EBRC Engineering Biology Research Consortium

Request for Information on Key Technology Focus Areas for the National Science Foundation's Directorate for Technology, Innovation and Partnerships

Response to 2025-11374 (90 FR 26330)

1. **Considering how each of the key technology focus areas listed above contributes to America's global technological leadership and drive economic growth and national security:**
    a. **Which, if any, technology areas currently included in the list should be revised or refined to better reflect the scope of a technology area critical to U.S. competitiveness? Please include the rationale and suggested revision.**
    b. **Which, if any, technology areas currently included in the list are no longer critical for U.S. technological competitiveness and why?**
    c. **What, if any, technology areas not currently included in the list are critical for U.S. technological competitiveness and should be added to the list? Why?**

Response 1.a. We recommend revising the key technological area 7 to: "*Biotechnology and engineering biology*". This refinement is inclusive, capturing the full scope of this area's contribution to U.S. competitiveness. Calling out two particular biotechnology applications, "medical technology, genomics", is constraining, implying that this area contributes selectively to biomedical research and health, whereas this technological area contributes more powerfully as a general-purpose technology that can drive national and economic security across application domains. Additionally, we recommend replacing "synthetic biology" with "engineering biology", aligning with terminology adopted by Congress and executive agencies, and more accurately reflecting the integrated, design-based nature of modern biological R&D.

Response 1.b. We do not recommend removing any of the existing key technology areas. Each remains essential to U.S. technological competitiveness and contributes to a broader innovation ecosystem that supports economic growth and national security. Maintaining a full spectrum of technology areas enables the U.S. to adapt to shifts in global dynamics and ensure long-term leadership.

Response 1.c. While we do not recommend adding new technology areas at this time, we encourage NSF to emphasize the importance of convergence across existing areas, particularly the integration of engineering biology with AI, data infrastructure, and advanced manufacturing. As underscored by the bipartisan National Security Commission on Emerging Biotechnology (NSCEB), leadership in biotechnology increasingly depends on the ability to combine capabilities across domains to accelerate innovation, scale production, and secure critical infrastructure. Enabling such integration strengthens U.S. competitiveness without diffusing focus.

2. **Among the 10 key technology focus areas listed above and any proposed additional areas pursuant to 1.c., what are the three most important based on each of the following considerations? Please list three technology areas for each category and include a short rationale.**
    a. **Geopolitical technology competition.**
    b. **Potential to power significant economic growth.**
    c. **Ability to advance national security capabilities.**
    d. **Likelihood to experience significant talent gaps or workforce availability risks.**
    e. **The need for use-inspired and translational research to mature the technology.**

Biotechnology and engineering biology are central to U.S. competitiveness, economic growth, and national security. While EBRC's domain expertise lies in biotechnology, we emphasize the importance of integrating advancements in the other key technology focus areas, particularly, AI/ML, HPC & semiconductors and quantum, with biotechnology, so as to achieve its greatest potential.

Response 2.a. The NSCEB's April 2025 final report identifies biotechnology as a strategic domain where the U.S. must act urgently to maintain global leadership. While China is integrating biotechnology into its Military-Civil Fusion strategy and rapidly expanding its capabilities in areas including genomics and biomanufacturing, the US lacks a coordinated national action plan. To maintain global competitiveness and leadership among countries prioritizing biotechnology, the U.S. must invest in infrastructure, standards, and a coordinated strategy.

Response 2.b. Engineering biology is a general-purpose technology with wide-ranging applications and economic potential. Support for biotechnology can enable advancements across materials, agriculture, health, energy, and industrial uses (including biomanufacturing, biomining, and environmental cleanup). These innovations lay the foundation for long-term economic growth and resilient supply chains.

Response 2.c. Biotechnology enables on-demand production of medical countermeasures (such as vaccines and blood replacements), food (including crop resilience and pathogen resistance), and fuel in austere settings, while also enhancing biosurveillance and threat detection. The NSCEB report rightfully underscores biomanufacturing as a strategic defense capability and calls for its deeper integration into national security strategy. Biotechnology strengthens deterrence, logistics, and preparedness across the defense enterprise. Along with shoring up semiconductor development and manufacturing and securing AI, biotechnology is a critical area for U.S. resilience and operational advantage.

Response 2.d. The U.S. faces significant bioliteracy and workforce gaps, particularly outside coastal innovation hubs. Biotechnology education and training programs remain fragmented, not well-integrated with industry, and undersized. As biotechnology further incorporates computation and automation, the workforce will need multidisciplinary education and training. National investment in workforce retraining, vocational pipelines, and public bioliteracy is essential to scaling capacity.

Response 2.e. Engineering biology has driven major advancements in foundational knowledge and in the capabilities enabled by its tools for basic research, science, and engineering. The field is ripe for driving economic growth through use-inspired and translational research, but faces persistent barriers to scale and widespread application. Enabling the maturation of biotechnologies through investment in translational research, testbeds, and infrastructure will significantly impact national and economic security by providing more affordable, sustainable, and resilient materials and practices in agriculture and food production, chemicals and fuels, and medical devices and pharmaceuticals.

About the Engineering Biology Research Consortium (EBRC)

The Engineering Biology Research Consortium (EBRC) is a nonprofit, public-private partnership that brings together scientists, engineers, and industry leaders to advance the field of engineering biology to address national and global needs. EBRC's members include experts from over 90 universities and research institutes, alongside leaders from more than 20 companies, philanthropies, and other organizations. Working closely with partners across the engineering biology ecosystem, EBRC focuses on four key areas: Research Roadmapping, Policy & International Engagement, Education, and Security.