A Cutting-Edge Research Platform Developing Solutions Needed for Fusion Energy Commercialization

Fusion, the process that powers the stars, involves two hydrogen atoms combining to form a single helium atom. This chemical reaction releases energy, and scientists and engineers are working to harness this process to create a nearly limitless clean energy source for humanity.

On Earth, plasma formed from hydrogen gas can be magnetically "bottled" in a device called a tokamak to sustain fusion reactions. Tokamaks are currently used for research and development, but many future fusion power plant designs based on the tokamak are being developed by the growing fusion industry.

The DIII-D National Fusion Facility hosts a tokamak-based fusion research and engineering program executed by a multidisciplinary team from institutions around the world. The mission of this program is to identify and develop the solutions needed to address key remaining fusion science and technology challenges for fusion energy generation. The world-leading flexibility and diagnostic coverage of the DIII-D tokamak provide ***a platform to investigate multiple approaches for fusion***, as well as test the materials and technology needed for future fusion power plants.

DIII-D
NATIONAL FUSION FACILITY

DIII-D National Fusion Facility

World-Leading Fusion Research and Development Executed by a Multidisciplinary Team of International Experts

- Scientists, engineers, technicians, and students from academia, industry, and national research institutions from around the world
- Growing industry base enabled by new rapid user agreement process allowing participation in program activities in as little as one day
- Highly productive research program producing peer-reviewed publications in top-tier journals and invited talks at major conferences, as well as useful insights and data for the continued refinement of fusion power plant designs

Research team conducting an experiment at DIII-D

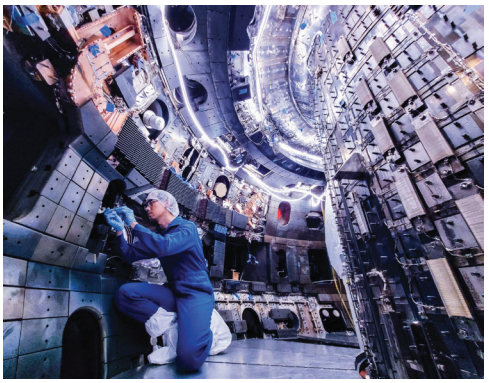
Participants in undergraduate and graduate internship programs

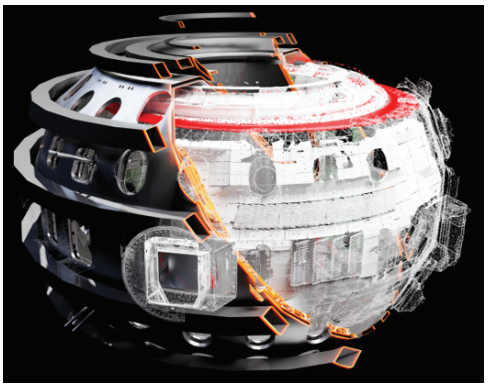
Building the Fusion Workforce of the Future

- Dedicated student experiment time ensures that graduate students gain the experience necessary to develop and execute a research project
- Proud participant in several STEM internship programs, including the U.S. Dept. of Energy SULI and CCI programs
- Collaborations supporting undergraduate engineering capstone projects

Providing a "Wind Tunnel" for Fusion Commercialization

- Regular upgrades to the machine and facility provide continuous evolution to meet the most critical needs of the fusion community and industry
- World-class diagnostics and machine flexibility allow rigorous testing of unique designs and components across multiple approaches for fusion
- Test platform for developing and demonstrating reactor-specific plasma control scenarios and algorithms
- Reactor-relevant plasma environment for testing and qualification of plasma-facing components and reactor materials independent of reactor design approach
- Development and testing of diagnostics and actuators for use in commercial reactors
- Extensive data archive for machine learning and artificial intelligence training as well as digital twin development
- Computational modeling and machine learning paired with live experimental testing
- High-performance computing resources provided through key collaborations as part of DOE's Integrated Research Infrastructure





Engineer working inside DIII-D (top) and DIII-D digital twin development supported by NVIDIA (bottom)