INFUSE | Innovation Network for Fusion Energy

DOE SC FES Private/Public Partnership Program

URL: https://infuse.ornl.gov
Email: infuse@ornl.gov

INFUSE Update+

A. Lumsdaine & E. Gilson

Fusion Power Associates 44th Annual Meeting and Symposium

December 20, 2023

Agenda

- What's Now? (INFUSE program status) *now*
- What's New? (FY2024 Request for Assistance) *new*
- What's Next? (INFUSE next steps) *next*
- What Else? (Non-INFUSE PPP innovation thoughts)

innovate

INFUSE Leadership

now

INFUSE Program Manager

Colleen Nehl

U.S. DEPARTMENT OF ENERGY | Office of Science

INFUSE Director

Arnold Lumsdaine

OAK RIDGE National Laboratory

INFUSE Deputy Director

Erik Gilson

PPPL PRINCETON PLASMA PHYSICS LABORATORY

INFUSE Overview

now

The mission of INFUSE is to provide private-sector fusion companies access to the expertise and facilities of DOE's national laboratories and (since FY2022) U.S. academic institutions to overcome critical scientific and technological hurdles in pursuing development of fusion energy.

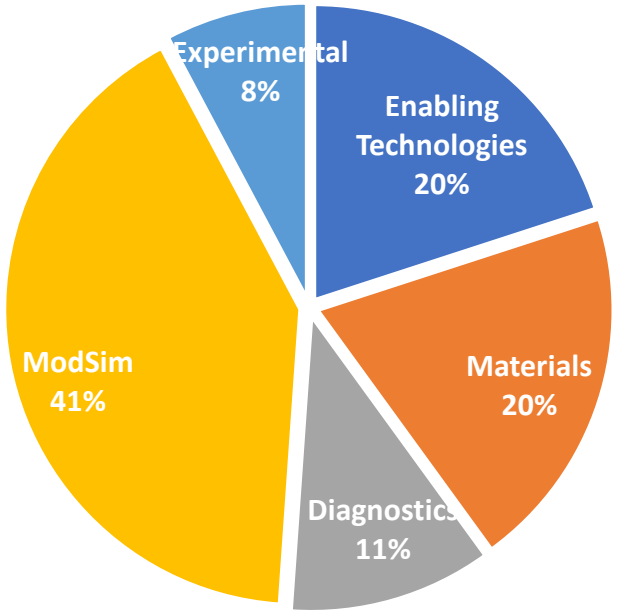
AWARDS

- **90** projects funded since 2019 with a total value of **$19.3M**
- Awards were made to **28** private companies partnering with **10** DOE labs and **11** U.S. Universities.
- Detailed list: https://infuse.ornl.gov/wp-content/uploads/2023/11/Cumulative_AwardList_wAbstracts_thru2023.pdf

