



U.S. DEPARTMENT OF
ENERGY

DOE's Vision for Commercial Fusion Energy

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Overview of recent developments in fusion

- Fusion is potentially a globally scalable, firm, carbon-free energy source that can help the U.S. and the world reach sustainable net-zero
- Recently, the U.S. has been forging a changing fusion R&D landscape, enabled by decades of public investments
 - Major scientific and technology advances, and dramatic growth of private investments
 - Demands an accelerated strategy for fusion RD&D both to maintain US leadership and to contribute to net-zero goals
- White House Fusion Summit (March 17, 2022) signaled ambition to realize a fusion pilot plant (FPP) on a decadal timescale by partnering with the private sector
 - Informed by National Academies report *Bringing Fusion to the U.S. Grid* (2021) and FESAC Long Range Plan (2021)
 - Recognized public-private partnerships (PPP) as the key opportunity to accelerate fusion RD&D
 - Secretary of Energy announced new DOE fusion crosscut initiative to develop “all-of-DOE” fusion energy strategy
- We are moving ahead aggressively
 - FOA released to start a milestone-based fusion development PPP program

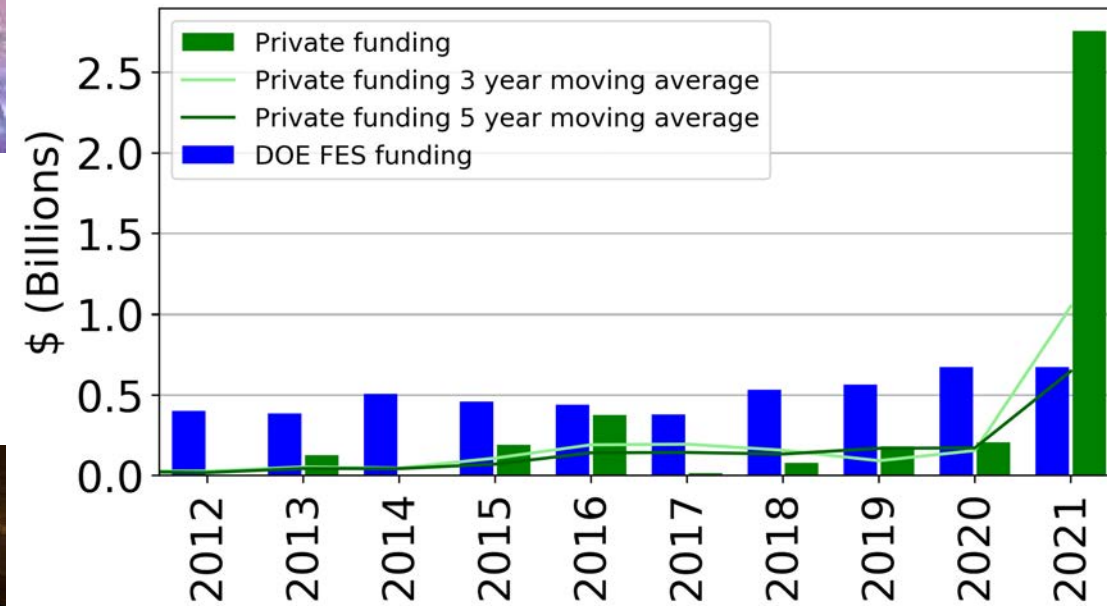
U.S. is forging a changed fusion landscape, offering a new opportunity and warranting a new fusion RD&D strategy



First ITER central-solenoid magnet module constructed by General Atomics and delivered by ORNL/USIPO



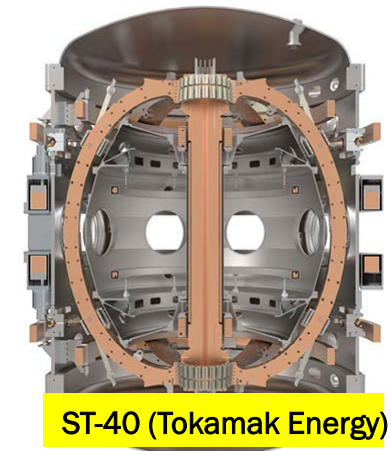
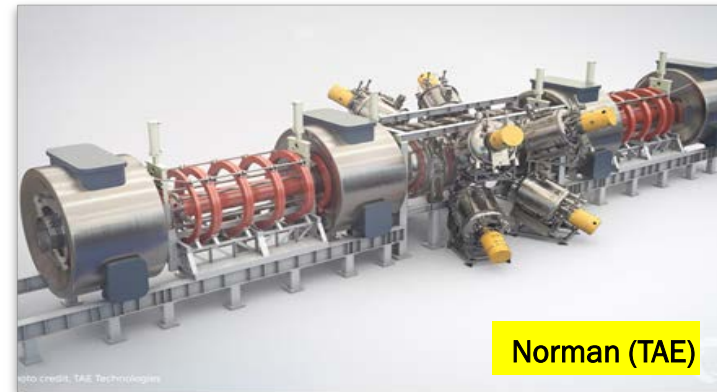
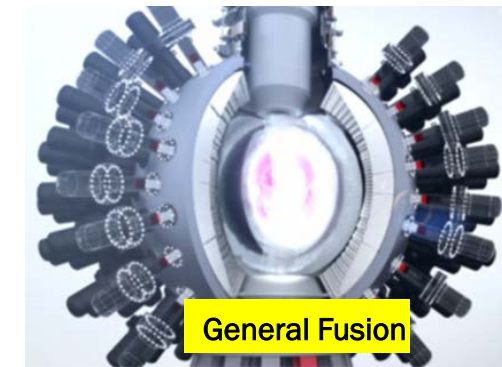
20-T magnet demonstration by Commonwealth Fusion Systems



