The Ohio State University
College of Engineering

Response to:

DEPARTMENT OF COMMERCE
National institute of Standards and Technology

[Docket No. 120418419-2419-01]

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

The NIST-hosted AMNPO is specifically interested in receiving input pertaining to one or more of the following questions:

Technologies with Broad Impact

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

Institutes must be aligned with business drivers that have broad impact and which will benefit from innovation and technological solutions as enablers, i.e. market need should be the driver to create and/or integrate technology and innovation into deployable solutions. Therefore, the criteria used to judge Institute proposals should start with metrics associated with new opportunity business case(s). These might include demonstrated market research and assessment of innovation/technology need, compelling return-on-investment scenarios, and game-changing or disruptive attributes. Once the overarching business case has been vetted, it would be appropriate to assess if the proposed technology focus area(s) align with the solutions envisioned. Of course, the NNMI initiative is all about the creation of jobs and/or reshoring of jobs back to the US. In this context, it is important that the criteria used to judge Institute proposals include measures of potential job creation and quality in those industries that will utilize the deployed solutions.

Concurrent with the identification of, and focus on, a compelling 'business/market issue' facing a US manufacturing segment, an Institute must also demonstrate that that it can adequately provide the *entire range of capabilities needed* to perform product development across the entire product development life cycle. In addition, it is critical that the Institute be capable of addressing *large-scale problems at the system level*. Thus, Institutes must possess a very strong R&D operations framework; replete with project management, systems engineering, business analysis, and risk analysis capabilities. These capabilities must reside 'in-house' within the Institute; although we strongly encourage the expectation that industrial members, especially at the OEM and tier one supplier level, will rotate human capital resources 'on-loan' to the Institute for extended periods. The operations capabilities outlined above are necessary for any organization whose mission is to bridge innovation and technology with market need in order to cross the proverbial 'valley of death.' Breadth of capability range is equally important to the selection of appropriate technology focus areas.

Lastly, successful Institute proposals must address the need for end solutions to span simulation, modeling, design, test, and implementation. Providing solutions ready for deployment to the manufacturing floor, but without linkage to upstream product development activities such as modeling and design, would be of limited value. Criteria for measuring the ability of the Institute to deliver should include an analysis of the proposed capability to deliver the full range of tools needed to create and implement new innovations and technology across the product development life cycle.

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

Our interests would be aligned with our institution's strengths and strategic growth areas, with strategic co-investment targeted to those industries that seek technical solutions and an associated trained, talented workforce.

Sub-divisions of the above would include new materials, joining technology, metal processing, forging, clean energy (biofuels, PhotoVoltaics, etc.), sensing and instrumentation technology, biomaterials, and bio-manufacturing.

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

The following measures could be used to assess the impact of Institute activities on overall U.S. manufacturing:

- Deployment of innovation and technology directly into products and manufacturing workflow. This measure should also account for innovation and technology that are integrated into products that support manufacturing (ex. Operations software, robotics, sensing, etc.).
- Self-reported company ROI as a function of Institute investment versus improvements in sales and/or yields.
- Institute membership trends.
- Manufacturing job trends tied to the deployment of Institute generated innovations, technology, and/or products ('solutions').
- Number of patents resulting from Institute activities as a ratio against licenses and/or deployed instances in production environments and/or products.
- Surveys measuring public perceptions of manufacturing as an economic driver within the U.S.
- Policy shifts solely or partially attributable to Institute educational and lobbying activities.

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

Client engagement measures should include the number of members (perhaps subdivided by the number within normalized definitions of 'tiers' of membership); the amount of membership funding both on annual basis and through long-term commitments (ex. founding partners and their multi-year pledges); the amount of competitive research funding by industrial partners (i.e. directed research); and the amount of research funded by government sources.

Technology and innovation advancement measures should include the annual and cumulative adoption of Institute technology, innovation, and IP (including rates of adoption as a function of time); success rates of development projects; rates of creation and adoption of new standards; and conversion rates of TRL 1-3 innovation from academic and other partners into projects with commercial deployment as the end objective.