PARTICIPATING LABORATORIES

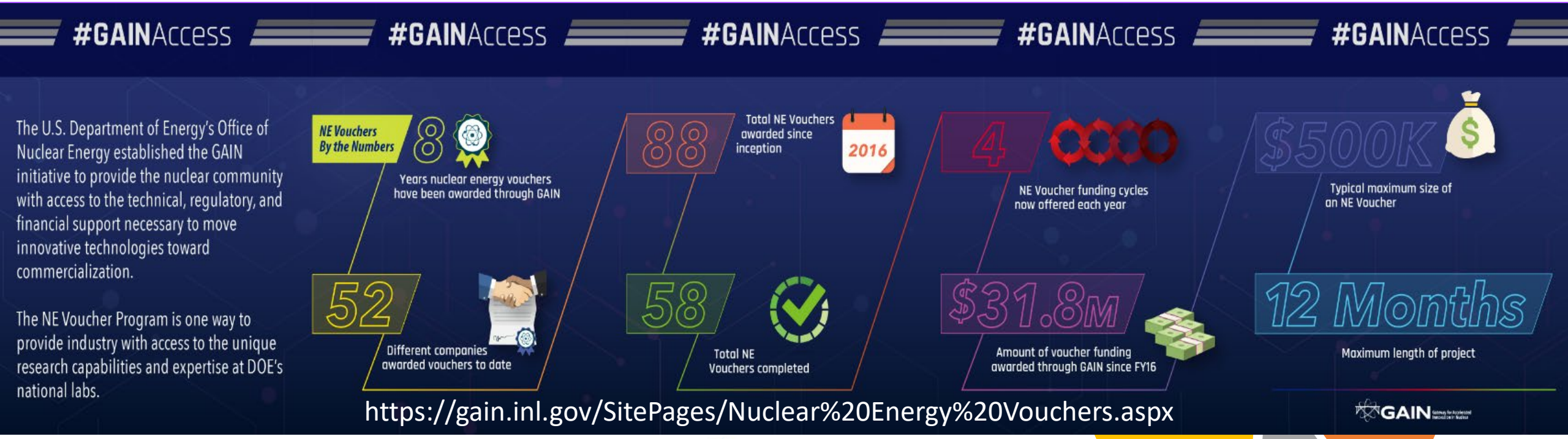
INL Idaho National Laboratory
BROOKHAVEN NATIONAL LABORATORY
BERKELEY LAB Lawrence Berkeley National Laboratory
LAWRENCE LIVERMORE NATIONAL LABORATORY
OAK RIDGE National Laboratory
Pacific Northwest NATIONAL LABORATORY
PPPL PRINCETON PLASMA PHYSICS LABORATORY
Sandia National Laboratories
Savannah River National Laboratory
Los Alamos NATIONAL LABORATORY
Fermilab

Awarded Topical Areas



TOPICAL AREAS

1) Enabling Technologies
2) Materials Science
3) Plasma Diagnostics
4) Modeling and Simulation
5) Unique Fusion Experimental Capabilities
6) Paths to Commercialization



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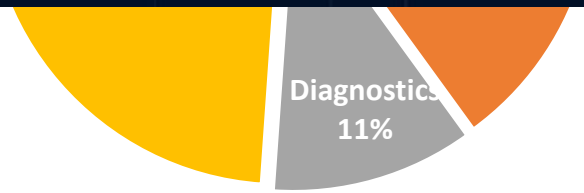

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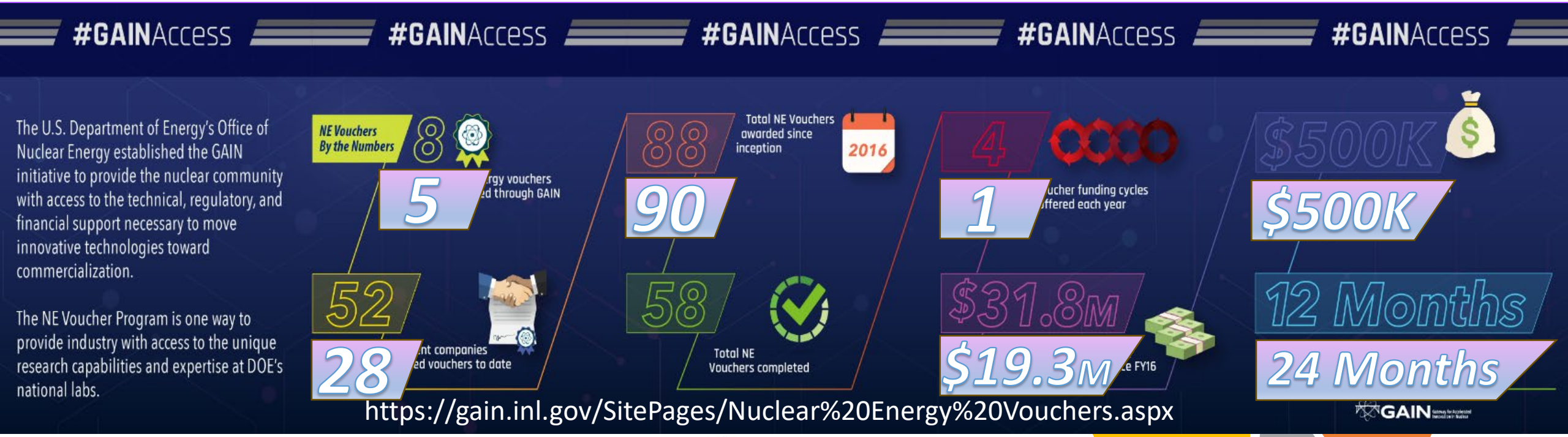

