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
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

Agriculture
CHIPS fabrication
Space Propulsion
Plasma Medicine
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

Enacted FY24 SC FES: $790M

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)*

- Magnets
- Burning plasma
- Blanket
- Plasma-facing Component materials
- Vacuum vessel and structural materials

**Goal: TRL = 8-9**

*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

<table>
<thead>
<tr>
<th>Title</th>
<th>Status</th>
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<tbody>
<tr>
<td>Continuation of Solicitation for the Office of Science Financial Assistance Program (Open Call)</td>
<td>Open until September 30, 2024</td>
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<tr>
<td>High Energy Density Laboratory Plasma Science</td>
<td>Proposals under review</td>
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<tr>
<td>Collaborative Research in Magnetic Fusion Energy Sciences on Long-Pulse International Stellarator Facilities</td>
<td>Proposals under review</td>
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<tr>
<td>Research in Basic Plasma Science and Engineering</td>
<td>Proposals under review</td>
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<tr>
<td>Research on General Plasma Science Collaborative Research Facilities</td>
<td>Closed on April 29</td>
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<tr>
<td>Opportunities in Foundational Fusion Materials, Nuclear Science, and Technology (Lab Call)</td>
<td>Closes on May 17 (encouraged applicants notified)</td>
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<tr>
<td>Early Career Research Program</td>
<td>Closed on April 25</td>
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<tr>
<td>Funding for Accelerated, Inclusive Research (FAIR)</td>
<td>Closes on July 16 Pre-applications due April 23</td>
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<tr>
<td>Reaching a New Energy Sciences Workforce (RENEW)</td>
<td>Closes on July 23 Pre-applications due April 30</td>
</tr>
<tr>
<td>Fusion Innovation Research Engine (FIRE) Collaboratives</td>
<td>To be issued soon</td>
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[https://science.osti.gov/fes/Funding-Opportunities](https://science.osti.gov/fes/Funding-Opportunities)
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.
FES Transition
Fusion and Plasma Research: FES budget Re-structure is the first step of FES alignment with LRP and BDV

<table>
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<tr>
<th>Theory and Simulation</th>
<th>Fusion Materials and Internal Components</th>
<th>Emergent Plasma Concepts</th>
<th>Closing the Fusion Cycle</th>
<th>Discovery Plasma Science and Technology</th>
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<tr>
<td>• Multi-scale modeling</td>
<td>• Fusion Nuclear Materials</td>
<td>• Spherical Tokamak</td>
<td>• Nuclear Science</td>
<td>• Foundational Plasmas and Astrophysics</td>
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<td>• Advanced Computing</td>
<td>• PFCs</td>
<td>• Long pulse/Adv.</td>
<td>• Blanket innov.</td>
<td>• Industrial Plasmas</td>
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<td>• FM&amp;T multi-scale computation</td>
<td>• Actuators</td>
<td>• Liquid Metals</td>
<td>• T, D, Li-6 mgmt</td>
<td>• HEDLP</td>
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<td>• AIML in control systems</td>
<td>• Adv. Manufacturing</td>
<td>• Stellarators</td>
<td>• Balance-of-Plant</td>
<td>• MEC-U</td>
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<td>• MPEX</td>
<td>• FRC, Mirror, MIF</td>
<td>• RAMI</td>
<td>• QIS, Microelec.</td>
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<td>• IFE</td>
<td>• Waste streams</td>
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<td></td>
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<td>• Enabling Technologies</td>
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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

Office of Fusion Energy Sciences

Research Division
- Theory, Simulation & AI/ML
- Emergent Plasma Concepts
- High Energy Density Plasmas
- Inertial Fusion Energy
- Quantum Information Science
- General Plasma Science
- Long Pulse Tokamaks
- DIII-D
- ITER Research
- Tokamak Research

Enabling Science and Partnerships Division
- Fusion Nuclear Science
- Fusion Workforce Pathways
- Public-Private Partnerships
- SBIR/STTR
- Enabling Fusion Technologies
- Plasma Technology
- Measurement Innovation

Facilities & Projects Division
- Fusion Materials and Internal Components
- MEC-U Project
- ITER Research
- sbir/STTR
- MPEX MIE
- Strategic Facilities
- ITER Organization Governance and Operations
- US Contributions to ITER Project
- NSTX-U Recovery Project
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

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

Theory, Simulation & AI/ML
Emergent Plasma Concepts
High Energy Density Plasmas
Inertial Fusion Energy
General Plasma Science
Tokamak Research
Quantum Information Science
Fusion Nuclear Science
Fusion Workforce Pathways
Public-Private Partnerships
SBIR/STTR

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

Fusion Materials and Internal Components
Plasma Technology
Enabling Fusion Technologies
Measurement Innovation

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

MEC-U Project
MPEX MIE
Strategic Facilities
ITER Organization Governance and Operations
US Contributions to ITER Project
NSTX-U Recovery Project

FESAC
Sam Barish
Sandy Newton

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

<table>
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<tr>
<th>Atomic, Molecular, and Chemical Sciences</th>
<th>Fusion and Plasma Sciences</th>
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<td>Biological and Environmental Sciences</td>
<td>High Energy Physics</td>
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<tr>
<td>Computer, Information, and Knowledge Sciences</td>
<td>National Security and Nonproliferation</td>
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<td>Condensed Matter and Materials Sciences</td>
<td>Nuclear Physics</td>
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<td>Energy Science and Innovation</td>
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- **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.orau.gov/Award/Lawrence](https://apps.orau.gov/Award/Lawrence)

- **For additional information:** [https://science.osti.gov/lawrence](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](https://science.osti.gov/fes/officehours)
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
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!