Operational measures should include a ratio of operating expenses versus labor associated with project work and the year-over-year ratio of operating expenses drawn from membership and project funding versus unrestricted governmental grants; an indication of long-term sustainability.

Workforce development measures should include 'graduates' of Institute programs placed in relevant positions, numbers of industry and/or college students involved in Institute training and/or projects, breadth of workforce development programs, and numbers of high-school graduates 'pipelined' into Institute training or college 'manufacturing' tracks through K-12 outreach efforts.

A suggested 'indirect' metric would be the amount of sponsored research conducted by industry with Institute academic partners, outside of the Institute construct, but within the technology space the academic partner is known for through their Institute activities. This is a critical measure, as most academic partners will not recover their 'cost-shared' investment in the Institute through Institute project work alone. Ultimately, their ROI will come from increased visibility to the general community in their area of Institute expertise; resulting in more research, higher rankings, and increased quality and quantity incoming students.

Institute Structure and Governance

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

We believe that Institutes meeting the NNMI vision must be challenged to successfully deliver on multiple 'primary' missions, including:

- Establishing and managing a private-public collaboration of universities, industry, and government entities that will successfully partner to merge technology, innovation, and market need into product concepts, transition those concepts through mid TRL risk reduction (business and technical), and engage in product development leading to economically and technically viable commercial solutions.
- Operate in a mode that acknowledges that research and development are equally important, that the ROI of each project must be on a positive vector for the project to continue, and that resources must be allocated judiciously across the project portfolio to maximize outcomes.
- Deliver high-quality workforce and primary, secondary, and higher education that result in a U.S. capability to implement and support the Institute's commercial solutions.

To successfully deliver on the above missions will require that the Institutes be operated as full-scale R&D operations with built-in educational capability. This can only be achieved if the Institutes possess the internal tools and capabilities to support product and process development across the full life-cycle. From a business model/operations standpoint, this means that systems

such as time tracking, earned-value management, risk management, and systems engineering requirements, design, and V&V control are highly desirable. In addition, professional staff experts in these various disciplines must be on-staff, augmented by rotating 'on-loan' resources from the industrial partners. The Institute financial model must account for these various resources.

Institutes should be independent from the academic and industrial partners. Desirable attributes of the legal structure would be tax advantages (such as with various forms of non-profits) and the flexibility to manage the expected portfolio of Institute IP in the best interests of the industrial and academic membership.

Lastly, the Institutes must have the flexibility to conduct contract R&D if desired. This option will enable the Institute to maintain close proximity to, and experience with, the product/process development life cycle through engagement on client projects with real-world near-term objectives. The contract R&D vehicle may also be leveraged to support state and regional MEP programs by being a solutions provider. Contract R&D may also provide an important 'load balancing' mechanism when staff 'time-on-project' metrics are not at optimum levels (ex. early in the institute life-cycle when core project work has not fully ramped-up to steady-state).

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

Each Institute should have a Board of Directors (BOD) to provide vision and mission oversight. Ultimately, the BOD would be responsible for guiding the Institute to a steady-state which is self-sustaining without dependence on government unrestricted operating grants. This will require a strong business-oriented, private sector influence.

Reporting to the BOD should be a CEO, supported by other C-suite level executives fulfilling operations, educational, business, and finance functions. This CXO team should be full-time and in-house. The CXO team should be experienced at running R&D type operations, with academic touch-points an important qualifier. Within the CXO team should be at least one individual with sufficient academic credentials to enable founding and fostering excellent relationships with the Institute academic partners and governmental funding agencies. This is likely to be the CEO and/or leader responsible for the educational mission of the enterprise.

Supporting the BOD and the CXOs should be a Research Review Board (RRB). The RRB would have the responsibility of guiding decisions related to the investment of Institute IR&D funds into early stage (TRL 1-3) research to be conducted by the Institute or its academic partners. The RRB might also take the role of assessing long-term trends in the manufacturing sector and determining candidate technologies and innovations needed to support future growth. The RRB membership should be weighted toward a research-oriented, academic influence.