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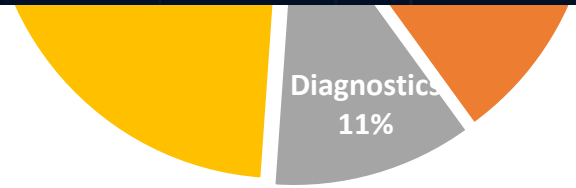

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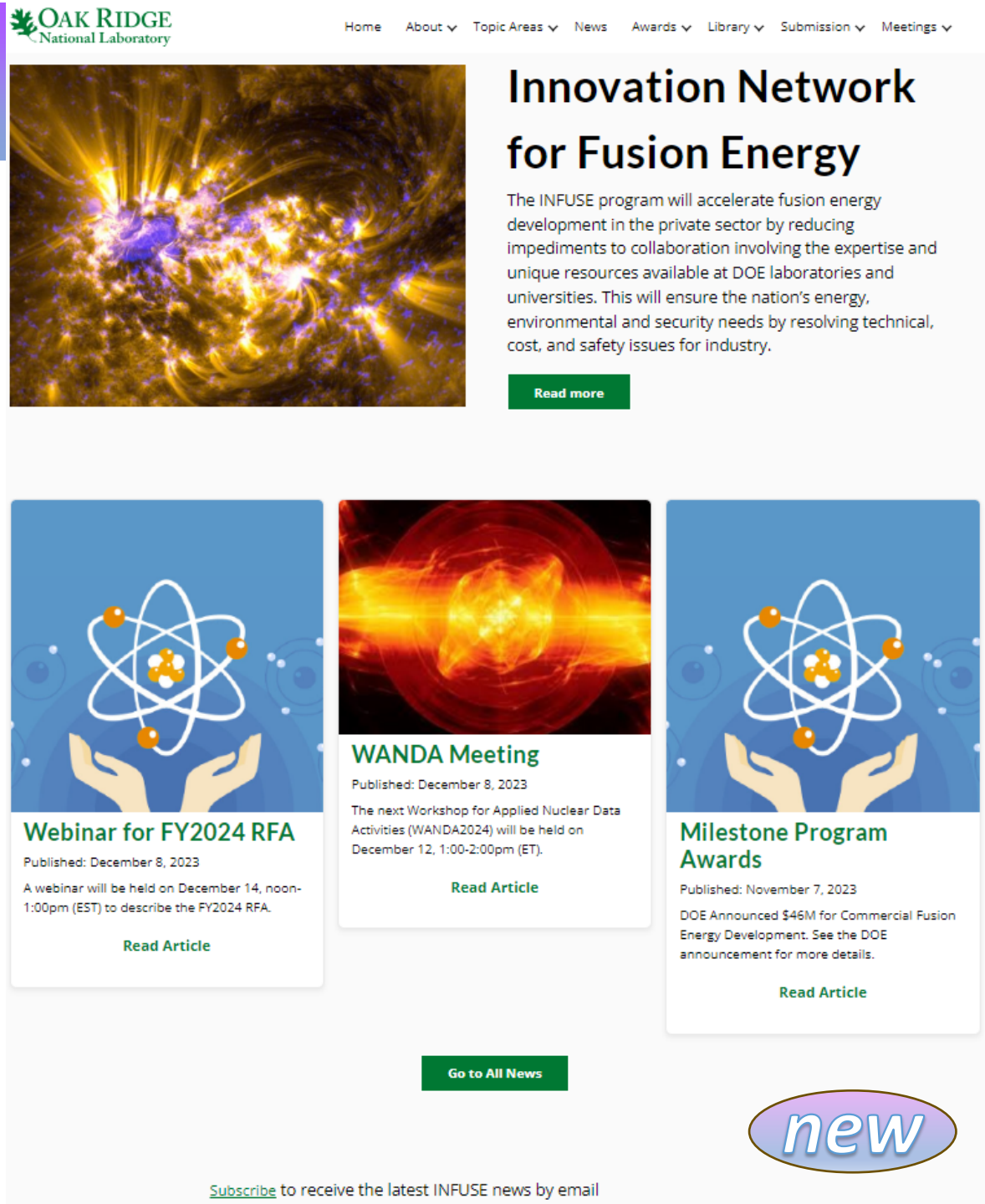
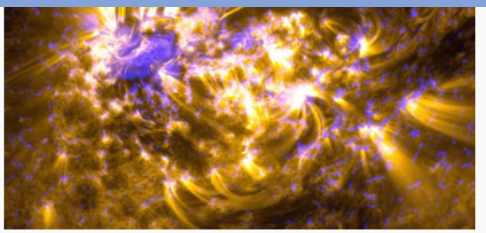
INFUSE Web Site - Rebuilt

