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To: amtech

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Subject: "AMTech Comments."

Dear Barbara Lambis,

I am very happy to be submitting the attached comments to the AMTech RFI. I submit these on behalf of a team that has been working together on these responses as well as considering options for how it might contribute to the success of President Obama's overall Advanced Manufacturing Initiative.

The members of our team, copied above, include:

Joseph Bordogna, Dean Emeritus,
School of Engineering and Applied Sciences
University of Pennsylvania

David Brookstein, Executive Dean of University Research
Philadelphia University, School of Design & Engineering

Wayne Figurelle, Director
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We hope our comments are helpful and look forward to the opportunity to find out about conclusions you may have reached given all the comments you receive. Our work on this will continue and over the next few months focus on gathering feedback from manufacturing companies of all sizes as well as those external firms that provide expertise and technologies that support the entire innovation cycle within manufacturing businesses. We want to understand their perspectives on what needs to be done to speed up the innovation cycle and improve its rate of success, defined as bringing more products and services to market more quickly and in a profitable way.

On behalf of all the members of the Greater Philadelphia team I express a thank you for the opportunity to engage in this process with you.

Sincerely,

Joe Houldin

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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?

Our group had two competing perspectives on the subject. First, that AMTech should not focus on single industries but on enabling technologies that are critical to multiple existing as well as new and emerging industries. To improve industrial competitiveness and job creation, product, process, and market innovation is required for companies across industry sectors and at every stage of the life cycle of a business, spanning formation, development, growth, and maturity. Particular attention should be given to the needs for mature companies in the legacy sector of our economy to help them respond to global competition through reinvention. This is particularly important for older industrial states and regions. Priority should also be given to new and emerging industries in areas such clean energy production, energy storage, robotics and others that should be specifically targeted for assistance.

The second perspective is that highly focused consortium will increase the velocity at which a single industry increases its technology base. In addition, a highly focused mission may bring in additional leverage from other state, federal and private sources. A broad system wide approach will benefit many industries, but the rate of change will be decreased.

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?

AMTech consortia should include companies of all sizes including global OEMs, manufacturing SMEs and start-up technology companies, as well as national laboratories, research universities, community and technical colleges, organized labor, state and local government agencies, economic and workforce development organizations, and others. These various types of participants should be encouraged to arrange themselves into innovation systems addressing research, technology development, product design and prototyping, marketing, and production and distribution within technology or industry focus areas. Consideration should be given to requiring funding contributions from state and local governments as a way to leverage increased funding for consortia and ensuring commitment to the enterprise by all levels of government. Research intensive public universities should be encouraged to lead development and management of such consortia based on their unique research, education, and technology management capabilities combined with their public service missions.

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

Restrictions should be considered aimed not at limiting membership but rather at ensuring balance between types of members spanning global OEMs, manufacturing SMEs, start-up technology companies, national laboratories, research universities, community and technical colleges, organized labor, state and local government agencies, economic and workforce development organizations, and others. These various types of participants should be

encouraged to arrange themselves into innovation systems addressing research, technology development, product design and prototyping, marketing, and production and distribution in a balanced fashion within technology or industry focus areas.

The major restriction our group considered concerning limiting membership should be the restriction to U.S.-based membership. This is simple for universities, governments and professional organizations; all are either in the U.S. or not. The question arises for private industry: what constitutes an American based company? The locations of headquarters, manufacturing or should both requirements be met to be considered a US company? In conjunction with whichever is considered a valid condition, strong IP controls with any company with U.S. manufacturing sites (employing within the U.S.) should be a requirement to be eligible for membership.

In addition, restrictions could be considered based on a vested interest or “skin-in-the-game”, such as research expertise in the industry and/or financial commitment.

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?

Research funding should be available only to teams comprised of private firms, research universities, and national laboratories. The aim of AMTech research funding should be help leverage research capacity at universities and national laboratories, in addition to corporate R&D, for industrial competitiveness and job creation. Restricting AMTech R&D funding to government-industry-university teams will help achieve this by requiring that these different types of organizations work together as a condition of receiving AMTech research funding.

