. Number and successes of new technology spin-off companies.
    b. Sustained and growing investment of industrial R&D funds and transfer of private-sector personnel to Institutes that support technology development and implementation.
    c. Transfer of skilled personnel from the Institutes to industry.
    d. Number of projects taken through to a specified TRL/MRL gate/level.

4. What measures could assess the performance and impact of Institutes?

    N/A

"Institute Structure and Governance"

5. **What *business models* would be effective for the Institutes to manage business decisions?**

a. A pre-competitive / collaborative environment for critical enabling technologies *along with* supply chain development to increase the amount of information exchange and sharing. Topics would be decided upon by the industrial members.
b. An open access environment to tools / equipment / technology for either collaborative or directed programs. These can be fee-based in addition to a membership fee.
c. Annual fee for participation, with sliding scale relative to size of enterprise and level of participation for industrial members.
d. Financial and business accountability to lie with Institute leadership and Executive Committee.

6. What *governance models* would be effective for the Institutes to manage governance decisions?

a. An administrative headquarters that would act as a hub for a distributed and flexible organization focusing on aspects of a particular technology.
   - Full time staff to lead and manage the Institute and be accountable to members and to cost and schedule
b. An executive committee to act as the governing board, consisting of:
   - Permanent members from Institute management and administration
   - Rotating members, representatives from advisory boards
c. The executive committee should be impartial and not be unduly influenced by larger members that pay higher membership fees.
d. Separate advisory boards in place for guidance and oversight, representing
   - Industry – large, medium, and small enterprises
   - Educational – universities, technical colleges, training institutes
   - Non-profits – regional, state, and local economic development bodies, professional societies, and miscellaneous interests

7. What membership and participation structure would be effective for the Institutes, such as financial and intellectual property obligations, access and licensing?

a. Tiered structure for annual fee for industry, based on level of participation in the Institute and the size of enterprise
b. Set fees for educational and non-profit participation
c. Priority access to equipment and expertise to dues-paying members
d. IP created non-competitively at the Institute to be license and royalty-free for members. IP to be offered for a negotiated fee to those outside of Institute to generate revenue
e. IP brought into the Institute by members to be protected <u>without exception</u>
   i. Non-disclosure agreements to be in place well in advance of any collaboration

8. How should a network of Institutes optimally operate?

a. Central Network headquarters to coordinate and set policies for common business and technology management activities at each Institute

i. IP and export offices, budgeting and finance, public relations and marketing, central meeting and collaboration space

b. Call for proposals and new member solicitation activities to come from each Institutes
c. A special Institute dedicated to enabling technologies that are pervasive the entire Network should be considered (ie, virtual manufacturing and modeling, human factors, advanced education and training concepts, etc.)

9. What measures could assess effectiveness of Network structure and governance?

a. Efficiency, cost, and speed by which new Institutes are proposed, initiated, built, and managed
b. Gradual reduction in amount and elimination of Federal Government support – do the Institutes within the Network truly become self-sustaining within a specified period of time.

"Strategies for Sustainable Institute Operations"

10. How should initial funding co-investments of the Federal government and others be organized by types and proportions?

a. Divide by funding needed to implement and sustain:
   - Overhead and infrastructure costs
   - Technical development / educational / training activities
b. Slowly phase out Federal funding over 5 years as a proportion of support until 100% driven by membership fees, directed program fees, education and training fees, and IP licensing / royalty fees
c. Even if success is validated using several metrics, the Institutes might need to continue to receive some percentage of Federal funding to sustain overhead and infrastructure. This should not be viewed necessarily as a demerit.

11. What arrangements for co-investment proportions and types could help an Institute become self-sustaining?

a. Membership fees
b. Revenues from training and education, IP licensing and royalties
c. Create a 'sliding-scale' fee for members who are participating in more than one Manufacturing Network, rather than pay the full fee to be a member of 2, 3, or more networks.
d. Basic R&D work led by Universities should be welcomed if it supports 'the critical path' for bridging the TRL/MRL gap. Funding can be provided by other sources typically found in the academic setting.
e. Ensure that projects selected for technology development (collaborative and directed) have a high chance of success across the TRL/MRL 4-7 gap in order to entice sustained and increased membership enrollment.

