

Building Bridges

A Bold Vision for the DOE Fusion Energy Sciences

FESAC Meeting, April 30, 2024, Rockville, MD

Jean Paul Allain

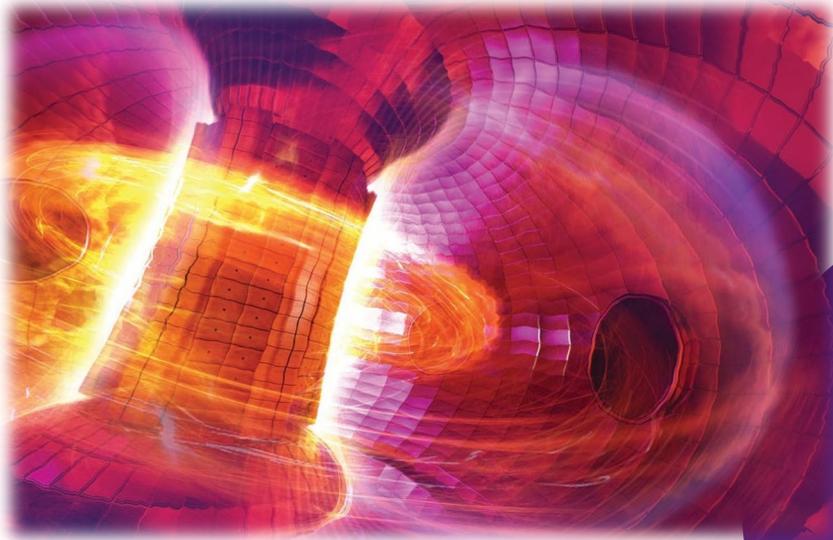
Associate Director of the Office of Science
for Fusion Energy Sciences



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Fusion Energy Science and Society