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

AMTech funding should support joint work by consortia members including global OEMs, manufacturing SMEs, start-up technology companies, national laboratories, research universities, community and technical colleges, organized labor, state and local government agencies, economic and workforce development organizations, and others. These various types of participants should be encouraged to arrange themselves into innovation systems addressing research, technology development, product design and prototyping, marketing, and production and distribution in a balanced fashion within technology or industry focus areas. The goal of the AMTech Consortia should be to create jobs in the U.S. by developing and marketing new or improved globally competitive products made in the United States. AMTech funding should be awarded based on the potential of consortia to achieve these goals.

The funding should focus on the problems of the industry. This combined with the correct IP controls and dissemination would help advance all members of the consortium. The consortium should opt to enable the private sector to connect with National Laboratories and the major research Universities for a fee for service programs of highly company-specific problems.

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

Broadly, AMTech funding should support research and development, product design and prototyping, education and workforce development, supply chain integration, and intellectual property management activities. Product design is an area for particular focus. Here, diverse teams of university faculty members and graduate students from engineering fields, business administration, and fine arts and other creative disciplines should be organized and supported to help companies design new and improved products and develop and execute business plans for bringing such products to market.

Furthermore, the AMTech Initiative should support pilot Technology Development Centers in which companies, including small to mid-sized companies, could access advanced manufacturing processes and testing capabilities for product maturation and reduction to practice.

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

The goal of the AMTech Consortia should be to create jobs in the U.S. by developing and marketing new or improved globally competitive products made in the United States. AMTech funding should be awarded based on the potential of consortia to achieve these goals. A limitation should be considered toward limiting consortia leadership to public institutions which have an explicit mission to serve the economic interests of a state, region, U.S. industry, or the nation.

However, the conceptual founders of AMTech must properly define U.S. manufacturing, until then proper conditions cannot be placed in the funded activities.

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

The ways to facilitate the involvement of small businesses in AMTech are to court their membership from the beginning. The membership to the program could be scaled or pro-rated to lower the barriers of entry for medium and small businesses. Possible metrics could be, market share, percentage revenues, inverse proportion of research and development spend, inverse proportion of the percentage of U.S. manufacturing employees (the latter two showing that the more you invest in research and development and U.S. manufacturing the less a company's membership would cost).

In the Greater Philadelphia Innovation Cluster for Energy Efficient Buildings, an U.S. DOE Energy Innovation Hub, a lead NIST-funded Manufacturing Extension Center was included by design in the consortia. While the role of the Manufacturing Extension Center has many dimensions, its main purpose is to represent the interests of the smaller manufacturing enterprise in the design and execution of GPIC activities but also act as a bridge which encourages, facilitates, and supports the active participation of key businesses which can contribute to and benefit from GPIC's mission purpose. Furthermore, a lead Manufacturing Extension Center in AMTech consortia provides connectivity beyond its region to all of the nation's smaller

manufacturing firms through the centers participation in the nationwide network of NIST Manufacturing Extension Partnership centers.

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

The adoption of the new technology would be accomplished by training the workforce (graduate students and professional organizations) and the vertically integrated exchange of technology (the buyers and suppliers). This prevents dissidence by a particular section of industry by standardizing the work force and gaining vision of the entire industries condition.

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.

10. 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?

The Bayh Dole Act of 1980 created financial incentives for universities to protect and license discoveries arising from federally funded research. As a result virtually all research universities have created IP management offices to patent and license inventions as a result. The incentives that Bayh-Dole created for universities seek royalties can impede joint industry-university research partnerships. This fundamental issue must be addressed for AMTech consortia to succeed. As part of its role as lead organization for the Greater Philadelphia Innovation Cluster for Energy Efficient Buildings, a U.S. DOE Energy Innovation Hub, Penn State has instituted several new models for university intellectual property management which could provide a useful model for AMTech consortia. For government sponsored research performed by members of the GPIC consortium, inventing organizations are must decide within 90 days of disclosure whether they will pursue commercialization. If they choose not to pursue commercialization, Penn State on behalf of the GPIC consortium has the right to market the technology. For industry sponsored research performed at Penn State, sponsoring companies will be granted an exclusive license for use of the technology in any field in exchange for a one-time fee equal to ten percent of the amount of the original sponsored research contract from which the invention emerged. These are examples of the innovative approaches to IP management being pioneered by Penn State and the GPIC aimed at removing IP as an impediment to government-industry-university technology partnerships.