https://infuse.ornl.gov/



INFUSE Web Site – Subscribe

new



The INFUSE program will accelerate fusion energy development in the private sector by reducing impediments to collaboration involving the expertise and unique resources available at DOE laboratories and universities. This will ensure the nation's energy, environmental and security needs by resolving technical, cost, and safety issues for industry.

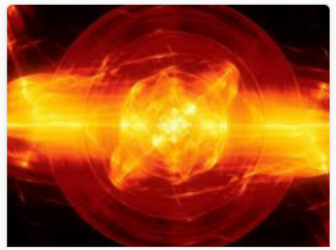
Read more

Webinar for FY2024 RFA

Published: December 8, 2023

A webinar will be held on December 14, noon-1:00pm (EST) to describe the FY2024 RFA.

Read Article



WANDA Meeting

Published: December 8, 2023

The next Workshop for Applied Nuclear Data Activities (WANDA2024) will be held on December 12, 1:00-2:00pm (ET).

Read Article

Milestone Program Awards

Published: November 7, 2023

DOE Announced $46M for Commercial Fusion Energy Development. See the DOE announcement for more details.

Read Article

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http://eepurl.com/iBeZiM

INFUSE Innovation Network for Fusion Energy

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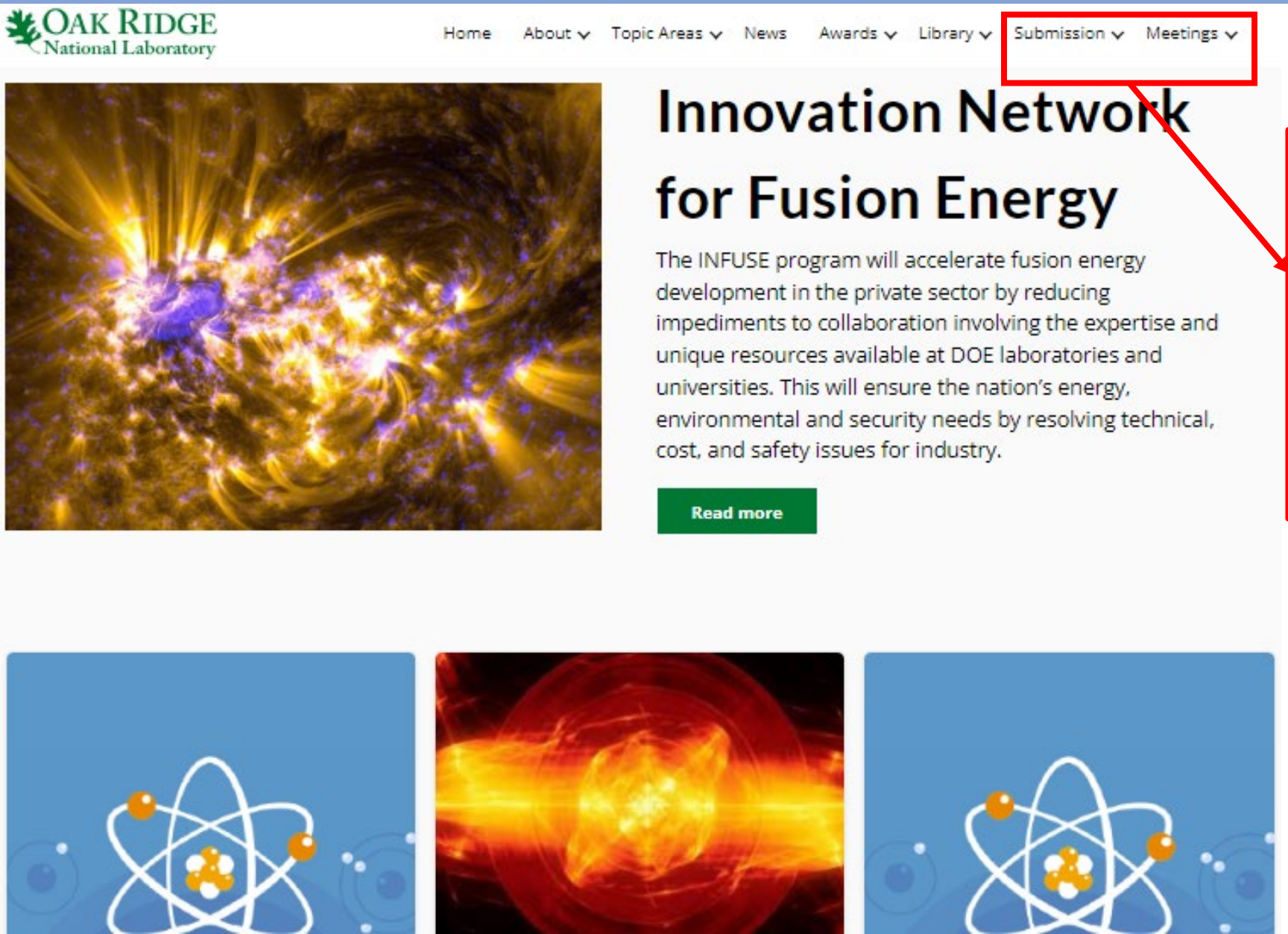
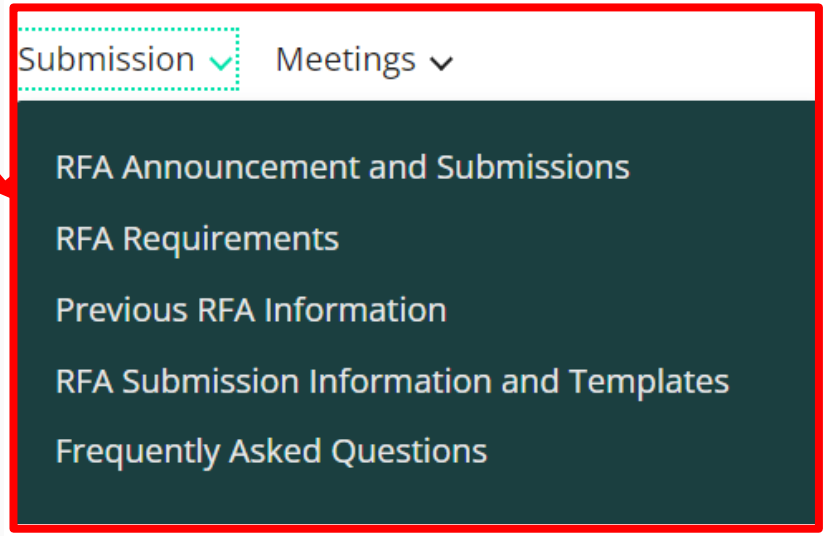
Emails will come from infusenews@mailer.ornl.gov

INFUSE Web Site – Submission

new





The Submission menu has all of the information related to what is needed to submit an application.