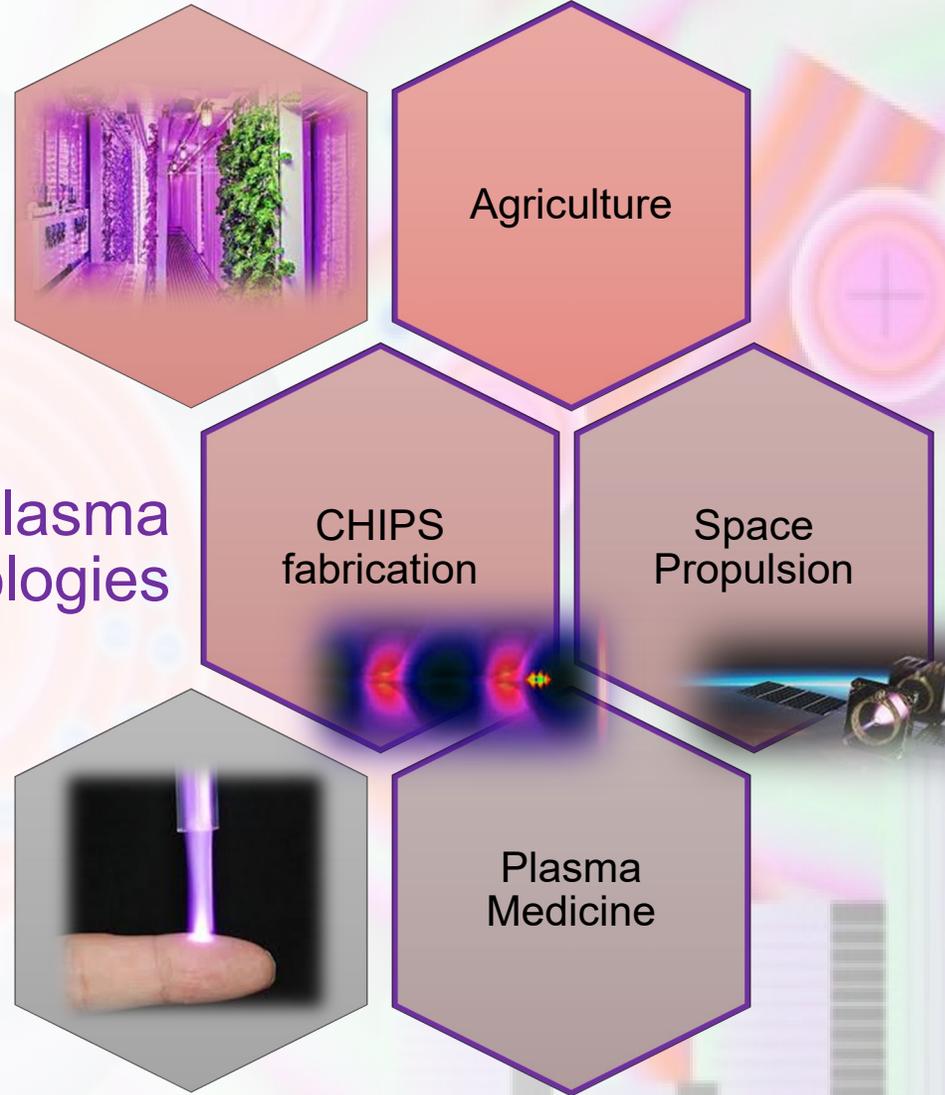


Fusion Energy is...

- Clean (non-carbon)
- Safe and Reliable
- Scalable
- Sustainable

Applying plasmas in every part of life

Plasma
Technologies



Vision for the DOE FES: Key Elements

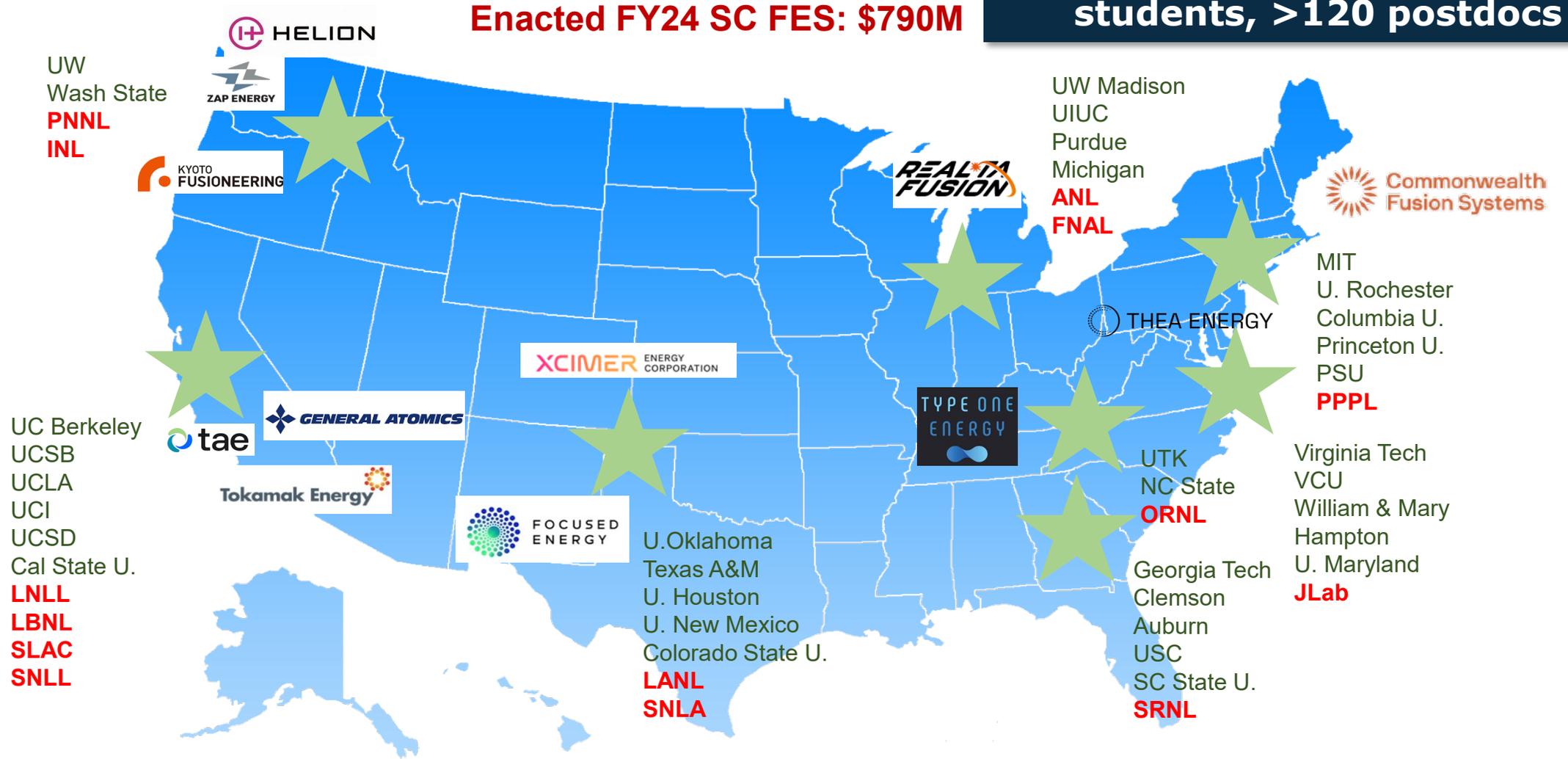
- **Workforce Development and Sustainment:** Ensuring we establish sustainable and resilient pathways for diverse and exceptional talent
- **Bridging Gaps:** Creating innovation engines with national laboratories, universities, and industry to resolve R&D gaps and support domestic supply chains for fusion energy
- **Transformational Science:** Nurturing plasma science and technology discovery translating to innovation impact



