



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Informational Webinar: MILESTONE-BASED FUSION DEVELOPMENT PROGRAM

DE-FOA-0002809

FOA Issue Date:	September 22, 2022
Submission Deadline for Pre-Applications:	October 20, 2022 at 5 PM Eastern Time
Pre-Application Response Date:	November 3, 2022 at 11:59 PM Eastern Time
Submission Deadline for Applications:	December 15, 2022 at 11:59 PM Eastern Time

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October 4, 2022*

Disclaimer : *This presentation summarizes the contents of the FOA. Nothing in this webinar is intended to add to, take away from, or contradict any of the requirements of the FOA. If there are any inconsistencies between the FOA and this presentation or statements from DOE personnel, the FOA is the controlling document.*

Office of Science Statement of Commitment and other Guidance

- ▶ **SC Statement of Commitment** – SC is fully and unconditionally committed to fostering safe, diverse, equitable, inclusive, and accessible work, research, and funding environments that value mutual respect and personal integrity. <https://science.osti.gov/SW-DEI/SC-Statement-of-Commitment>
- ▶ **Expectations for Professional Behaviors** –SC’s expectations of all participants to positively contribute to a professional, inclusive meeting that fosters a safe and welcoming environment for conducting scientific business, as well as outlines behaviors that are unacceptable and potential ramifications for unprofessional behavior. <https://science.osti.gov/SW-DEI/DOE-Diversity-Equity-and-Inclusion-Policies/Harassment>
- ▶ **How to Address or Report Behaviors of Concern**– Process on how and who to report issues, including the distinction between reporting on unprofessional, disrespectful, or disruptive behaviors, and behaviors that constitute a violation of Federal civil rights statutes. <https://science.osti.gov/SW-DEI/DOE-Diversity-Equity-and-Inclusion-Policies/How-to-Report-a-Complaint>
- ▶ **Implicit Bias** – Be aware of implicit bias, understand its nature – everyone has them - and implicit bias if not mitigated can negatively impact the quality and inclusiveness of scientific discussions that contribute to a successful meeting. <https://kirwaninstitute.osu.edu/article/understanding-implicit-bias>

Program Office Introduction

Fusion Energy Sciences Program Mission:

- The mission of the Fusion Energy Sciences (FES) program is to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundations needed to develop a fusion energy source. This is accomplished by the study of the plasma state and its interactions with its surroundings.
- The Energy Act of 2020, Section 2008 augmented the scientific mission of FES with supporting “the development of a competitive fusion power industry in the U.S.”

*Ref: <https://science.osti.gov/fes>
Accessed Sept 30, 2022*

Context:

- ▶ Consistent with the Energy Act of 2020
- ▶ The purpose of the milestone-based development program... “shall be to support the development of a U.S.-based fusion power industry through the RD&D of technologies that will enable the construction of new full-scale **fusion systems capable of demonstrating significant improvements** in the performance of such systems, as defined by the Secretary, within 10 years of the enactment of this section.”