12. What measures could assess progress of an Institute towards being self-sustaining?

a. Basic financial metrics – revenues, profit / loss
   - Revenues should increase over time as the number of members increase and revenue-creating items are generated.
b. Increase in membership and level of active participation
   - Number of common and directed technology development programs
   - Numbers of personnel in training and education programs
   - Numbers of trained personnel and students being hired by members to support technology adoption for production

13. What actions or conditions could improve how Institute operations support domestic manufacturing facilities while maintaining consistency with our international obligations?

a. An embargo period or right of first-refusal to deploy technologies or know-how off-shore, but may require consideration for large multi-national industrial members
b. Understand fully how US export control will affect the participation of foreign members (eg. affiliates of industrial partners, foreign universities and institutes)
   - The stated goal of operations with no export control restrictions for open access work could be very difficult. What does 'proprietary' mean in the sense of the Institute membership and rights?
   - An in-house export control office will be essential.

14. How should Institutes engage other manufacturing related programs and networks?

a. The Institutes should actively engage external manufacturing and engineering professional societies and invite these to become full members at a reduced rate – Society of Mfg. Engineers, ASME, ASM International, etc. These will be important stakeholders as they typically have considerable experience in education and training, standards creation, etc.
b. Encourage and show preference for collaboration with other manufacturing networks as appropriate, either within NNMI or with external organizations
c. Very strong Institute leadership required to manage these relationships

15. How should Institutes interact with state and local economic development authorities?

a. Development authorities should act as advocates for the network – tax incentives, infrastructure planning, networking resources, etc.
b. Co-invest as appropriate, especially in early stages of establishing an Institute. This could include investment in particular projects with an additional measure of business risk (but with potential high payoff)
c. These authorities should have an advisory, but non-voting, seat on the Executive Committee in order to remain impartial.

16. What measures could assess Institute contributions to long term national security and competitiveness?

a. Number of new manufacturing jobs and new companies created incorporated in the United States

b. Number of jobs in-sourced into the US from overseas – especially jobs that were originally outsourced originally as 'low-wage.'
   - In other words, successes from the Institutes demonstrate the advantages of 'advanced and domestic manufacturing' versus 'cheap and foreign manufacturing."
c. Number of new and advanced technologies successfully adopted by US-based industry
d. Does the formation and success of the Institute provide a lasting example and template for accelerating new and advanced technology?
e. As technologies issued from the Institutes mature and a robust supply chain is created and becomes self-sustaining, does that particular Institute eventually morph towards another technology or dissolve?

"Education and Workforce Development"

17. How could Institutes support advanced manufacturing workforce development at all educational levels?

a. Provide internship and co-op programs for high-schools, technical colleges, and universities
b. Create and promote outreach programs to high schools to dispel the notion that manufacturing as a profession is 'dangerous, dirty, and disappearing.'
c. Support continuing education programs for credit and professional certification.
d. Provide input to curricula for certification courses

18. How could Institutes ensure that advanced manufacturing workforce development activities address industry needs?

a. Develop and provide training at all levels relevant to industry – from shop-floor technician to engineer
b. Utilize advances in human-factors understanding and sciences to develop optimized training programs for the shop floor level.
c. Understand and address where the gap lies between Industry need and ability / capability of the typical worker. Directly involve industry in the development and assessment of training and education programs.

19. How could Institutes and the NNMI leverage and complement other education and workforce development programs?

a. Offer facilities for vocational training, student internships, and graduate research
b. Participate in programs similar to ASM International "Teacher Camps" – educators spend a week at the Network participating in structured programs

20. What measures could assess Institute performance and impact on education and workforce development?

a. Percentage of students and skilled workers employed in advanced technologies as a result of Institute participation and training
b. Track the percentages still working in industry 5 and 10 years.
c. Track salaries relative to the low-wage / low-skill workforce

21. How might institutes integrate R&D activities and education to best prepare the current and future workforce?

a. Coordinate with Federal funding agencies (NSF, DOE, DOD, etc) to provide grants for professors and students to pursue research at the Institute
b. Host sabbaticals for professors to better understand links between R&D and manufacturing
c. Create "innovation portals" to solicit new ideas and concepts from students, teachers, and professors. Fund small packages of work to demonstrate feasibility and facilitate contacts with Industrial partners / members for further development.