FY 2024 Request for Assistance (RFA)

new

- **Eligible Applicants:** Private companies incorporated in the United States (can be a foreign owned subsidiary – PI and all cost-share must come from US subsidiary).
- **Eligible Partner Institutions:** Any DOE national laboratory or institution of higher education with unique capability that is not available in the private sector. Partners must agree to work (record of discussion).
- **Award size:** $100K to $500k with a 20% cost share requirement, 12 months in duration. Requests of higher amounts and up to 24 months will be considered for work deemed to be of critical value to the company.
- **Number of Allowable Applications:** 5 per company per RFA call.
- **Company Certifications:** (1) Cost-share certification; (2) IP Certification (CRADA or IP Management Plan); (3) Conflict of Interest certification ("button push" on submission site).

For further details, consult the RFA Call:

https://infuse.ornl.gov/wp-content/uploads/2023/12/FY2024-INFUSE-RFA_FINAL.pdf

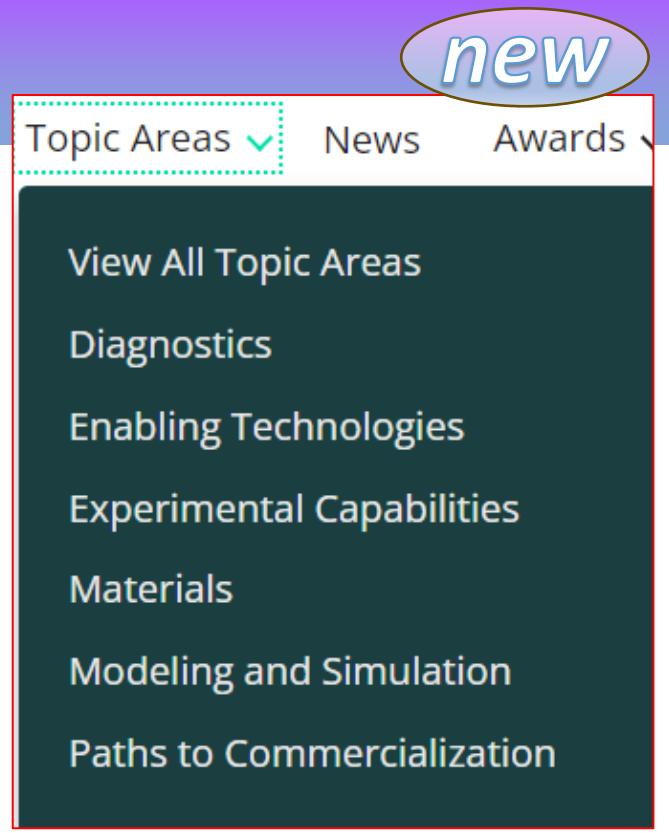
For eligibility requirements:

https://infuse.ornl.gov/rfa-requirements/

To request access to the submission site:

https://infuse.ornl.gov/rfa-announcement-and-submission/

Topic Area Modification (from 2023)



- **Activities to support eventual fusion commercialization ("Paths to Commercialization")**
  - This topic was added in view of the maturation of the private fusion industry.
  - This would include but not be limited to:
    - Accident and safety analysis in support of eventual licensing
    - Public engagement, including energy and environmental justice
    - Fuel supplies
    - Advanced manufacturing
    - Waste disposition and recycling
- **Expansion of "Modeling and Simulation"**
  - This would include but not be limited to:
    - Physics, engineering and/or materials modeling/simulation
    - Plant costing (e.g., models focused on cost to build a fusion plant and cost drivers for a fusion plant or essential subcomponents/systems, such as tritium processing)
    - Technoeconomic modeling focused on cost-of-electricity or other products (e.g., process heat) for fusion plants