Year	1	2	3	4	5	6	7	8	9	10	11	12
FOA PoP												

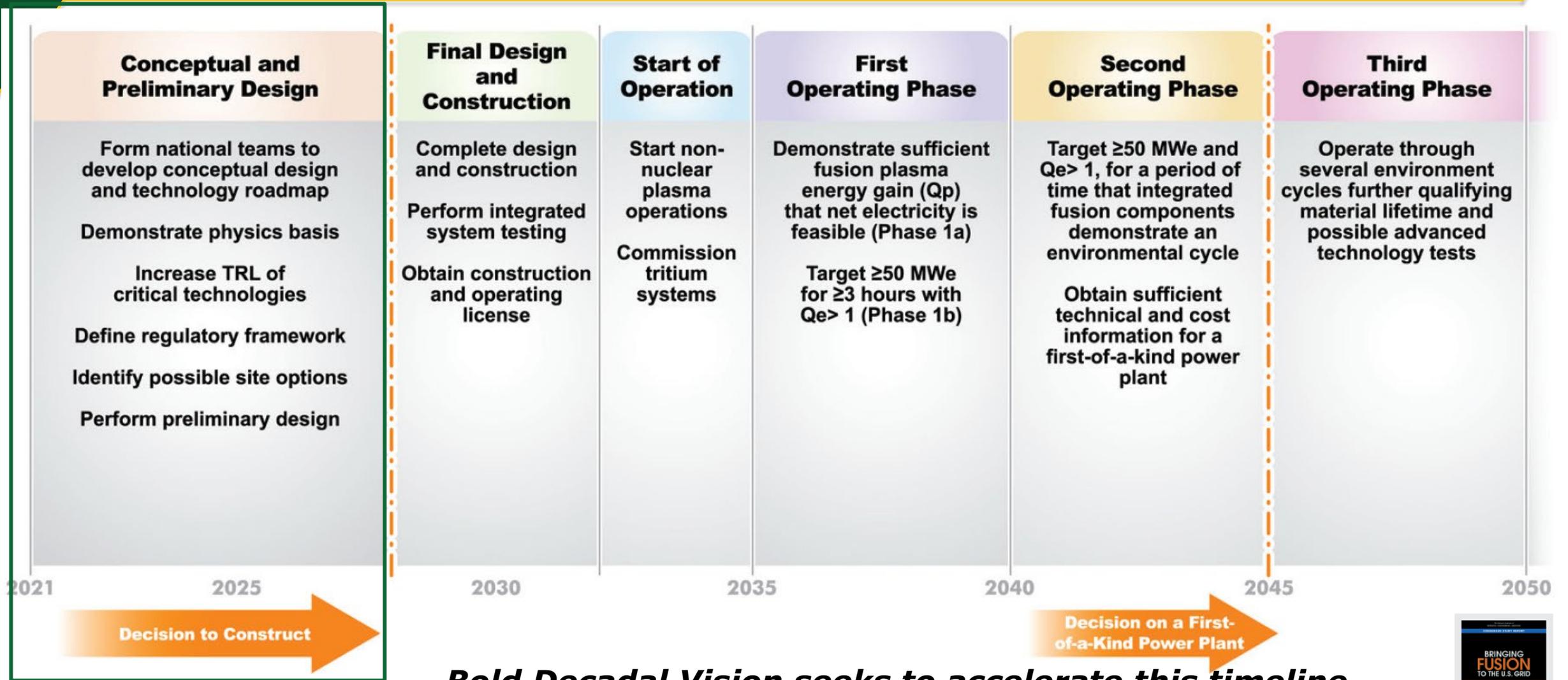


*Deliverables:
Preconceptual designs, tech roadmaps

The Energy Act of 2020, Section 2008 requires the use of Other Transactions agreements and payments upon milestone completion, or reimbursable expenses are reviewed and verified by DOE

- ▶ DOE has authority to enter into Other Transactions (OT) agreements, (as opposed to cooperative agreements), 42 U.S.C. 7256(g), which are implemented via Technology Investment Agreements (TIAs).
- ▶ For-profit entities must be the lead recipient
 - ▶ Required by DOE's TIA regulations at 10 CFR 603.210 Recipients
 - ▶ These entities are the only entities capable of **“meet[ing] particular technical milestones before a participant is awarded funds by the Department.”**

NASEM Report Defines FPP Goals



Bold Decadal Vision seeks to accelerate this timeline

Nat'l Academies of Sciences, Engineering, and Medicine 2021.
Bringing Fusion to the U.S. Grid. <https://doi.org/10.17226/25991>.



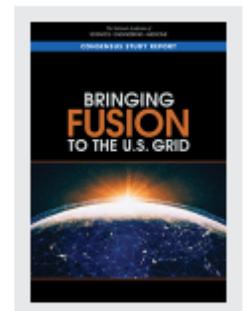
FOA focuses on work leading to a PDR

Recommendation or Innovation Category	Immediate action	Completed by			
		Conceptual Design	Preliminary Design	Final Design	Construction
Organization & Design	Create national teams to initiate design from private sector, universities and national labs	Complete concept. Enhance teams.	Select and consolidate team(s) Define cost and schedule	Execute Fusion Pilot Plant design and construction	
Technology approach	Develop technology roadmaps	Conceptual design, Refine technology roadmaps	Preliminary design. Critical technology prototypes demonstrated.	Final design completed.	Complete construction
Public-private partnerships	Develop PPP models for fusion and tech development	Execute PPPs	Refine and expand PPPs.		
Data / expertise access	Private sector access to ITER data Expand industrial access to labs and universities	Continued data and expertise sharing from labs/universities into private sector. Intellectual property agreements.			
Regulatory		Develop regulatory needs / framework	Finalize regulatory framework	Obtain required licenses	
Site			Develop site requirements and options	Develop site	
Workforce	Define Diversity, Equity and Inclusion (DEI) plan	Execute DEI improvement	Workforce growth consistent with DEI plan		