Foundational Science will always play a role in a vibrant *private fusion industry*

U.S. Fusion Energy ecosystem: potential for local economic development impact

Funding at 61 universities,
14 national laboratories, and
23 private companies
> 1,500 FTEs, >300 grad
students, >120 postdocs



Key Tech to de-risk (TRL ~ 0-4 push to 7)



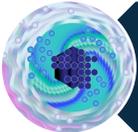
Fusion Materials



Fuel Cycle (tritium) &
Blanket



Enabling Tech (magnets,
laser systems, heating)

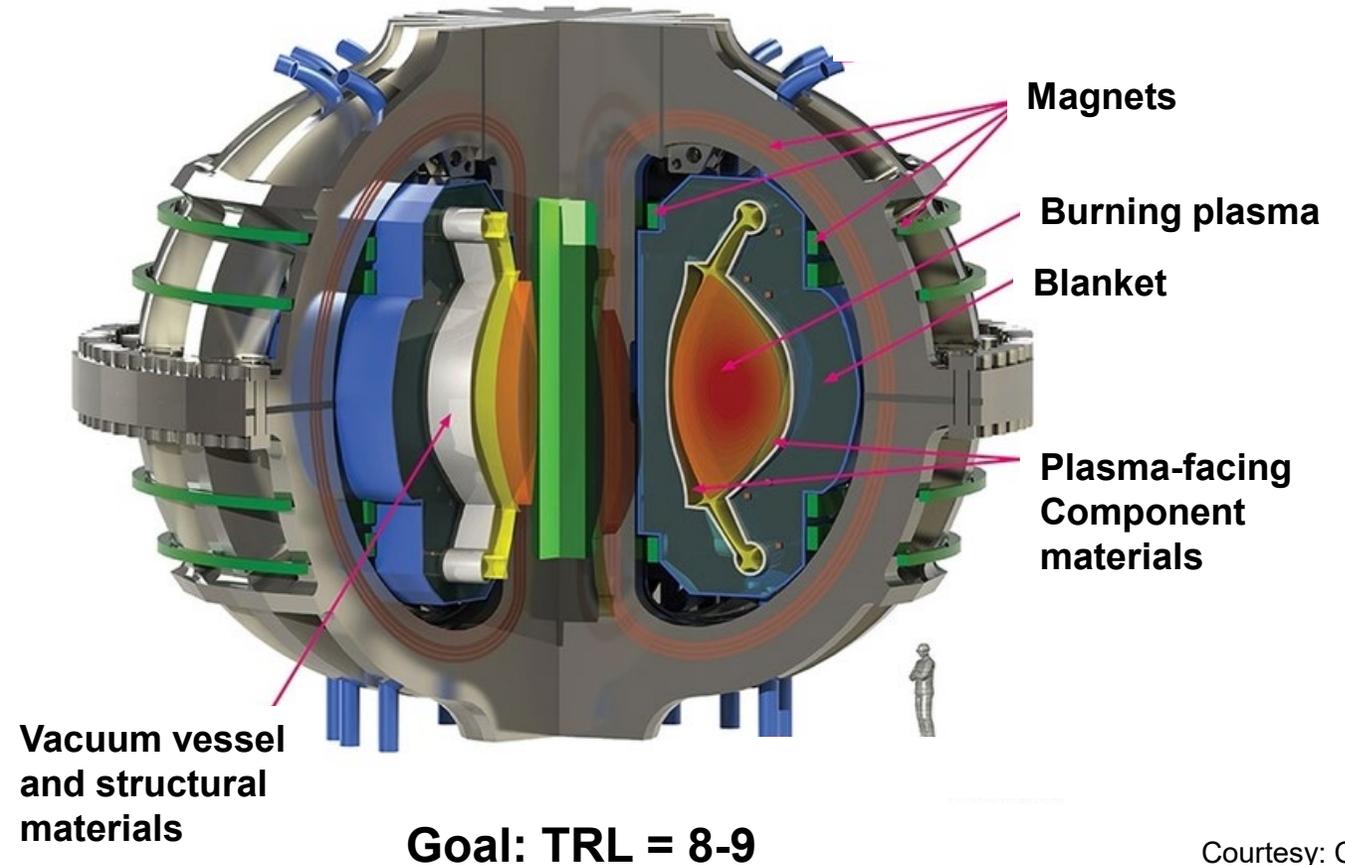


Integration



Sustain a Burning Plasma

Fusion Power Plant (three competing approaches: MCF, MIF, IFE)



Courtesy: CFS

SC FES Mission: *Establish the foundational understanding of fusion and plasma science in enabling development of a fusion power industry (Energy Act of 2020)*

FY 2024 FES Funding Opportunity Announcements / Lab Calls

Title	Status
Continuation of Solicitation for the Office of Science Financial Assistance Program (Open Call)	Open until September 30, 2024
High Energy Density Laboratory Plasma Science	Proposals under review
Collaborative Research in Magnetic Fusion Energy Sciences on Long-Pulse International Stellarator Facilities	Proposals under review
Research in Basic Plasma Science and Engineering	Proposals under review
Research on General Plasma Science Collaborative Research Facilities	Closed on April 29
Opportunities in Foundational Fusion Materials, Nuclear Science, and Technology (Lab Call)	Closes on May 17 (encouraged applicants notified)
Early Career Research Program	Closed on April 25
Funding for Accelerated, Inclusive Research (FAIR)	Closes on July 16 Pre-applications due April 23
Reaching a New Energy Sciences Workforce (RENEW)	Closes on July 23 Pre-applications due April 30
Fusion Innovation Research Engine (FIRE) Collaboratives	<i>To be issued soon</i>

<https://science.osti.gov/fes/Funding-Opportunities>

LRP and the Fusion Innovation Research Engine (FIRE) Collaborative

LRP Science Drivers:



Sustain a Burning Plasma



Engineer for Extreme Conditions



Harness Fusion Energy

Fusion Science and Technology Drivers

... "Rapidly expand the R&D efforts in fusion materials and technology (FM&T)"

Fusion Innovation Research Engine Collaborative

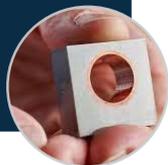
Vision: The FIRE Collaborative will help establish a fusion ecosystem that brings together discovery science, innovation, and translational research in partnership with multiple public and private partners

Mission: Fulfilling the fusion energy mission focused on the Long-Range Plan (LRP) FM&T gaps, which connects the three science drivers: Sustain a Burning Plasma, Engineer for Extreme Conditions, and Harness Fusion Energy.

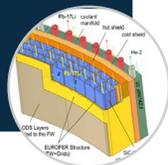
Focus: Priority R&D areas that relate the FM&T gaps to the FIRE Collaborative program are listed below. The FIRE Collaboratives are expected to address gaps that exist in or across these R&D areas and will also be the bridge between the FES foundational research programs and enabling science and technology for fusion energy.