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

Memberships in the Institute should be tiered, reflecting the composition of the companies that span the supply chain(s) relevant to the each Institute's technology focus. Thus, the tiered membership structure should account for OEMs, suppliers and interested third parties (such as suppliers of software and equipment used within the supply chain). Companies higher in the

supply chain should be expected to make larger annual contributions to the Institute, possibly with some form of recognition related to IP rights or roles within the Institute governance structure. The tiered structure should also allow for some form of 'observer' or 'friend of the Institute' status, with low or zero associated fees. Consideration should also be given to some form of special 'tier' and/or tier fee reduction for industrial partners that provide the Institute with services or material-in-kind.

In addition to annual membership fees, there should be a provision in the Institute design for a limited number of industrial founding partners who are committed to the long-term success of the Institute.

The Institute needs to have a clearly articulated IP posture that allows for efficient and effective transition of innovations into deployable market solutions. This needs to effectively balance a shared-IP structure consistent with a shared membership and a mechanism for moving shared IP, when appropriate, into an Institute controlled IP pool that enables deployed solutions 'greater than the sum of the parts' that enhance time-to-market and business ROI on behalf of the entire membership.

Institutes should be structured to support both Internal Research and Development (IR&D) and directly sponsored research programs (SRP) by individual Institute members. [IR&D in this context is analogous in some sense to the 'pre-competitive' research conducted by NSF Industry/University Cooperative Research Centers.] All IR&D and SRP IP should go into an Institute managed IP pool. Access to IP in the pool by members should be proportionate to the tier they occupy and whether or not they were direct supporters of the research activity(s) that resulted in the IP.

All licenses from the Institute should carry a moratorium on use outside of the U.S. for a specified number of years. This will incentivize global corporations to participate in the Institute knowing that an outlet for new manufacturing technology and innovation exists through a U.S. presence; while allowing for global utility after the moratorium period.

8. How should a network of Institutes optimally operate?

Each Institute must have the ability to operate independently; to assure that the best possible business decisions are made for their constituents. However, there would be high value in a network level entity that would serve to implement and promote internetwork communications, implementation of common best practices, sharing of capability and resources, common reporting mechanisms, assessment of the IP created by the network for possible 'bundling' opportunities, and monitoring of industry satisfaction and the quality of relationships between Institutes and their members.

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

Instances of joint gatherings of Institute representatives for various purposes, utilization rates of common best practices, satisfaction surveys of members (in particular those who belong to more than one Institute), and instances of Institute staff participating in the governance of other Institutes.

Strategies for Sustainable Institute Operations

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

Institutes will be chartered to address complex, system-level technology challenges; provide educational and experiential training within their manufacturing domain space; and positively influence public and governmental perception of manufacturing as a critical component of the U.S. economy and national security. Establishing each of these components of Institute capability will require unique time-frames and investments; which will influence the types and proportions of Federal support. At the highest level of consideration there should be strong base funding and matching of industrial projects, especially those that are early-stage and may not draw strong, initial industry support. Federal support of core and project activity should decrease over time, but support for early-stage next-generation research should retain some form of long-term, steady-state profile. [Funding for the latter may come from Federal sources other than AMNPO.]

Facilities – While leveraging existing physical infrastructure should be exercised to the extent possible, it must be recognized that state-of-the-art innovation and product/process development in the manufacturing domain will require customized facilities. Specific to manufacturing; it may be necessary (depending on the technology focus) to implement a highly flexible and configurable space for the establishment of pilot-scale verification and validation of new processes. Not only may this require significant square footage; but novel approaches to the routing of power, fluids, communications, HVAC, etc. will also be needed.

Implementing the flexibilities outlined above will be optimized by designing the necessary facility from the 'ground up,' or expanding a facility that already possesses these features and is scalable. With the above in mind, Federal funds should be made available to seed critical facility development. We recommend that these funds represent 60% of the total Federal investment if a new facility is needed; 30 to 40% if expansion of an existing facility is possible. Federal cost share ratios of 1:1 to 2:1 with industry should be implemented – to incentivize large industrial cash contributions. Facilities funding should be a one-time Federal investment, staggered over the first two to three years of Institute operations. Strong Federal support for core facilities will be a key 'tipping-in' point for prospective industrial founding partners; who will be asked to make large investments and must be able to project a positive ROI on long-term basis.