FOA focuses on work leading to a PDR

Recommendation or Innovation Category	Immediate action	Completed by			
		Conceptual Design	Preliminary Design	Final Design	Construction
Actuators		Define actuator needs	Develop actuator technology	Design and deploy actuators	
Heat exhaust		Define heat exhaust challenge	Demonstrate heat exhaust solutions	Implement solutions	
Tritium / Fuel Cycle		Define tritium / fuel cycle requirements. Design demonstration.	Demonstrate tritium / fuel cycle process technology		Demonstrate efficient tritium/fuel cycle processing
Blanket		Define blanket and test facility requirements. Design blanket test facility.	Operate blanket test facility. Obtain data.	Finalize design and build 1 st generation	
Neutron material degradation		Design limited volume neutron source	Operate neutron source, obtain initial results	Acquire further data, confirm material and design	
Structural design requirements		Develop high temperature structural design requirements	Obtain requisite data.	Implement requirements.	
Plasma-facing components		Define PFC requirements	Design and test PFCs	Fabricate and install PFC	
Blackstart		Evaluate blackstart capability			



Milestone-Based Fusion Development Program FOA

Important Deadlines:

- Pre-applications: **October 20 @ 5 PM ET**
 - Pre-applications are mandatory
 - DOE response by **November 3** (encourage / discourage)
 - Only “encouraged” applicants can submit a full application
- Applications: **December 15 @ 11:59 PM ET**
- Based on merit review of applications, DOE will select Finalists for an oral presentation
 - Finalists will be provided a minimum of two weeks to prepare for oral presentations

https://science.osti.gov/fes/-/media/grants/pdf/foas/2022/SC_FOA_0002809.pdf

DEPARTMENT OF ENERGY (DOE)
OFFICE OF SCIENCE (SC)
FUSION ENERGY SCIENCES (FES)



MILESTONE-BASED FUSION DEVELOPMENT PROGRAM

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0002809

FOA TYPE: INITIAL
CFDA NUMBER: 81.049

FOA Issue Date:	September 22, 2022
Submission Deadline for Pre-Applications:	October 20, 2022 at 5 PM Eastern Time A Pre-Application is required
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FOA Key Elements

▶ Key Eligibility Requirements

▶ **It is expected that all applications will be led by the private sector**

- ▶ Key partners could include DOE national laboratories, academic institutions, non-profits, and other organizations/entities.
- ▶ Applicant teams should have a demonstrable range of technical and nontechnical expertise needed for fusion energy R&D and eventual demonstration and commercialization.
- ▶ Non-Federal financial commitments will be expected for all fixed-support TIA applications and required for expenditure-based TIA applications.
- ▶ **Energy justice (EJ) and Diversity, Equity, Inclusion, and Accessibility (DEIA) are integral to this program.**

▶ Key Application Requirements

- ▶ Program Narrative including Community Benefits Plan
- ▶ Program Office Specific Requirements

Tiers

Each application shall select one Tier. Applicants may submit a *single* application to one of the following Tiers, or a separate application to each Tier.

However, at most one application per lead entity may be selected for award negotiations

- ▶ **Tier 1: FPP Preliminary Design Review (PDR)** Plausible path and proposed milestones leading to a successful PDR, by the late 2020s, of a fusion pilot plant that can begin operations by the early 2030s. Significant commitment of non-Federal resources is expected for all Tier 1 applications, i.e., a majority of the total project cost (see Section III.B for details).
- ▶ **Tier 2: Improvement in Fusion Performance** Plausible path and proposed milestones leading to a significant improvement, as defined quantitatively by the applicant, in the fusion performance (including the physics basis and required enabling materials/technologies) of their proposed FPP concept by the mid/late 2020s. Applications shall further describe how the improved performance may lead to a successful PDR by the early 2030s, of an FPP that can begin operations by the late 2030s. Significant commitment of non-Federal resources is expected, i.e., a majority of the total project cost, although lower fractions $\geq 20\%$ may be considered for awards made under an expenditure-based TIA (see Section III.B for details).

See Section I of the FOA for the technical description of the Tiers

Milestone Table (1 of 2)

- ▶ Milestones should reflect critical-path scientific/technical, business/financial, commercialization, and EJ/DEIA-related (including socio-technical) deliverables. Provide estimated total and requested federal funding amounts for each milestone
- ▶ Applicants are strongly encouraged to include particular milestones to address the following scientific and technical requirements, if applicable within the 5-year period of performance:
 - ▶ **Achieve plasma conditions (i.e., the required Lawson parameter $n\tau$ and ion temperature T_i) needed for a significant improvement in equivalent (i.e., using D-D instead of the actual commercial fuel) scientific energy gain up to and beyond $Q>1$**
 - ▶ **Achieve scientific energy gain $Q>1$ using the chosen commercial fuel cycle**
 - ▶ Heat-exhaust and plasma-facing-component (PFC) solutions for the FPP
 - ▶ Sustainable fuel-cycle solution, including blanket and tritium processing if applicable, for the FPP
 - ▶ Actuators and key enabling technologies