Crosscutting Fusion Materials and Technology R&D

Fusion Materials



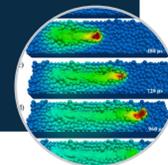
Fusion Blankets and Fuel Cycle Systems



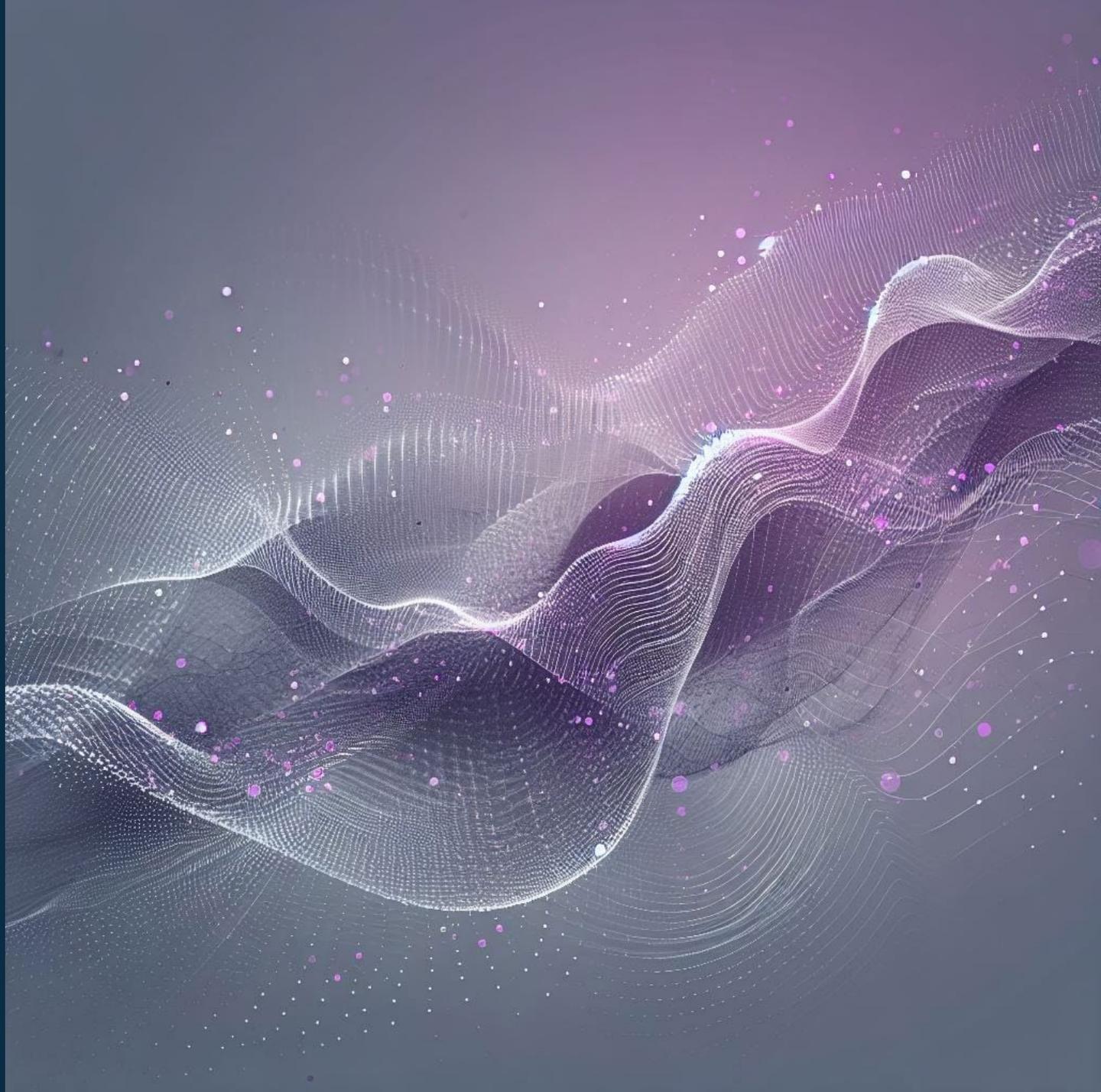
Fusion Enabling Technologies



Advanced Simulations for Design and Optimization



FES Transition

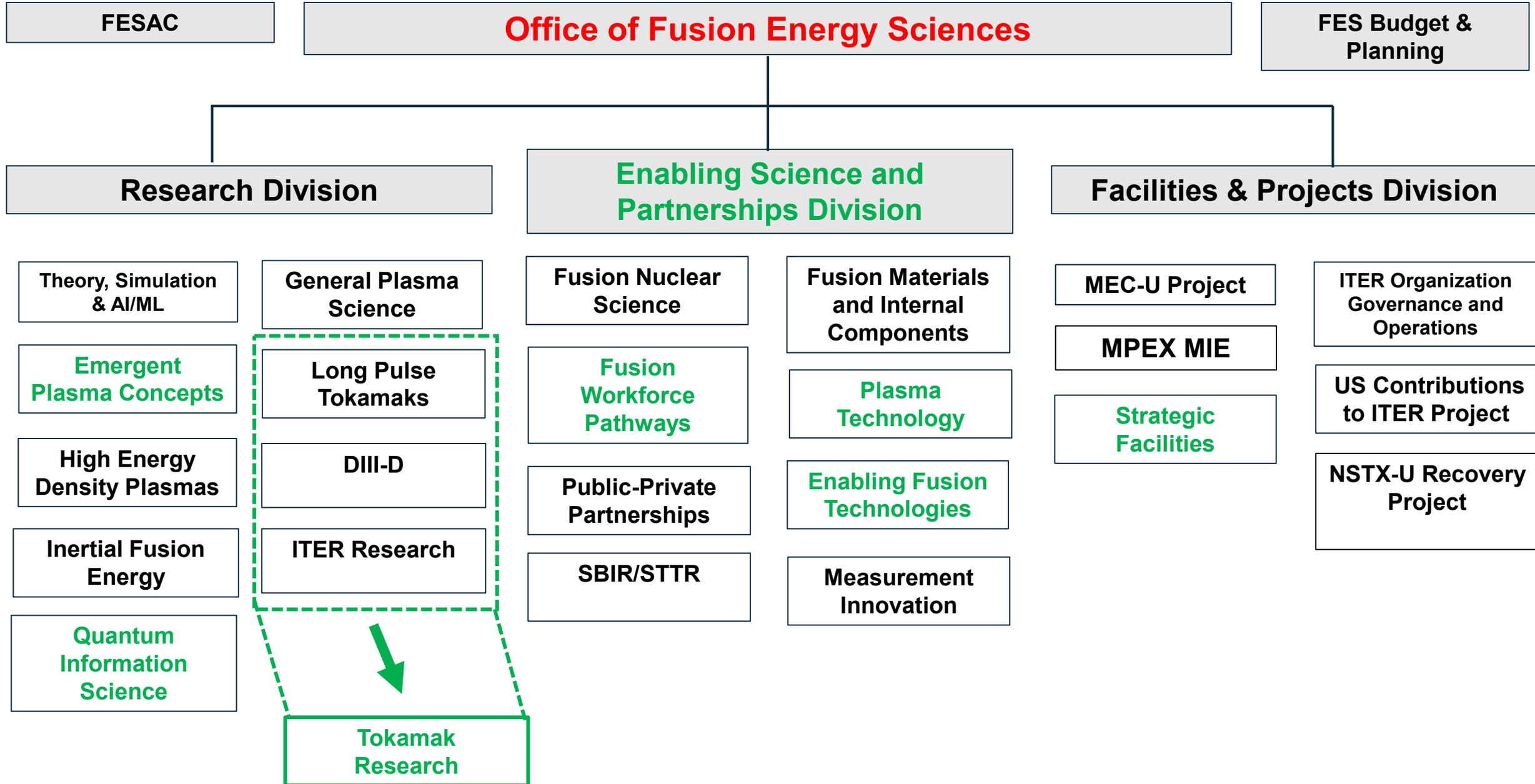


Fusion and Plasma Research: FES budget Re-structure is the first step of FES alignment with LRP and BDV

Theory and Simulation	Fusion Materials and Internal Components	Emergent Plasma Concepts	Closing the Fusion Cycle	Discovery Plasma Science and Technology
<ul style="list-style-type: none"> • Multi-scale modeling • Advanced Computing • FM&T multi-scale computation • AIML in control systems 	<ul style="list-style-type: none"> • Fusion Nuclear Materials • PFCs • Actuators • Adv. Manufacturing • MPEX 	<ul style="list-style-type: none"> • Spherical Tokamak • Long pulse/Adv. • Liquid Metals • Stellarators • FRC, Mirror, MIF • IFE 	<ul style="list-style-type: none"> • Nuclear Science • Blanket innov. • T, D, Li-6 mgmt • Balance-of-Plant • RAMI • Waste streams • Enabling Technologies 	<ul style="list-style-type: none"> • Foundational Plasmas and Astrophysics • Industrial Plasmas • HEDLP • MEC-U • QIS, Microelec.

Cross-threads: DIII-D, NSTX-U, PPPs, Fusion Workforce Pathways, strategic facilities/projects/operations, infrastructure & ITER

FES Re-organization: emphasis on strategic partnerships and initiatives



FESAC
Sam Barish
Sandy Newton

Office of Fusion Energy Sciences
Jean Paul Allain, Associate Director (IPA)
Gene Nardella, Chief of Staff, Fusion Tech Lead
Senior Strategy Advisor (Vacant)
Sam Barish
International Partnerships (Sandy Newton)
Yvette Walker, Program Support Specialist

FES Budget & Planning
Pam Miller,
Financial Analyst
Program Analyst
(Vacant)

Research Division
John Mandrekas, Director
(Vacant), Administrative Assistant
Marty Carlin, Program Analyst

Enabling Science and Partnerships Division
(Vacant), Director
(Vacant), Program Support Specialist

Facilities & Projects Division
Joseph May, Director
Nadia Ahmed, Administrative Assistant
(CONTR)

