

From: Forbes, Nathan (GE Global Research) [mailto:forbes@ge.com]

Sent: Tuesday, September 20, 2011 7:06 PM

To: amtech

Subject: General Electric comments in response to AMTech Program RFI

Thank you for the opportunity to provide comment in response to NIST's AMTech Program RFI. The following input represents the views of the Advanced Manufacturing Technology organization at GE Aviation (Evendale, OH) and the Manufacturing Technologies organization at GE Global Research (Niskayuna, NY).

1. Should AMTech consortia focus on developments within a single existing or prospective industry, or should its focus be on broader system developments that must be supplied by multiple industries?

Much of the innovation in the future will be at the intersection of existing industries, such as nano/bio, energy/water, flexible electronics, additive manufacturing, etc. AMTech should focus on system developments that can be cross-fertilized into multiple industries. For example, additive manufacturing could bridge aerospace, ground transportation, shipyard, and heavy equipment industries.

2. Who should be eligible to participate as a member of an AMTech consortium? For example, U.S. companies. i.e., large, medium, and/or small; institutions of higher education; Federal agencies; state, local, and tribal governments; and non-profit organizations?

All of the above mentioned entities should be eligible encompassing basic R&D, applied R&D, end users (large and small and their associated resources) & suppliers within a supply chain. While the recent changes in patent law and the increased emphasis on commercializing university research are an important component of strategies to improve US competitiveness, large corporations are in a much stronger position to introduce this technology into US supply chains. For this reason, we believe that all parties should be eligible, but there need not be set-asides for particular institutions or groups. Instead, competition should be fair and open and based on the technology and its impact on US manufacturing competitiveness.

3. Should AMTech place restrictions on or limit consortium membership?

No.

4. Who should be eligible to receive research funding from an AMTech consortium? For example, U.S. companies i.e., large, medium, and/or small; institutions of higher education; Federal agencies; state, local, and tribal governments; and non-profit organizations?

All entities with demonstrated technical capabilities and experience in the field should be eligible to participate. Clear emphasis should be placed on promoting consortiums with partners that have complementary technical skill sets. Because many corporations now outsource their production to suppliers, it will be important to make sure that in addition

to basic and applied research, suppliers who can translate the research results into production capability are part an AMTech consortium.

5. What criteria should be used in evaluating proposals for AMTech funding

The following criterion may be used to evaluate the proposal:

1. Whether the consortium has been formed
2. The criticality of the technology being pursued: Preference should be given to proposals that address real or potential global threats to US supply chains. Also successful proposals should demonstrate how their technology approach, if successful will revolutionize manufacturing practices and improve the competitiveness of US manufacturing supply chains.
3. The opportunity to conduct pre-competitive, cross-industry work which can be widely disseminated and can significantly impact/benefit the future of US manufacturing. There are several examples of areas where the answer is yes, including flexible printed electronics and additive manufacturing.

6. What types of activities are suitable for consortia funding?

The overarching aim of consortia activities should be to advance US manufacturing infrastructure and ensure global competitiveness. We envision that future manufacturing systems will be able to produce highly customized parts, with short turnaround times for a large & disparate customer base. This can be achieved by interfacing designers, manufacturing OEMs, academia and federal agencies. In this context, the following activities are suitable for consortia funding:

1. Basic manufacturing R&D
2. Development R&D for manufacturing systems and technologies
3. Pilot manufacturing process development & implementation
4. Developing application of manufacturing technologies across industries
5. Development of standards and (destructive and non-destructive) testing methods to qualify new manufacturing processes

7. Should conditions be placed on research awards to ensure funded activities are directed toward assisting manufacturing in the U.S.?

Yes, clear metrics of progress should be developed to direct research towards the end goal of commercializing technology. Funding should be provided in phases based on progress towards achieving the declared technical goals.

8. What are ways to facilitate the involvement of small businesses in AMTech consortia?

Engage them, in parallel, via the SBIR system. Given the long-term nature of a consortium's charter, engage the SBIRs as they achieve MRL 4 to 6. If the SBIR has the capability to offer relevant basic R&D, then engage at the onset. The overriding principle of engagement should be to include small businesses as early as possible to enable larger companies to communicate their business needs and technology requirements. This will accelerate the speed of adoption as these small businesses will be able to better focus their efforts.

9. What are best practices for facilitating the widest dissemination and adoption of knowledge and technology through consortia?

The consortia must include small companies, equipment suppliers, and OEMs. For example, in additive manufacturing, the consortia should be organized to include a supplier of equipment, an OEM, and multiple companies committed to offering additive manufacturing systems at the conclusion of the program. The users involved in the program will have established knowledge of the emerging products and should have a relationship with the OEMs. Simultaneously, standards should be developed to ensure that components manufactured via new technology can be qualified for use in safety critical applications. Professional organizations such as the SME, ASME, SAE etc. can be engaged to provide a platform to discuss advances in technology with the wider manufacturing research community.