See Section I of the FOA for more information on the milestone table

Milestone Table (2 of 2)

Milestone #	Milestone Title	Milestone Completion Criteria	Estimated Total cost to fulfill milestone (\$M)	Requested Federal Share (\$M)	Quarter due (from award date)
1					e.g., Q1
2					e.g., Q2
	FPP preconceptual design (must include this milestone)	Written report and oral presentation to DOE			No later than Q6
	FPP technology roadmap (must include this milestone)	Written report and oral presentation to DOE			No later than Q6
Etc.	Add rows as needed				
	Final milestone (must include this milestone)	Written report and oral presentation to DOE documenting successful preliminary design review (PDR) of FPP (Tier 1) or demonstration of significant performance improvement (Tier 2)			Q20 or earlier

See Section I of the FOA for more information on the milestone table and Section IV for application and submission information

Key Pre-Application Requirements

- ▶ Select one tier per pre-application
- ▶ Review coversheet requirements
- ▶ Review bulleted list in Section IV
 - ▶ E.g., FPP concept, FPP S&T and commercial requirements, performance gaps, team description, activities in support of EJ/DEIA, milestones, deliverable(s) at month 18 estimated project cost, applicant's resources
- ▶ Specify your preferred contractual option (not binding at the pre-application phase), i.e., fixed-support or expenditure-based TIA (see Sections II and III.B of the FOA for more information)

See Section IV of the FOA for application and submission information

Merit Review Criteria

- ▶ Scientific and technical viability (30%)
- ▶ Commercialization viability (30%)
- ▶ Business and financial viability (30%)
- ▶ Community Benefits Plan: Energy justice (EJ) and Diversity, Equity, Inclusion, and Accessibility (DEIA) (10%)

See Section V of the FOA for detailed Application Review Information

Community Benefits Plan

Community Benefits Plan: Energy justice (EJ) and Diversity, Equity, Inclusion, and Accessibility (DEIA)

- ▶ Potential long-term support of DOE's Justice40 policy priorities by the proposed commercialization pathway
- ▶ Fraction of total project cost devoted toward EJ/DEIA-centered activities
- ▶ Teaming opportunities for individuals from groups that are historically underrepresented in STEM, including minority-serving institutions (MSIs)
- ▶ Potential to contribute to the development of a diverse, skilled fusion workforce.
- ▶ Commitment to advance DEIA in the applicant team and organizations through evidence-based practices, with an emphasis on all aspects of DEIA and not only diversity
- ▶ Commitment to engage with communities to address their concerns regarding commercial fusion energy, including but not limited to environmental impact/burdens of the proposed fusion commercialization path
- ▶ Articulates how considerations of EJ and DOE Justice40 policy priorities may impact the project's R&D and FPP-design choices.

FOA Award Information (1 of 2)

- ▶ **Total Estimated Funding:** \$50M (total value) over the first 18 months of this program, subject to the availability of FY23 appropriations.
 - ▶ Additional funding for subsequent milestones up to a total period of performance of five years will be contingent upon awardees meeting early milestones and the availability of appropriated funding to continue this program in FY24 and beyond.
- ▶ **Period of Performance:** DOE anticipates awards with a period of performance of a maximum of 5 years, with initial funding covering only the first 18 months.
 - ▶ The intent is to allow awardees to continue pursuing their negotiated milestones up to 5 years, with continuation beyond 18 months contingent on: (1) availability of funds appropriated by Congress and future year budget authority, (2) continued fulfillment of negotiated milestones, and (3) compliance with the terms and conditions of the award.
 - ▶ Applicants should designate three budget periods of 18, 18, and 24 months in duration, respectively
- ▶ **Ceiling/Floor:** Expected range of award sizes is \$5,000,000 to \$25,000,000. Applicants should request sufficient funding to achieve their proposed results.
- ▶ **Expected Number of Awards:** DOE anticipates awarding between three and five (3–5) awards; the exact number of awards depend on the number of meritorious applications selected and the availability of appropriated funds.