Theory, Simulation & AI/ML

General Plasma Science

Fusion Nuclear Science

Fusion Materials and Internal Components

MEC-U Project

ITER Organization Governance and Operations

Emergent Plasma Concepts

Tokamak Research

Fusion Workforce Pathways

Plasma Technology

MPEX MIE

US Contributions to ITER Project

High Energy Density Plasmas

Quantum Information Science

Public-Private Partnerships

Enabling Fusion Technologies

Strategic Facilities

NSTX-U Recovery Project

Inertial Fusion Energy

SBIR/STTR

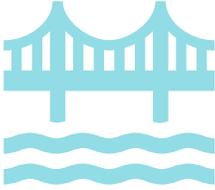
Measurement Innovation

FES alignment and re-structure



Strategic Input

- FESAC LRP/ CPP
- Bold Decadal Vision/ NASEM21
- FESAC FCP**
- FESAC Decadal Plan**
- Community and BRN Workshops



Re-alignment

- FES Budget Re-structure
- FES Re-organization
- Staffing
- FES Vision: Building Bridges

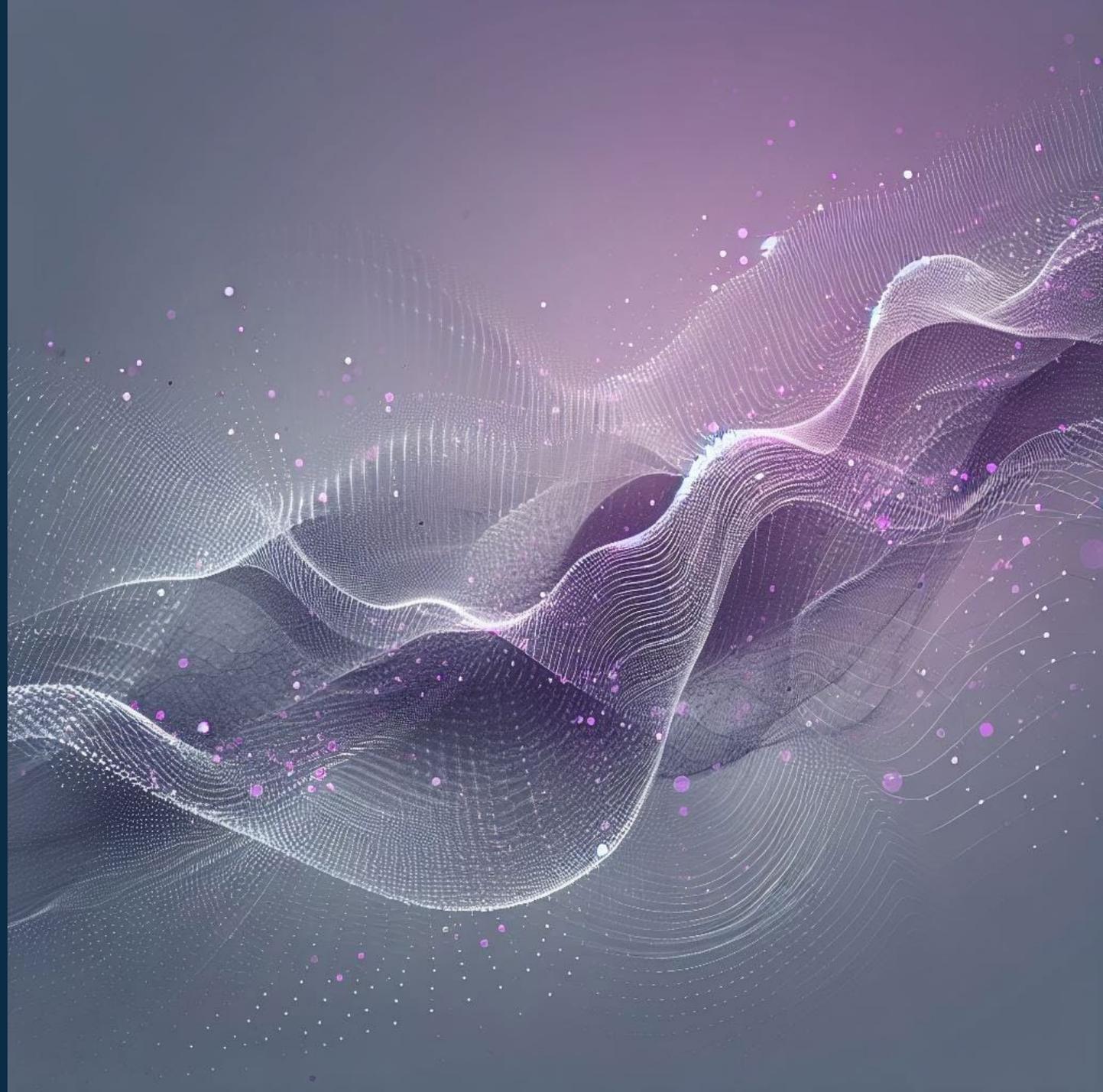


Impact Drivers

- FS&T Roadmap (**CY25 Q1**)
- PS&T Roadmap
- International and Public-Private Partnerships
- U.S. Fusion Energy Strategy

We are in a process of transition; we need all of you to be engaged and willing to work as a unified community (public and private!)

