

POSITION STATEMENT

Fusion Energy

*Approved by IEEE-USA
Board of Directors (November 21, 2025)*

Achievement of controlled fusion will offer a sustainable and proliferation-free source of energy for the future. Fuel material is widely available, and control of the process is inherently safe. The goal of fusion is to provide humanity with an inexhaustible supply of energy and a stable global environment. Fusion is intrinsically compatible with other energy sources and can provide a reliable, dispatchable power source. IEEE-USA supports continued U.S. fusion energy research to capture these benefits and commercialize the technology.

IEEE-USA Recommends:

- **Expansion of the U.S. government-funded fusion science program:** Basic research in fusion-related science issues continues to be a priority. This will be a critical step towards commercially viable fusion energy and reinvigorate the domestic fusion supply chain.
- **Supporting public-private partnerships to accelerate the development of fusion energy:** Some of the strongest private fusion companies are in the U.S., and they can provide access to unique facilities.
- **Support of ITER as a full partner via U.S. Department of Energy (DOE):** Support should include both funding and commitment of U.S. expertise and support for use of ITER as a scientific instrument during the operations phase, to take advantage of the significant international investments in this critical facility.
- **Maintenance of a vigorous and stable domestic program, including magnetic and inertial fusion:** This includes consideration of new research facilities, to address physics and technology topics beyond the scope of ITER and private companies, but aligned with technology maturation pathways being laid out in the ongoing DOE Fusion Energy Sciences (FES) road mapping efforts. A robust domestic program is critical to attract a new generation of talented scientists and engineers to the US fusion workforce. Such a program, coordinated by DOE, should involve national laboratories, universities, and, where appropriate, industrial partners.

Background

Considering the timescale for commercialization, the concurrent evolution of enabling technologies, and the sweeping changes in the worldwide energy picture that will take place in the 21st century, the economic competitiveness of fusion is likely to improve. Recent advances in superconductor technology by a combined academic and private team serve as an example of improved economics enabled by a technology innovation coupled to decades of fusion science research.

There has been significant progress in fusion in recent years, including: the aforementioned magnet technology, nearly \$8.9B invested in private fusion companies, the first laboratory burning plasma at the NIF, and the steady progress of construction at ITER. The Joint European Taurus (JET) doubled previous records for heat energy, and CEA's WEST facility has informed a design for DEMO, a 2 GW demonstration power plant with construction planned for 2040.

Recently announced in June 2024, the DOE has a Bold Decadal Vision for Commercial Fusion Energy.¹ This vision captures the strategy for accelerating commercial fusion energy in partnership with the private sector. In support of this strategy, the DOE announced a \$180 million funding opportunity for Fusion Innovative Research Engine (FIRE) collaborations. Eight organizations were selected for a milestone-based fusion development program, which catalyzes further private investment in fusion. The decadal vision also includes an RFI on a Public-Private Consortium Framework (PPCF). This Bold Decadal Vision prioritizes fusion as a cornerstone development area for U.S. energy dominance, and IEEE is fully supportive of the strategy for Fusion commercialization.

Using the currently projected reactions, fuel supplies are expected to be nearly limitless and will not be geographically limited. Byproducts from operations are unlikely to pose problems and may have positive value. Waste disposal issues may arise with plant structural items, but probably no more so than with fission reactors.

A balanced combination of domestic and international fusion research, including working with private fusion companies, is the most effective means to advance the fusion program and promote U.S. interests. While the U.S. needs to continue to participate in ITER, an ongoing international collaboration to demonstrate the scientific and technological feasibility of fusion energy, a committed and robust domestic

¹ <https://www.energy.gov/articles/doe-announces-new-decadal-fusion-energy-strategy>

research program is also essential to ensure that the U.S. is prepared to compete as a major supplier of fusion power reactors as the technology matures into a commercial energy source. This approach ensures that the U.S. is well-positioned to play a significant role, while reaping substantial benefits from the wide-ranging technological advancements and the overall benefits of fusion development and global scientific cooperation. This is consistent with a recent recommendation from the National Academies of Science.²

Domestic: A vigorous U.S. domestic program is essential to capture and leverage the benefits of prior investments through strong, continuing involvement in fusion physics and expansion into fusion technology. Strong support of existing and new DOE experimental facilities in the U.S., as well as private sector fusion energy ventures, will ensure continuity and inflow of the requisite scientific and engineering workforce. Opportunities exist for the U.S. to take on leadership roles in key developmental areas, as well as alternative and/or enabling concepts that may optimize the fusion energy system. Domestic facilities should be considered to facilitate technical progress in these areas and enhance U.S. leadership. A vibrant and vigorous domestic fusion industry will require a stable, long-term commitment of qualified personnel, facilities, and funding to develop the technology. Thus, it is critical that government funding supporting R&D workforce development at universities and national laboratories is stable, if not growing, to meet increasing demands. Large projects, such as fusion energy development and demonstration, require new funding mechanisms and a more long-range perspective. Successful programs in other areas, such as the NASA Commercial Orbital Transport Services, should be used as examples for fusion energy.

International: The ITER³ project, initiated in 1988, is an international effort with the mission to demonstrate the scientific and technological feasibility of fusion energy. Involving seven members, comprising 35 nations, the project is the culmination of worldwide efforts to establish the large-scale production of fusion power in the late 2030s. While there are private domestic plans for burning plasma in the mid-2020s by private entities, ITER will still explore new frontiers of science and technology and demonstrate the ability of a complex international organization to cooperate on a large-scale project at a global level. Adequate funding for the U.S. contribution to ITER is requisite to the project's ability to complete construction and begin operations on schedule. The present fusion knowledge base, which has led the world fusion community to proceed with ITER and enable many private fusion companies, derives significantly from past decades of fruitful U.S. research and development by a highly productive and innovative U.S. scientific and engineering workforce. Other nations with

² National Academies of Sciences, Engineering, and Medicine. 2021. Bringing Fusion to the U.S. Grid. Washington, DC: The National Academies Press.

<https://nap.nationalacademies.org/catalog/25991/bringing-fusion-to-the-us-grid>

³ <https://www.iter.org>

established and emerging fusion programs, in particular China, the U.K., and Korea, are rapidly expanding their own domestic programs and workforces. Now is the time to reinvigorate the U.S. fusion program to ensure leadership as this important technology matures and comes into commercial use.

This statement was developed by the IEEE-USA Energy Policy Committee and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. IEEE-USA advances the public good and promotes the careers and public policy interests of the nearly 160,000 engineering, computing and allied professionals who are U.S. members of the IEEE. The positions taken by IEEE-USA do not necessarily reflect the views of IEEE, or its other organizational units.