FOA Award Information (2 of 2)

- ▶ **Types of Awards:** DOE anticipates awarding Other Transactions (OT) agreements via Technology Investment Agreements (TIAs) under this FOA. Multi-institutional teams *must* apply using a prime and subaward model with one application submitted by the lead organization.
- ▶ **Key Advantages of TIAs:**
 - ▶ Opportunities to negotiate IP
 - ▶ Eliminates cost accounting standards for fixed-support awards.
 - ▶ Fixed payments for milestone completion under fixed-support TIAs
- ▶ **Estimated Award Date:** It is anticipated that the award selection will be completed by FY 2023, and awards will be made in FY 2023

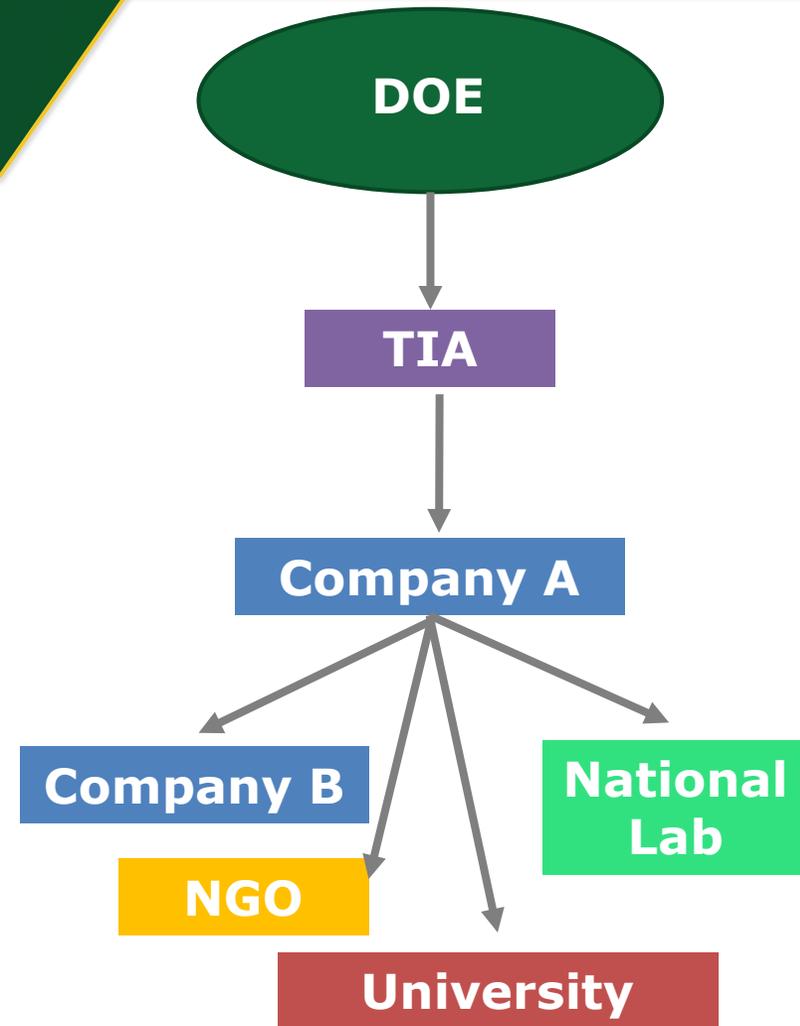
Tiers & Non-Federal Resources

	Tier 1	Tier 2
Fixed-support TIA. <i>eliminates cost accounting standards</i>	Non-Federal >50% of TPC	Non-Federal >50% of TPC
Expenditure-based TIA	Non-Federal >50% of TPC	Non-Federal >20% of TPC

Review Section IIIB for detailed requirements for non-Federal resource commitments



Team Structure



- ▶ Applications may *only* be submitted by for-profit domestic entities* because for-profit entities are the only entities capable of meeting technical milestones before funds are awarded
- ▶ Team members (not lead or standalone applicants) can be academic institutions, DOE/NNSA and non-DOE FFRDCs State, local, and tribal government entities, Federal agencies and instrumentalities (other than DOE), nonprofit organizations**

*Or the subsidiaries/affiliates of for-profit foreign entities that are incorporated in the United States, including U.S. territories.

**Except those described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995

Question & Answers

- ▶ Please submit questions using Zoom Q&A window, which should be accessible at the bottom of your Zoom window
- ▶ If your question is not answered today, or you have additional questions about the presentation, please submit to:
 - ▶ John Mandrekas (john.mandrekas@science.doe.gov)
 - ▶ Colleen Nehl (colleen.nehl@science.doe.gov)

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Where to find this information and more

- ▶ Where will this recording be posted

- ▶ Viewgraphs:

- ▶ Recording:

- ▶ Transcript:

- ▶ FAQs:

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

- ▶ Whom to contact:

- ▶ John Mandrekas: john.mandrekas@science.doe.gov

- ▶ Colleen Nehl: colleen.nehl@science.doe.gov

- ▶ PAMS Help Desk: sc.pams-helpdesk@science.doe.gov