Equipment – Addressing system level technology challenges, in addition to providing an environment conducive to workforce development training and general education, will require substantive investment in a broad range of equipment. However, this is an area where repurposing of existing equipment from amongst the institute partners, combined with donations of equipment by vendors interested in both establishing brand awareness and benefitting from design enhancements resulting from Institute research, will offset a need for large Federal investment. We recommend that 10% of the Federal investment be reserved for equipment, at a 0.5:1 to 1:1 cost share with the Institute and its members. This funding could be staggered over three to five years, as it will take time for the Institute to make project selection determinations and equipment needs will change as projects mature.

Personnel and Operating Expenses – We expect that revenue from Institute memberships and direct project funding may adequately cover the costs associated with initial staffing of the Institute and operating expenses. For planning purposes and to allow for the contingency, we recommend that 10% of Federal support be reserved for 1:1 cost share associated with recruiting and funding key CXO and technical positions for the first two years of Institute operations.

Projects – A critical aspect of Institute operations will be the self-creation, or import, of the core TRL 1-3 innovations that will likely be required as the underpinnings to the system level solutions ultimately to be delivered to the industrial constituents. Thus, an initial focus of Institute research will be core, early-stage innovation and technology development. We recommend that 20 to 40% of Federal support be reserved for 1:1 cost share on these initial projects, spread over the first two to three years of Institute operations.

Education – While it is an objective for the Institutes to achieve self-sufficiency with respect to funding; it must be noted that they will still be expected to fulfill an ambitious educational mission – a mission that is historically underwritten at all levels from K-12 through workforce development by governmental support. We believe that it would not be unreasonable to expect continuing Federal support for this mission, but are not sure if it would be appropriate for this funding to come through AMNPO. We are therefore intentionally choosing to be silent on any recommendation for educational support as a proportion of the NNMI funding specific to standing-up the Institutes.

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

Reserving a high proportion of Federal support for front-end investment in Institute facilities, infrastructure, and equipment will be a major factor in enabling a self-sustaining business model by substantially reducing the carrying costs normally associated with large-scale capital investments.

Requiring that the majority, if not all, of operating expenses be supported by private investment and/or non-AMNPO Federal research funding (i.e. typical Federal research programs won through successful bid and proposal mechanisms) will drive a self-sustaining Institute business model and culture. Such an approach will force the Institutes to design their operations from the beginning with an eye toward being lean and efficient. An exception, as noted in our answer to question 10, is the potential value-add of making Federal support available over the first year or two of operations to support the recruitment and retention of key CXO and technical staff who have a demonstrated track record of R&D success.

While we refrained in our answer to question 10 from recommending specific Federal investment in the educational mission of the Institutes, it could be argued that such investment could serve to underwrite educational and workforce development programs until they could be matured sufficiently to have a 'market value' that would be self-sustaining. In other words, one can expect that these programs will be loss leaders early on; a detriment to an objective to be self-sustaining if the carrying costs are too high.

Project risk is always highest at the 'front-end' of the product/process development pipeline. A higher percentage of projects will fail and a larger portfolio of projects is needed to assure positive ROI several years out, when surviving projects are reaching commercial deployment. It is therefore advisable that Federal investment should be made within the first several years of Institute existence in TRL 1-3 research programs that will 'seed' the overall project portfolio. Again, this will reduce the 'carrying costs' of the inevitable projects that will fail in the early stages; thus allowing a self-sustaining business model to take hold as the Institute matures. This approach is reflected within our response to question 10; where we recommend that 20-40% of Federal support be designated for projects.

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

Each Institute should be expected to maintain business and R&D plans; these plans should include financial milestones reflecting the goal of self-sustaining operation at a defined point in time. Therefore, one measure of progress toward self-sustaining operation would be quarterly financials and business decisions showing actuals at or exceeding planned results. An additional metric could include monitoring net operating margin; looking for a trend toward, or exceeding, 'break even' (with AMNPO support excluded); concurrent with stable or increasing project backlog (reflecting increasing short and long-term commitment to the Institute by its industrial members and Federal clients).

