



Department of Energy  
Office of Science  
Washington, DC 20585

Office of the Director

November 16, 2023

Professor Anne White  
Associate Provost and Associate Vice President for Research Administration  
School of Engineering Distinguished Professor of Engineering  
Department of Nuclear Science and Engineering  
Massachusetts Institute of Technology  
77 Massachusetts Avenue, 24-107  
Cambridge, Massachusetts 02139

Dear Professor White:

The 2020 report of the Fusion Energy Sciences Advisory Committee (FESAC) Long-Range Plan (LRP) “Powering the Future: Fusion & Plasmas” states in its Executive Summary that “*Now is the time to move aggressively toward the deployment of fusion energy which could substantially power modern society while mitigating climate change.*” In addition, the same report states, “*Fulfilling the [fusion] energy mission demands a shift in the balance of research toward FM&T (Fusion Materials and Technology), which connects the three science drivers: Sustain a Burning Plasma, Engineer for Extreme Conditions, and Harness Fusion Energy.*” Furthermore, a key recommendation in the 2021 Consensus Study Report of the National Academies of Sciences, Engineering, and Medicine (NASEM) “Bringing Fusion to the U.S. Grid” was that “*For the United States to be a leader in fusion and to make an impact on the transition to a low-carbon emission electrical system by 2050, the Department of Energy and the private sector should produce net electricity in a fusion pilot plant in the United States in the 2035-2040 timeframe.*” The recommendations in these reports, which reflected the tremendous progress in fusion science and technology over the last decades as well as the rapid growth and significant investments of the private sector in fusion, contributed to the Administration’s recognition of the potential of fusion energy to advance the goal to get to net-zero emissions by 2050.

In March 2022, the White House Office of Science and Technology Policy and the Department of Energy co-hosted a summit on *Developing a Bold Decadal Vision for Commercial Fusion Energy*, which called for accelerating the viability of commercial fusion energy in partnership with the private sector. As a first major step in achieving the Bold Decadal Vision (BDV), the Fusion Energy Sciences (FES) program issued a Funding Opportunity Announcement (FOA), “Milestone-Based Fusion Development Program”, to accelerate the development of a fusion pilot plant (FPP) by working with private industry. This initiative is also consistent with the Energy Act of 2020, which expanded the scientific mission of FES with supporting “*the development of a competitive fusion power industry in the U.S.*”

The private sector responded enthusiastically to this FOA, and in May 2023, FES announced \$46 million in awards to eight fusion startup companies. The Office of Fusion Energy Sciences (FES) budget request for fiscal year (FY) 2024 includes additional support for the BDV, specifically enhanced support for the Milestone Program, the establishment of fusion research and development (R&D) centers to resolve critical science and technology gaps, and support for future facilities studies including a fusion prototypic neutron source.

The BDV builds upon the FESAC LRP and the NASEM report and accelerates the timeline to an FPP. The FESAC LRP and the American Physical Society/Division of Plasma Physics (APS/DPP) Community Planning Process provided important community input on prioritization among various FES program elements. Given recent developments, it is necessary to re-assess the alignment of the FES program with the FESAC LRP and the expanded mission of the FES program in addressing the BDV in a decadal timeframe. Namely, what new opportunities exist for accelerating fusion energy development and what are some unique synergistic opportunities with discovery plasma science and technology.

We are therefore asking FESAC to form a subcommittee to re-assess the program elements and their alignment with the FESAC LRP science drivers and the BDV, within the four major categories of the FES budget structure: Burning Plasma Science: Foundations (which includes Advanced Tokamak, Spherical Tokamak, Theory & Simulation, Public-Private Partnerships, and Inertial Fusion Energy); Burning Plasma Science: Long Pulse (which includes the FES international collaborations under Long Pulse: Tokamak, international collaborations and domestic efforts under Long Pulse: Stellarators, and Materials & Fusion Nuclear Science); Burning Plasma Science: High Power (which includes ITER Research); and Discovery Plasma Science (which includes General Plasma Science, High-Energy Density Laboratory Plasmas, and Measurement Innovation). The subcommittee should represent diversity in experiences and perspectives, especially as relates to the private sector engagement requirements to achieve the goals of the BDV.

The following program elements will not be part of the requested assessment: United States (U.S) Contributions to ITER project, Artificial Intelligence/Machine Learning, Material Plasma Exposure eXperiment project, Matter in Extreme Conditions – Upgrade project, Quantum Information Science, Advanced Microelectronics, Advanced Manufacturing, Reaching a New Energy Science Workforce, Funding for Accelerated Inclusive Research, Accelerate Innovations in Emerging Technologies (Accelerate), Established Program to Stimulate Competitive Research, General Plant Projects/General Purpose Equipment/Infrastructure, and Other Research.

For each program element in each category, identify opportunities or current plans to contribute to the FESAC LRP FM&T and fusion plasma science gaps establishing the basis of an FPP in the context of the BDV, taking into consideration the diversity in FPP concepts represented in the Milestone Program awardees. In particular, identify a scope that will address near-term scientific and technological gaps impacting the design and

construction of an FPP on the pathway to commercialization within the timeframe of the BDV. For the scope within a program element that is not identified as critical to support the LRP Science Drivers or the BDV, identify specific elements that can be deferred with minimal or modest impact on the FES Program to enable redirection in support of the LRP FM&T gaps and the BDV. Identify the program elements that need to be increased to meet the goals of the LRP FM&T gaps establishing the basis of an FPP in the context of the BDV and those that can be decreased. In addition, the subcommittee should identify the role of the public sector and the FES user facilities (National Spherical Torus Experiment - Upgrade and Doublet III) in addressing the FM&T gaps and advancing commercial fusion applications going forward. Throughout the process, please take the full FESAC LRP into account and consider sustainable support for foundational research as synergies between discovery plasma science and fusion energy development (e.g., spin-off plasma technology applications from fusion) are valued.

In your deliberations, you should consider the impact of your recommendations on workforce continuity, diversity of the workforce, and continuing U.S. leadership in fusion and plasma science. Your assessment should be informed by the APS/DPP Community Planning Process report, FESAC LRP, NASEM report, objectives of the Administration's BDV, and recent workshop reports and community reports. We would appreciate receiving a final written report from FESAC by Fall 2024.

Please contact Dr. Jean Paul Allain, Associate Director for Fusion Energy Sciences, if there is anything we can do to help you in this process.

I appreciate FESAC's willingness to undertake this important activity.

Sincerely,



Asmeret Asefaw Berhe  
Director, Office of Science