Flexible Hybrid Electronics Manufacturing Innovation (FHEMI) Institute

Frequently Asked Questions:

1. **When and how will the competition for the Institute be announced?**
   - The DoD will release a formal solicitation approximately 45-60 days after the initial announcement of the institute topic. The announcement will be available on grants.gov and be further publicized at manufacturing.gov, which acts as the primary communications portal for all manufacturing institute news.
   - The DoD will also hold a proposers’ day during the open period of the competition, featuring presentations by the Institute program manager, chief technology officer, and the grants officer.

2. **How much federal funding will go into this new institute?**
   - The institute’s federal funding contribution will be about $75 million across the five years of the cooperative agreement period of performance. Consistent with the President’s broader proposal, the Institute will be supported with federal funding through the start-up and initial operational phases, after which they are expected to become fiscally self-sustaining.
   - This Institute for Manufacturing Innovation solicitation will require that applicants match the federal investment on no less than a 1:1 basis.

3. **What will the Flexible Hybrid Electronics Manufacturing Innovation Institute focus on?**
   - This institute will enable a complete end-to-end domestic innovation ‘ecosystem,’ containing design, packaging, assembly and test automation research and workforce development capabilities which can be accessed by small, medium and large companies as well as academic institutes. The institute will invest in prototyping and scale up of production processes such as high speed pick-and-place, printed circuits and sensors, additive power sources and hybrid fabrication of thinned silicon CMOS chips. Scale up and standardization of FHE materials such as conductive inks, flexible sensors and substrates, and interconnect adhesives will be key focus areas. Proven manufacturing capabilities will enable defense and commercial applications in wearable electronics, unattended sensors, medical prosthetics / neuro-synthetic devices, and the continuous improvement in SWAPC (Size, Weight And Power plus Cost) for electronic systems. Additionally the IMI will provide leadership in manufacturing experiences and education that will accelerate workforce development, promoting industry growth and employment. This IMI will bring government, industry and academia together with the goal of organizing the currently fragmented U.S. research and development activities in flexible hybrid electronics technology and better position the U.S. relative to global competition.

4. **What are flexible hybrid electronics?**
   - Flexible Hybrid Electronics combine advanced electronic materials that flex with thinned silicon chips to produce integrated products that better fit the form and function of our world. We use the term flexible hybrid to describe the technology due to the integration of “flexible” electronic materials which bend and stretch with traditional silicon chips for processing power to produce “hybrid” devices, which are flexible but intelligent. Flexible Hybrid Electronics is enabled through innovative manufacturing processes and fabrication that preserve the full operation of electronic devices on flexible circuit boards that can be attached to the outer body of airplanes, folded into the tight spaces of our personal devices, or even stuck on our bodies as a smart bandage. These flexible products could include integrated components like communications, sensors, power, and of course processors to provide the higher level functions.
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5. What markets will use flexible hybrid electronics and what is the economic potential?
   - Flexible hybrid electronic applications are in several market segments, including wearable technology. Some industry experts estimate between $15-$60B over the next ten years; medical devices, which had a market of $6.3B in 2013; and the internet of things, which is projected to grow from $2B to $17.6B by 2020.
   - The primary commercial implementation of flexible hybrid electronics manufacturing technologies will be within the electronics manufacturing services sector, which totaled $400B in global revenue for 2013. The United States leads the world in electronic design capabilities, and these companies need access to design rules and standardized tools for materials and manufacturing processes. Scale-up and maturation of emerging flexible hybrid technologies within the Institute using end-to-end demonstration facilities will allow the U.S. to quickly innovate in product design and gain competitiveness.

6. What are the benefits to the Department of Defense?
   - For the nation’s warfighters, these new, innovative families of conformal and durable electronics will break the pattern of “militarizing” standard electronics with heavy, bulky enclosures and enhance their combat effectiveness in manifold ways. For example, intelligent bandages and smart clothing will alert soldiers to first signs of injury or exhaustion; structural integrity sensors will offer real-time damage assessment for helicopters or aircraft after engagement; and small, unattended sensors will give soldiers greater situational awareness.
   - More generally, defense applications for flexible hybrid electronics will provide several key benefits for system developers. The primary benefit will be the capability to physically match the shape and characteristics of an object to provide novel and critical mission performance. Examples would include structural sensors, conformal antenna arrays, or medical monitors. Additional benefits include reduction in size, weight and power for electronics, increased durability, the ability to design electronics into systems outside traditional space limitations, and integration of multiple functions on a single platform – such as chemical sensors, power sources and WiFi communications.

7. With declining budgets, can DoD afford to use its resources to establish these institutes?
   - Yes, this is a matter of funding our highest defense and national priorities. The DoD is already investing in critical additive manufacturing, lightweight and modern metals manufacturing, digital manufacturing and design, and integrated photonics needs. Engaging in sustainable public-private partnerships that build strong innovation capacity around these manufacturing technologies is our chosen investment strategy. We know that defense requirements alone are often insufficient to underpin the development, growth and sustainment of emerging industries needed to produce leading edge defense systems. We need a vibrant domestic commercial base in these areas as well, and these public-private manufacturing partnerships will provide that capability. We also leverage other planned federal investments in these technologies.