Other measures to consider would be the number of members (increasing), types of members (increases in all categories), growth in non-Federally funded research, IP creation, IP revenue, project progress (minimum thresholds met for projects on a trajectory toward completion), and enrollment rates in educational and workforce development programs (increasing).

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

There are various mechanisms that can be implemented to cause and/or incentivize Institute members to initially deploy Institute IP and technical solutions into domestic facilities or domestically made products, while providing a pathway for global organizations to eventually leverage their investment into facilities world-wide. Examples of approaches that should be considered include:

- Licenses to Institute technology could be structured to permit deployment into U.S. facilities several years ahead of non-U.S. facilities. Optionally, the Institute might consider a premium license fee for immediate deployment to non-U.S. facilities, with the proceeds used to offer reduced fees for U.S. deployment by competing firms.
- Institute should only engage in manufacturing transition with U.S. facilities. As the new technology is integrated into these facilities, the member manufacturing personnel will gain sufficient familiarity to enable future deployment on their own into non-U.S. facilities. Thus a 'built-in' lead time in U.S. facilities is encouraged
- High quality Institute workforce development programs, and higher education of U.S. students, will improve the quality and relevance of a U.S. workforce. This in turn will be a

strong motivating factor for industrial partners to expand, or locate, manufacturing facilities in the U.S.

- Offer government incentives (ex. tax breaks) for implementation of Institute work products into U.S. manufacturing facilities or use within products made in the U.S.
- Provide mechanisms which ensure that manufacturing capabilities developed in the Institutes that are important for national security, both in technology and production capacity, retain a nonzero footprint in the US.

In general, Institutes should encourage involvement by multinational companies with few, but reasonable constraints. The great advantage for companies with a domestic presence will be proximity to the Institute facilities. The advantage to this proximity cannot be understated and will be a strong driver for the greatest rewards.

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

Institutes should have active programs to engage with other manufacturing related entities for the purpose of collaboratively mapping complementary strengths and implementing easy to use mechanisms for cross-utilizing capabilities. These collaborations should also provide the basis for a relationship framework that encourages regular interactions for benchmarking of best practices. It would be ideal if there were an entity responsible for oversight of the network of Institutes, with part of its mission including management and coordination of intra and inter-connections between the Institutes and related external entities.

Because of their manufacturing focus, Institutes should be expected to engage with state and regional MEPs; acting as technical and educational services when and where possible.

To the extent possible, Institutes should incorporate representation from manufacturing related programs and networks within their governance and advisory boards, and should solicit like positions for their key staff in such organizations. This is an important consideration that will elevate cross-fertilization of ideas above the level of day-to-day interactions on specific projects and programs.

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

Institute proposals should demonstrate how the business (i.e. market segment) and technical focus of the Institute will align with, and leverage, local and regional strengths. Such an analysis should be supported by commitments and data from local and regional economic development organizations.

Once established, Institutes should readily and actively engage with economic development authorities by participating in joint efforts to attract industry to the region, and service industry within the region, by demonstrating a successful track record of providing capability and expertise (ex. engineering services), training of a highly capable local workforce (including direct training of personnel within SMEs), and access to high-value, pooled R&D facilities that are complementary to, and likely more sophisticated than, the in-house capabilities of most prospective industrial partners.

State and local economic development authorities should work closely with Institutes in their region to promote support for the Institute in forms such as tax incentives and match funding from local governments.

A well designed Institute will be a beacon for community engagement by providing facilities and programs that excite and educate a broad range of the public about manufacturing and its importance to the U.S. economy and our future. Programming of this nature should be designed and conducted in partnership with economic development organizations in the region and will provide a further incentive for manufacturing concerns to locate facilities nearby.

Lastly, the Institutes should collaborate with economic development partners to contribute to job growth in those market sectors within the Institute's strategic focus.

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

It can be argued that the greatest threats to national security include a lopsided balance of trade and a rapid exodus of both manufacturing expertise and manufacturing tools themselves. The NNMI Institutes will be central to the development and deployment of a new generation of agile manufacturing processes and tools to enable expansion of local manufacturing for global impact. In this context, metrics that assess the success of deploying Institute innovation and technology in manufacturing environments will be important.