Announcements!



Call for Nominations: 2025 E.O. Lawrence Awards

- **Award recognizes** mid-career U.S. scientists and engineers for exceptional technical contributions and achievements in research and engineering supporting the broad missions of DOE and its programs to advance national, economic, and energy security of the U.S.
- **Awards considered in nine categories:**

- Atomic, Molecular, and Chemical Sciences
- Biological and Environmental Sciences
- Computer, Information, and Knowledge Sciences
- Condensed Matter and Materials Sciences
- Energy Science and Innovation
- Fusion and Plasma Sciences
- High Energy Physics
- National Security and Nonproliferation
- Nuclear Physics

- **Eligibility requires nominees be:**
 - Mid-career, defined as within 20 years of earning highest degree (2004 or later);
 - United States citizen;
 - Recognized for achievement(s) in research principally funded by DOE; and
 - Recognized primarily on the scientific impact and technical significance of their work relative to its discipline and/or related DOE mission.
- **Deadline to submit nominations: Thursday, May 9, 2024, 5:00 p.m. ET**
 - Submit nominations via Lawrence Award Online System: <https://apps.ornl.gov/Award/Lawrence>
- **For additional information:** <https://science.osti.gov/lawrence>

Contact: SCLawrence.Award@science.doe.gov

A great way to connect with us! FES Office Hours

- FES is holding Office Hours on the **first Wednesday of each month, 2-3 pm Eastern Time.**
- Researchers, educators, and research administrators from all institutional types are encouraged to join.
- A primary goal of the virtual office hours is to broaden awareness of our program; no prior history of funding from DOE is required to join.
- Program managers will be available to answer questions. Registration is required for attendance.
- **Past Office Hours:**
 - Wednesday, March 6, 2024 – Introduction to FES and program mission
 - Wednesday, April 3, 2024 – FES topics in the FY 2024 Open Call.
- **Upcoming Office Hours:**
 - Wednesday, May 1, 2024: How to Become an Effective Reviewer
- For more information, including recordings and slides, and to register, please visit <https://science.osti.gov/fes/officehours>

Image Credit: Ana Kova / U.S. Fusion Outreach, AIP

FES is engaging outside its “sandbox”

- SC FES partnering with DOE S4 and ARPA-E will be presenting Fusion Energy as a use-case for the new DOE FESI (Foundation for Energy Security and Innovation) as an opportunity to **establish a public-private fusion energy and technology consortium to build fusion tech infrastructure *quickly***
- **FES at ClimateImpact Summit 2024**
 - JP Allain part of panel on energy transition, London, UK, May 7-8, 2024 at the Royal Institution, Mayfair



FUSION
ENERGY
WEEK

A circular logo is centered on the page. The background is split horizontally into a light pink upper half and a red lower half. The logo consists of the words 'FUSION', 'ENERGY', and 'WEEK' arranged in a circle. 'FUSION' is at the top, 'ENERGY' is at the bottom, and 'WEEK' is on the left side. Two white circular dots are positioned within the circle: one at the top and one at the bottom, aligned with the word 'FUSION' and 'ENERGY' respectively.

Fusion Energy Week

MAY 6–10
2024



Illustration by Thumy Phan for
U.S. Fusion Outreach

- Organized by: U.S. Fusion Outreach Team
- Recruiting worldwide events: in-person, virtual and hybrid
- Partner organizations: APS, FIA, IAEA, UKAEA, Energy for the Common Good, and many more!
- Exciting Events (more than 30!) and custom Fusion Energy trading cards!
 - **Capitol Hill Briefing:** *Pioneering Partnerships to Accelerate Commercial Fusion Energy*, May 9, 2-3:30pm, Rayburn
 - Many other events including plasma facility virtual and public tours, Webinar talks, many more!



Steff Diem - sjdiem@wisc.edu

**Thanks for your
attention!**