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?

A planning grant could generate sufficient interest on the part of industry to collectively identify the enabling technologies needed to support the products and services that will drive future economic expansion and job growth. However, true incentives for industry are realized if and when market pathways are more readily identified and an opportunity or interests on the part of an intended consumer is apparent. Sematech did lead to the development of enabling pre-

competitive technologies which improved the U.S. global position in the that marketplace, however a key driving force at the table was the DoD and its interest in the U.S. semiconductor industry as it related to national security. Connectivity to national interests and policy priorities such as energy efficiency, environmental sustainability, modernized transportation systems and infrastructure, and national defense, as examples, provide a line-of-sight to a future marketplace and better rationalize a national, state, and local investment.

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

Some but not all members of AMTech consortia should be required to provide cost sharing. Industry members of AMTech should be required to provide 50 percent of the total cost of R&D projects for which they receive AMTech funding. Educational institutions and national laboratories should not be required to provide cost sharing since the only sources of other funds these institutions is other sponsored research activity or in the case of educational institutions, tuition. State and local governments should be required to provide cost sharing to AMTech consortia equal to the amount of federal funding received.

However, particular attention should be paid to ensure that cost sharing for small to mid-sized companies does not preclude their participation in AMTech. Cost sharing requirements for these organizations could be scaled based on organizational size. In addition, NIST should explore gated revenue sharing schemes that would provide low cost of entry into AMTech for small companies.

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

Research proposals submitted to an AMTech consortium should undergo objective peer review for both technical merit and impact on industrial competitiveness and job creation by technically qualified experts. Final approval should be made by the consortia governing body and the sponsoring federal agency.

Assuming they meet the basic criteria (U.S. based, manufacturing, R&D related, high level technology), evaluating research proposals should consider the number of jobs created or retained, industrial need, feasibility of the project, number of clients served (with a separate customer satisfaction measure), direct and indirect economic impacts, the capital requested and the expected ROI.

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

The Energy-Regional Innovation Cluster (or E-RIC) initiative, developed by the White House Interagency Taskforce for the Advancement of Regional innovation Clusters (TARIC), represents a new approach to public-partnerships that attempts to overcome these challenges by focusing public-private partnership development efforts on a specified geographic region based on unique regional strengths. The program includes coordinated participation by multiple federal agencies and levels of government, and its participants are bound together in a joint effort to address a selected aspect of the U.S. energy challenge as a vehicle for promoting economic

growth and job creation. The Greater Philadelphia Innovation Cluster (GPIC) for Energy Efficient Buildings was established in February 2011 as the first E-RIC consortium. The GPIC consortium comprises 24 members including eleven prestigious universities, two DOE laboratories, six high profile global industrial firms, economic development agencies, and community and technical colleges, led by Penn State. The GPIC shows that research-intensive public universities can play key roles in helping to organize and lead large public-private consortia. These universities possess significant research capacity but also have a mission to help make life better for the people of their home states with economic development, community development, and other services. The E-RIC initiative and the GPIC consortium in particular can serve as models for development and management of AMTech consortia.

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

Lead institutions and key personnel involved should have some degree of demonstrated, knowledge, skills, and experience in managing public-private partnership, joint-venture, and other consortia like activity. Likewise, a demonstrated history and culture of managing such multi-institutional programs should be a requirement of lead institutions.

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

A key success factor of a given consortia should be the degree to which the participating organizations take ownership of the direction, management, and the continuity of the effort. A truly market-driven initiative should not rely on the continued investment of federal dollar beyond development and cultivation of interest and in the development and identification of key technology interests (i.e., roadmaps) that will drive economic expansion and job growth. Continued investment by the federal government should be contingent the degree of leveraging the federal investment achieves and, given that, to ensure that national policy interests are captured in the technology roadmaps and research resulting from them.