Creation of new companies, expansion of existing companies, and the creation and retention of jobs will have a positive influence on our national security and competitiveness. Measures of the relationship between Institute activities and work products and these desired outcomes would be beneficial.

Contributions of Institute IP to the U.S. portfolio of manufacturing innovation should be monitored and quantified. High-value IP that leads directly to U.S. deployed manufacturing solutions will have a positive impact on our competiveness and security.

<u>Education and Workforce Development</u>

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

Institutes should have an active plan for developing workforce at all levels (pre-college, 2-year, 4-year, and graduate student research levels), including provisions for appropriate in-house facilities, equipment, and staffing from inception. This will require an integrated approach involving both 2-year and 4-year institutions and, potentially, instructors at the high school level. The manufacturing workforce will require expertise at both the engineering and technician level. Universities are best suited to the training of advanced manufacturing engineers at the BS, MS, and PhD levels, and to assist instructors at the 2-year institutions to develop curricula for training a skilled technician work force. Special programs can also be developed to assist high school teachers in developing and teaching manufacturing-related content.

These must be vertically integrated such that students from one level are encouraged to move to the next. For example, the most talented students from 2-year programs would be encouraged to move on to 4-year institutions. High school graduate interested in advanced manufacturing would be encouraged to enroll in 2-year or 4-year institutions depending on student aptitude and capability.

In addition, the Institute must address the retraining of existing manufacturing personnel. This would be done by a combination of online courses and hands-on training at the NNMI facility.

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

The Institute would, by definition, be industry driven. Industry input would be sought regarding the development of advanced manufacturing curricula. It is anticipated that experts from industry would participate in education delivery, including invited lectures, seminars, plant tours, etc. Courses would be focused on problem solving and directly linked to the current and future needs of industry partners. Metrics could include number of students at various levels for which the Institute has played a direct educational role; enrollment and financial success of continuing education programs, etc.

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

No single NNMI site will be capable of meeting all the educational needs of advanced manufacturing in the US. Thus, a network (or networks) of education and workforce development programs must be established that leverage the strengths of other NNMI sites. At its core, this would constitute an online offering of courses that would be available to NNMI member organizations. Each NNMI site would identify courses that were relevant to its specific mission (additive manufacturing, advanced materials, precision forming, robotics, sensors, etc.) and would make these available to others in the NNMI network. The organization and coordination of such a network would need to be centralized and reciprocity agreements would have to be established (mandated) among the various NNMI sites. Central management and coordination of these educational and workforce programs would improve the effectiveness and efficiency of these elements.

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

Performance can be gaged directly by feedback from the target audience and their ability to obtain/retain a job in manufacturing and/or progress in their career. The best feedback will come from the workforce retraining component of the program. These individuals, and their employers, will know if the education they received has benefited them and their feedback will help to shape future educational programs. Another measure of success will be the ability of students from 2-year and 4-year institutions to obtain quality, salary-competitive jobs in the manufacturing workforce. Industry interest in hiring students trained through these educational programs is a direct indicator of the program being on target.

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

The NNMI concept provides the ideal opportunity to accomplish the integration of R&D and education, and therefore should have a specific mission to do so. Since NNMIs are envisioned as physical sites with specific laboratory capabilities, students in these programs will have direct access to equipment and technology during the course of their education. For on-campus students, this will include direct involvement in combined research and graduate education programs that are conducted as part of the Institute's core competency. At the 4-year level, engineering capstone design projects can be supported though the Institute. This provides the students direct contact with industrial sponsors while working on projects that are relevant to those sponsors. It is anticipated that graduate students will also participate in these projects as part of their thesis/dissertation work.

With regard to retraining the existing workforce, the Institute would provide opportunities for short term internships (3-6 months) that would allow onsite access to NNMI facilities. In most cases, these students would be working on projects directly funded by their own employer. This will create an environment where industry can more quickly evolve their engineering workforce through direct interaction with faculty and staff of the NNMI.

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