PIER Plan Update

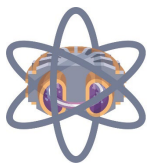
new

- **Review of PIER Plan**
  - A fifth review criteria was been added to the original four in FY23.
  - The addition was made following a requirement of the Office of Science.
  - Applicants will add this in Appendix 1 of the application (not within 10 page limit).
  - Go to https://science.osti.gov/grants/Applicant-and-Awardee-Resources/PIER-Plans/Information-about-PIER-Plans for more information.
- **Notes on the PIER Plan evaluation**
  - The language of the review criteria is provided by the Office of Science.
  - Both INFUSE partners, both the private company and the lab / university should include PIER plans. It is understood to be the view of the organization, not the individual PI.
  - The size of the project, and the size and maturity of the company will be taken into account in the review.
  - It is acceptable to include items in the budget that will support the activities detailed in the PIER plan in keeping with the cost principles in 2 CFR 200.
  - The PIER Plan is expected to be a plan, not a census.

FY 2024 Schedule

new

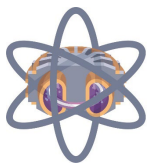
➢ Apr. 13, 2023	Virtual townhall meeting
➢ Nov. 9, 2023	Virtual mini-workshop
➢ Dec. 11, 2023	RFA posted
➢ Dec. 14, 2023	FY2024 RFA Webinar
➢ Jan. 3, 2024	Web site open for submissions
➢ Feb. 16, 2024	RFA closes **noon EST**
➢ Feb. 27-28, 2024	In-person workshop at PPPL (**tentative**)
➢ Mid-June, 2024	Award Announcement
➢ Sep. 1, 2024	Work Start Date



Blue = INFUSE meetings

Communication of Results

- In order to communicate INFUSE success stories to stakeholders . . .
  - Describe technical impact
    - Artifacts generated (papers, patents, etc.)
    - Technical readiness demonstrated / matured
    - Risks mitigated
  - Describe business impact
    - Progress towards company objectives
    - Input into other funding opportunities
    - Risks mitigated



Divertor Component Testing

Topic Area: Experimental Capabilities

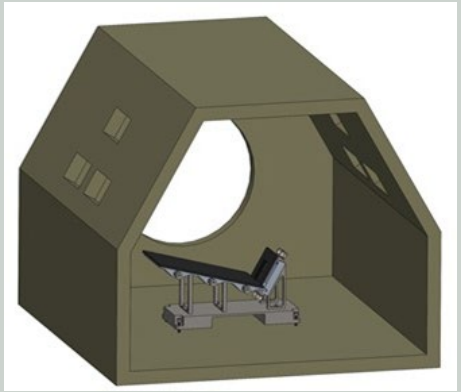
next

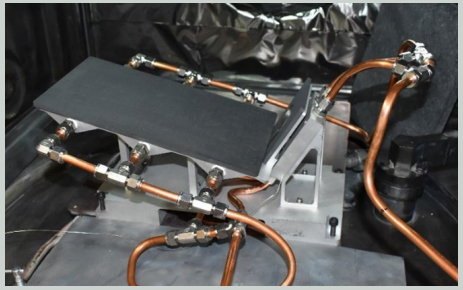
Partner	*Company*
Oak Ridge National Laboratory	Commonwealth Fusion Systems
Dr. Travis Gray	Dr. Adam Kuang Dr. Matthew Reinke

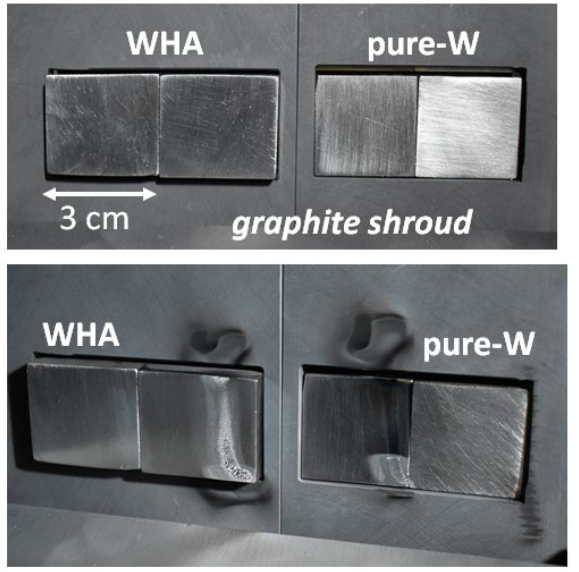
Project Summary:
Execute high heat flux testing of the base material being considered for SPARC at representative loads.