10. While it is expected that the research efforts of AMTech consortia (including participants from the Federal, academic, and private industry sectors) will take place largely at the pre-competitive stage in the development of technologies, the generation of intellectual property is possible, and even likely. What types of intellectual property arrangements would promote active engagement of industry in consortia that include the funding of university-based research and ensure that consortia efforts are realized by U.S. manufacturers?

OEMs who would ultimately commercialize manufacturing technology should be granted rights to the IP developed within the program as long as it is incorporated in a product as a result of the program. The IP developed by basic R&D team members should be licensed with a minimal cost penalty to the resulting product and serve more as blocking IP to protect this new OEM base from existing competition. Because the consortium members are being paid to establish IP, they should therefore have limited ability to gain further profits in future products. These same considerations regarding IP should be applied to the industrial users within the funded program.

11. Would planning grants provide sufficient incentive for industry to develop roadmaps and initiate the formation of consortia? If not, what other incentives should be considered?

Planning grants should be discouraged. Instead, AMTech should give priority to existing consortia and their technology roadmaps. The incentive should be the ability to compete and win AMTech contracts that share the cost of technology development.

12. Should each member of an AMTech consortium be required to provide cost sharing? If so, what percentage of cost sharing should be provided?

Yes, consortium's should cost share . For example, where consortiums already have existing manufacturing technology development efforts (e.g. additive manufacturing), this support from NIST will enable the acceleration of production applications as well as the OEM equipment suppliers base. Consortium members should contribute 20% minimum depending on the state of the technology development.

13. What criteria should be used in evaluating research proposals submitted to an AMTech consortium?

The following criteria may be used:

- Strength of consortium (inclusiveness of small, medium, and large companies with established relationships)

- Impact of technology development: on US manufacturing competitiveness and jobs. Potential to impact multiple technology sectors (ex, energy, defense, consumer, etc)
- Quality of team: (as measured by prior experience commercializing technology and creating jobs)
- Global competitiveness: areas where other parts of the world are ahead of us because of their established R&D programs
- Cost, timeline: will this program make a difference with the funding available in the timeframe of interest
- Ability and experience to take technology development to product commercialization

14. What management models are best suited for industry-led consortia?

Advisory boards with representation at all levels of the value chain.

15. Should the evaluation criteria include the assessment of leadership and managerial skills?

Yes

16. Should limitations be placed on the duration of consortia?

No. Effectiveness towards reaching the program goals should be periodically reviewed. Assuming successful progress, consortia should be allowed to continue indefinitely. However, any funded programs need to have milestones with timelines attached.

17. How should an AMTech consortium's performance and impact be evaluated? What are appropriate measures of success?

Yes, if a viable commercial source for the equipment results from the first few (1 to 4) years of the consortium, the program is a success. This would imply proliferated applications across the diverse industrial membership.

18. What are the problems of measuring real-time performance of individual research awards issued by an industry-led consortium? What are appropriate measures of success?

Business plans firming for a) production applications and b) OEM equipment suppliers.

19. How should the NIST AMTech program be evaluated?

See above. Ultimately, the end goal should be globally competitive products from manufacturing advancements.

20. What are lessons learned from other successful and unsuccessful industry-led consortia?

Successful consortia have: 1) Bounding of mutually agreed upon goals. For example, consortium cannot study aluminum for a subset of members leaving the remaining

members to extrapolate to titanium; 2) have established goals aligned throughout a value chain (materials suppliers, component manufacturers/suppliers, OEMs), and inclusive of small and large business and research organizations. This provides more open sharing of technology development and IP. Unsuccessful consortia: 1) places competitors together to share and potentially contaminate IP.

21. How can AMTech do the most with available resources? Are there approaches that will best leverage the Federal investment?

1. Focus on consortia that result in OEM products in addition to applications.
2. Womb-to-tomb R&D, use, and support.
3. Cost share to ensure industry commitment.
4. Discontinue support to ineffective consortia that repeatedly fail to meet success criteria.

22. How should AMTech interact with other Federal programs or agencies?

There needs to be an overarching bond between the various federal programs that are pursuing similar initiatives. This could be managed by OSTP with representatives from NIST, DOE, and DOD. Work done in one program/agency should be leveraged by AMTech and vice versa. For example, nearly every DoD agency is funding some level of additive manufacturing. This has sufficient merit to warrant a national initiative.

23. What role can AMTech play in developing, leading, or leveraging consortia involving other Federal agencies?

NIST can provide a link to other consortia through the AMTech program, but the AMTech program should not add another layer of management to other consortia that already exist. OSTP and PCAST are better suited for maintaining a connected framework between agencies, where NIST will contribute to develop consortia along with DOE and DOD. NIST should look to develop consortia that impact broad areas of the US economy beyond just energy or defense. For example, additive manufacturing and flexible electronics have the potential to revolutionize broad sectors of the economy from consumer products to defense. This is where NIST could have a role.

Kind Regards,

Nathan G. Forbes
Business Development Manager
External Affairs & Technology Programs
GE Global Research

T 518-387-6906
M 202-285-7421
DC *833-6906
F 518-387-5449
nathan.forbes@ge.com

One Research Circle
Bldg. KW Rm. D279A
Niskayuna, NY 12309

[GE imagination at work](#)