8. What happens after the five years of federal funding and the Cooperative Agreement is concluded? What will be the government role be at that time?
   - While the Cooperative Agreement concludes at the end of the five years, the government hopes to continue to be a customer of the Institute. This could include specific project funding applied to the institute from a variety of federal agencies.
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9. What is the length of the Cooperative Agreement for each DoD-led institute?
   • The Cooperative Agreement for the Institute will be for a period of five years.

10. What will be the role of the DoD in the management of the Institutes?
    • The Department’s overarching roles are to stand-up individual Institutes through federal acquisitions (including the provisioning of federal funding) and provide oversight and stewardship of federal funds. DoD will also contribute technical advice and assistance through participation on an advisory board. Each Institute will have substantial autonomy from its partner organizations and institutions and will have an independent fiduciary board of directors predominantly composed of industry representatives. An Institute leader such as an executive director will be in charge of day-to-day operations.

11. Who will lead the institute?
    • The FHEMI Institute will be overseen by the Office of the Secretary of Defense (OSD). As was the case with the existing DOD-led Institutes, OSD will delegate program management and grants office functions to a lead service or agency.
    • Component and interagency partners support the technical advisory board of this Institute. This board will be solicited through and supported by a joint-service, interagency group composed of members from contributing agencies.

12. What would be the proportion of workforce training and development in the total activity of an institute?
    • Though the proportion is not fixed, Institutes for Manufacturing Innovation will provide educational opportunities to improve and expand the manufacturing workforce, including K-12 programs, internship opportunities, skills certification, community college engagement, university collaboration, graduate studies, post-doctoral studies, and retraining to meet the requirements set forth by each institute’s mission.
    • Each institute should have a plan to be self-sustaining based on diverse funding sources beginning at Institute formation, and be fully independent of IMI funds five years after launch. Institutes will have the flexibility to pursue sustainable Institute revenue from a variety of sources, including revenue generated by various forms of workforce training.

13. Will all the Institutes for Manufacturing Innovation be networked and, if so, how?
    • The agreements signed by each Institute include a requirement to support an effort to form a Pilot Network for Manufacturing Innovation, initially involving the established DoD and DOE-led Manufacturing Innovation Institutes. The Pilot Network is a non-binding partnership initially comprised of: the funded institutes; the funding agencies supporting each Institute; and other invited federal agencies that are leading efforts in advanced manufacturing innovation. During the course of this agreement, the Pilot Network may grow as new institutes are established. The purpose of this interaction is to share best practices, engage in a dialogue about leveraging common Institute activities, and develop common practices across all institutes.

14. Is the Institute open to foreign companies?
    • These institutes are designed to provide an opportunity for U.S. companies to be more competitive in the international arena. Domestic companies are eligible to participate as well as all companies with substantial manufacturing operations in the U.S.
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15. Can other companies/universities/organizations join one of the DoD Institutes after award? If so, how does one become a member?
   • Yes, others can join after award. While membership approaches vary between institutes, in general, membership is open to organizations with an interest in flexible hybrid electronics. Interested organizations should contact the Institute after the completion of the grant process.

16. Do other countries have similar programs?
   • Many countries have active programs designed to inspire innovation and improve manufacturing. Germany has Fraunhofer Gesellschaft, the United Kingdom has Catapult, France has Carnot, Taiwan has the Industrial Technology Research Institute, Canada has the Industrial Research Assistance Program, and Belgium has IMEC.

17. How will this Institute for Manufacturing Innovation differ from the German Fraunhofer model?
   • The Institute for Manufacturing Innovation has a number of objectives, including the following: forging domestic companies into stronger competitors in the international market; improving the manufacturing landscape in the US; and positively impacting domestic employment. Fraunhofer in Germany has similar objectives, but it consists of a single body running and overseeing 80 institutes world-wide, with 60 in Germany. Each of our Institutes for Manufacturing Innovation is run independently by an industry- academia-government consortium.
   • By German law, the German government provides one-third of the total budget of the Fraunhofer Institutes every year. In our case, federal funding phases out after five years.

18. Is this activity more aligned to the mission of the Department of Commerce?
   • In fact, the Administration envisions the Department of Commerce (DOC) as the agency in charge of the broader IMI initiative. The DoD and DOE have worked closely with the DoC every step of the way: by developing the initial IMI blueprint document, creating the Advanced Manufacturing National Program Office housed in the National Institute of Standards and Technology (NIST), and informing DOC about our DoD-led institute stand-up activities. The bipartisan, bi-cameral legislation entitled the “Revitalize American Manufacturing and Innovation (RAMI) Act of 2013” will provide a $300 million fund for NIST within Department of Commerce in order to grow the network of Manufacturing Innovation Institutes.

19. Will this institute create new jobs?
   • The institute will help develop the ability, skills and knowledge it takes to make 21st-century commercial and defense products, given that they are imperative in our nation’s security, safety, and prosperity. As existing companies and new companies deploy this knowledge they will create jobs to produce products that can compete in the global market place.