Fusion Impact:
Qualified the use of tungsten heavy alloy (WHA) - 97% W, 2% Ni, 1% Fe by weight, for use in tokamaks under higher heat fluxes than previously assessed and documented failure mechanisms relative to pure tungsten.

Business/Market Impact:
Potential cost savings to future devices as tungsten heavy alloy has significantly lower machining cost relative to pure tungsten. Material properties also enable larger components, thus reducing part count.







Left: Model and actual test stand. Top: Before and after images of the test samples.

Period of Performance:
3/2020 - 3/2021

Public Private Partnerships

- FES white paper on cost share programs
  - Tier 1: Basic science and proof-of-principle research and development (similar to the existing INFUSE program).
  - Tier 2: Representative scale research development of specific candidate enabling technologies that close gaps for, or enhance the attractiveness of, multiple future fusion reactor concepts.
  - Tier 3: A milestone-based program to evaluate and demonstrate the commercial viability and potential significance of candidate fusion confinement concepts

U.S. DEPARTMENT OF ENERGY

innovate

DOE Fusion Energy Sciences: A Plan on a Possible Cost Share Program for Fusion Reactor Technologies

September 2020

https://science.osti.gov/-/media/fes/pdf/2022/DOE_Fusion_Energy_Sciences-A_Plan_on_a_Possible_Cost_Share_Program_for_Fusion_Reactor_Technologies.pdf

United States Department of Energy
Washington, DC 20585

Public Private Partnerships (2)

- “A strong PPP is not based on a single program but is the result of many interactions occurring across a wide variety of challenges at different levels of maturity and technological readiness.”
- “Tier 2 would pursue research and development at a larger scale, requiring more time and financial commitment, and they could be set up following a performance-based, milestone-driven approach.”
- “Examples of research topics for Tier 2 could include both low- and high-temperature superconducting materials and magnet development, tritium breeding technology development, and neutron source development for materials testing.”

FES Public Private Partnership Elements

- INFUSE (Innovation Network for Fusion Energy)
  - Leverage National Laboratory and university infrastructure/capabilities for industry use
- Milestone-Based Fusion Development Program
  - Fusion companies partner with national labs and universities to provide viable FPP designs and technology roadmaps
- New PPP funding and financing program
  - Create a new bridge between the public and private sectors in fusion science and technology
  - Innovative PPP program to design and/or build facilities to de-risk low-TRL fusion technologies
  - To provide the public sector an opportunity to leverage strategic private sector infrastructure
  - CPP, FESAC LRP, FESAC IB, FESAC FCP, NASEM reports and US S&T Roadmap will all inform this program

Overview of Procedure – Access to ITER STI

- Significant scientific and technical information (STI) has been developed by the ITER project.
- Some requests have come from private fusion companies to access this STI. More are expected.
- A procedure is underway to formalize responses to these requests.

Fusion Supply Chain Symposium

- A special symposium is planned for the TechConnect World meeting in Washington, DC from June 17-19, 2024 – "Supply Chain Challenges for the Commercialization of Fusion Energy"

  https://www.techconnectworld.com/World2024/sym/Materials_Innovation_for_Commercialization_of_Fusion_Energy.html

- Plans are to include the following topics:
  - Needs of the growing private fusion industry
  - The view from key supply chain sector companies
  - Lessons learned from past and current fusion projects and facilities
  - Role of public-private partnerships
- If interested, contact:
  - Arnie Lumsdaine (lumsdainea@ornl.gov)
  - Amelia Campbell (campbellaf@ornl.gov)

Questions?