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

An AMTech consortium's performance and impact should be evaluated by the number of jobs created or retained, new products or IP, works and papers published, number of clients served (with a separate customer satisfaction measure), addition capital leveraged and invested, direct and indirect economic impacts, world ranking of industry, change in research and development times and a general assessment of the industry as a whole in the U.S.

Again, a key success factor of a given consortia should be the degree to which the participating organizations take ownership of the direction, management, and the continuity of the effort. A truly market-driven initiative should not rely on the continued investment of federal dollar beyond development and cultivation of interest and in the development and identification of key technology interests (i.e., roadmaps) that will drive economic expansion and job growth. Continued investment by the federal government should be contingent the degree of leveraging the federal investment achieves and, given that, to ensure that national policy interests are captured in the technology roadmaps and research resulting from them.

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?

A significant problem is that the success should be measured later in time. Possibly, 3 and 5 years later, this is when the value of the award can properly be assessed.

19. How should the NIST AMTech program be evaluated?

A key success factor of a given consortia should be the degree to which the participating organizations take ownership of the direction, management, and the continuity of the effort. A truly industry-led, market-driven initiative will be demonstrated by the degree to which the AMTech investment has been leveraged by private funding, research institution, and other government funding included other federal agencies with specific research interests.

An AMTech consortium's performance and impact should be evaluated by the number of jobs created or retained, new products or IP, works and papers published, number of clients served (with a separate customer satisfaction measure), addition capital leveraged and invested, direct and indirect economic impacts, world ranking of industry, change in research and development times and a general assessment of the industry as a whole in the U.S.

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

Public-private technology partnerships have long been proposed for solving problems of U.S. industrial competitiveness and declining manufacturing employment. Since the 1980s, numerous initiatives have been launched to promote public-private technology partnerships to address these problems, including federal programs such as the Department of Defense Sematech program, the NIST Advanced Technology Program (more recently known as TIP), the Engineering Research Centers of the National Science Foundation, and many others, along with technology partnership programs in most states. These programs share some key weaknesses, including inadequate attention to local and regional conditions and strategies, poor coordination among federal agencies and levels of government, and often weak ties binding partners together. The Energy-Regional Innovation Cluster (or E-RIC) initiative developed by the White House Interagency Taskforce for the Advancement of Regional innovation Clusters (TARIC) focuses public-private partnership efforts on geographic regions and includes coordinated participation by multiple federal agencies and levels of government, and its participants are bound together in a joint effort to address a selected aspect of the U.S. energy challenge as a vehicle for promoting economic growth and job creation. These and other features of the E-RIC model should be considered in design for the AMTech consortia.

Furthermore, members of our group believe that highly focused programs create new technology at a faster speed and that inclusive programs create more benefit for the overall economy. Mismanaged resources and incorrect incentives can easily ruin a program. Strong IP and patent controls are needed to protect the interest of all parties involved.

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

AMTech should focus on the identification, establishment, and support of a strong experienced consortia management team, critical industrial partners and their key representatives, strong state and local investment and presence, facilitation of federal partners, and strong technical liaison and support of the NIST laboratories. Building a strong team that will build a strong, industry-led, and sustainable consortium is the most critical AMTech investment.

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

AMTech should ensure that other mission and technology interests of other federal agencies are reflected in technology roadmaps and resultant research by ensuring their active participation, as members, in relevant consortia. Other agencies should be involved in the evaluation and selection of AMTech consortia investments.

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

AMTech should look to and lean on the policy, technology, and mission interests of other Federal agencies to avoid some of the expected ideological landmines preceding precompetitive research programs have stepped upon. A strong connectivity to national policy and public interests, which improves our domestic industrial base, which in turn translates into economic expansion and job growth, may form purposeful public basis for these investments which transcends the anticipated “picking winners and losers” arguments expected to follow.