Growth of private-sector fusion investment

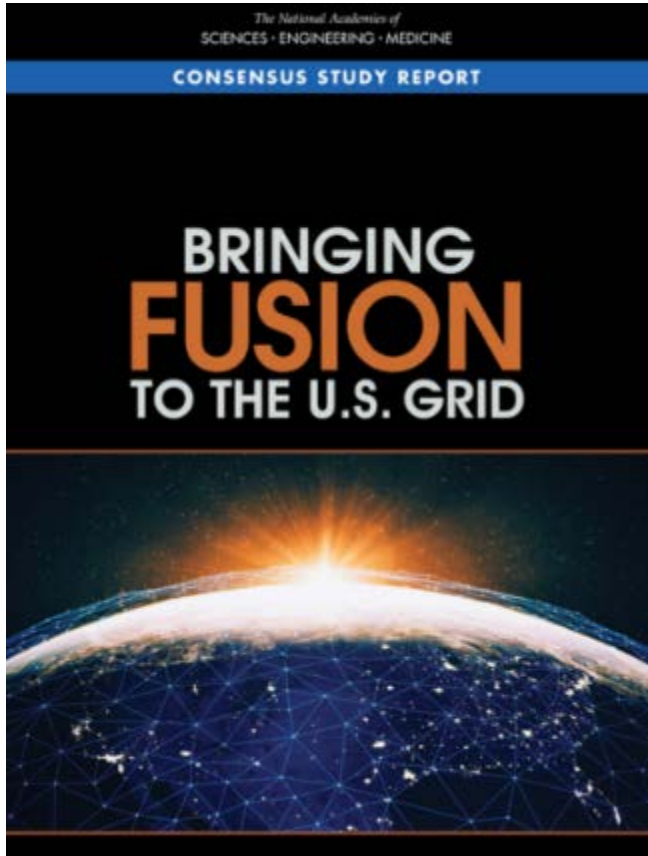
Fusion companies have raised >\$5B of private capital

Fusion Industry Association formed in 2018,
now with 29 member companies



- Pursuing diverse number of fusion approaches and fuel cycles
 - The regulatory framework should be flexible enough to address a broad range of fusion concepts/approaches and fuel cycles
- Now building the largest new fusion experiments in the US

Key (abbreviated) recommendations from NASEM report *Bringing Fusion to the U.S. Grid (2021)*



- To ensure US leadership and impact the transition to net-zero by 2050, DOE and the private sector should demonstrate net electricity in a fusion pilot plant in the 2035–2040 timeframe
 - White House Summit declared ambition to accelerate this to the early 2030s
- DOE should move forward now via public-private partnerships to develop and bring fusion to commercial viability
 - First step is a milestone-based fusion-development program
- Urgent investments by DOE and private industry are needed to resolve the remaining S&T issues to realize a fusion pilot plant
 - We are working to build support for the needed resources

Demonstration of safe operation of the fusion pilot plant is one of its most important goals.

- **DOE will support the NRC in developing a risk-appropriate fusion regulatory framework that provides regulatory certainty and...**
 - Ensures public safety
 - Enables investor/developer confidence by minimizing unnecessary regulatory burden [2021 NASEM report]
 - Addresses equity, energy-justice, and environmental concerns
- **Fusion is fundamentally different than fission**
 - No special nuclear materials and no concerns about criticality
 - Therefore, 10 CFR Part 50, which is tailored to fission power reactors, is not well suited to fusion technology [2021 NASEM report]
- **Tritium dominates the source term, and mitigation of tritium release is key**
 - Experience from TFTR, JET, NIF, and ITER can be leveraged