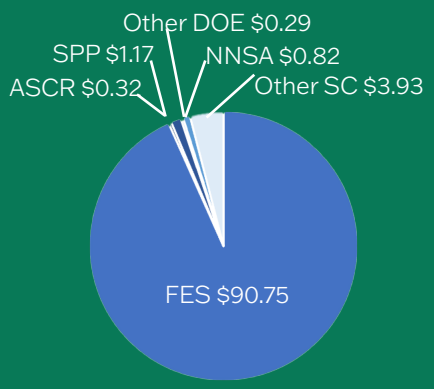
AT A GLANCE: PRINCETON PLASMA PHYSICS LABORATORY

Princeton Plasma Physics Laboratory (PPPL), a collaborative national center for fusion energy science, basic sciences, and advanced technology, has three major missions: (1) to develop the scientific knowledge and advanced engineering to enable fusion to power the U.S. and the world; (2) to advance the science of nanoscale fabrication for future industries; and (3) to further the scientific understanding of plasmas from nano- to astrophysical scales. PPPL has been a world leader in magnetic confinement experiments, plasma science, fusion science, and engineering. As the only DOE National Laboratory with a Fusion Energy Sciences mission, PPPL aspires to be the nation's premier design center for the realization and construction of future fusion concepts (e.g., next wave of scientific innovation in plasma nanofabrication technologies). The laboratory is evolving, broadening its expertise to more effectively contribute to U.S. economic health and competitiveness by being a national leader in computation, nanofabrication, surface science, and technology.

FUNDING BY SOURCE

FY 2019 (Costs in $M)
Total Laboratory Operating Costs: $97.28
DOE/NNSA Costs: $96.11
SPP (Non-DOE/Non-DHS) Costs: $1.17
SPP as % of Total Laboratory Operating Costs: 1.2%



FACTS

Location: Princeton, NJ
Type: Single-program Laboratory
Contractor: Princeton University
Site Office: Princeton Site Office
Website: pppl.gov

PHYSICAL ASSETS

90.7 acres
30 buildings
$744.1 million replacement plant value
758,000 GSF in buildingsinfrastructure assets (OSFs)

HUMAN CAPITAL

531 FTE employees
8 joint faculty
36 postdoctoral researchers
24 undergraduate students
45 graduate students
318 facility users
28 visiting scientists

CORE CAPABILITIES

Large-Scale User Facilities/Advanced Instrumentation
Mechanical Design and Engineering
Plasma and Fusion Energy Sciences
Power Systems and Electrical Engineering
Systems Engineering and Integration
**Proposed new core capabilities: Computational Science, and Condensed Matter Physics and Materials Science.*

MISSION UNIQUE FACILITIES

Laboratory for Plasma Nanosynthesis
Lithium Tokamak Experiment
Magnetic Reconnection Experiment
National Spherical Torus Experiment-Upgrade
Facility for Laboratory Reconnection Experiment

U.S. DEPARTMENT OF ENERGY

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PPPL
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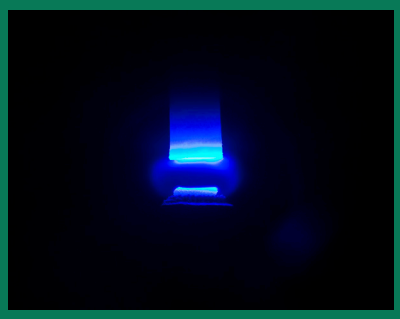
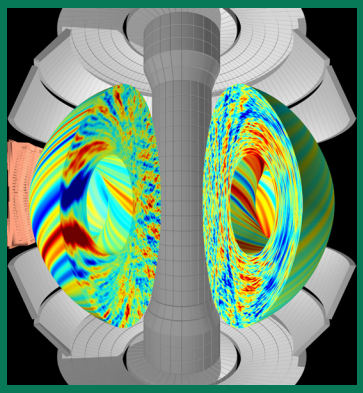
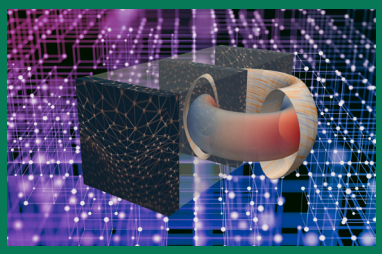
ACCOMPLISHMENTS



Unique Facility: Princeton Collaborative Research Facility on Low Temperature Plasma - Low temperature plasma, a dynamic state of nature, has applications in fields ranging from golf clubs and swimwear to aerospace and biomedical equipment. Princeton Plasma Physics Laboratory has for years been exploring such plasmas and recently launched a facility open to researchers from across the country—to advance understanding and control of this practical state. The Princeton Collaborative Research Facility on Low Temperature Plasma, housed at PPPL, makes the extensive diagnostic and computational resources at PPPL and Princeton readily available to the U.S. academic, scientific, and industrial communities. "It's important for the nation's plasma physics laboratory to make a major contribution to understanding the physics of low-temperature plasmas," said Jon Menard, deputy director for research at PPPL. "This facility will open all the tools in the laboratory's low-temperature area for wider use."



Tech-to-Market Highlight: Innovation Network for Fusion Energy - PPPL is sharing its state-of-the-art computer codes and world-class research expertise with five companies developing facilities to produce fusion energy. The five partners are Commonwealth Fusion Systems in Massachusetts, developing high-temperature superconducting magnets to build smaller, lower-cost fusion reactors; TAE Technologies in California, working toward developing a fusion reactor based on the field-reversed configuration (FRC) concept; Tokamak Energy in Britain, developing a compact spherical tokamak with high-temperature superconducting magnets; HelicitySpace in California, designing a combined magnetic and inertial plasma confinement system to drive spacecraft and generate electricity; and General Fusion in Canada, pursuing a novel magnetized fusion device that uses pistons to compress plasma tightly to produce fusion energy. These public-private partnerships are drawing on decades of PPPL scientific and engineering advances to speed the arrival of commercial fusion power to generate electricity.



Research Highlight: Fusion Disruption Predictions - PPPL scientists have opened promising new pathways to the capture and control of fusion energy, the power that drives the sun and stars as a source of safe, clean, and abundant energy for generating electricity. In recent years the laboratory has applied AI, the branch of computer science that is transforming scientific inquiry, to forecast sudden disruptions that can halt fusion reactions and damage the doughnut-shaped tokamaks that house the reactions. The deep learning AI code that researchers have produced has demonstrated its ability to predict true disruptions within a 30-millisecond time frame. Even more significant for risk mitigation, the code now can move well beyond those 30 seconds to provide warnings for more than 100 milliseconds before disruptions occur. The next step will be to move from the prediction of disruptions to their control.