

Appropriations

Overview by

Leland Cogliani, Lewis Burke Associates

Annie Bartlett, Federal Representative for Purdue

“No Money shall be drawn from the Treasury, but in Consequence of Appropriations made by Law.”

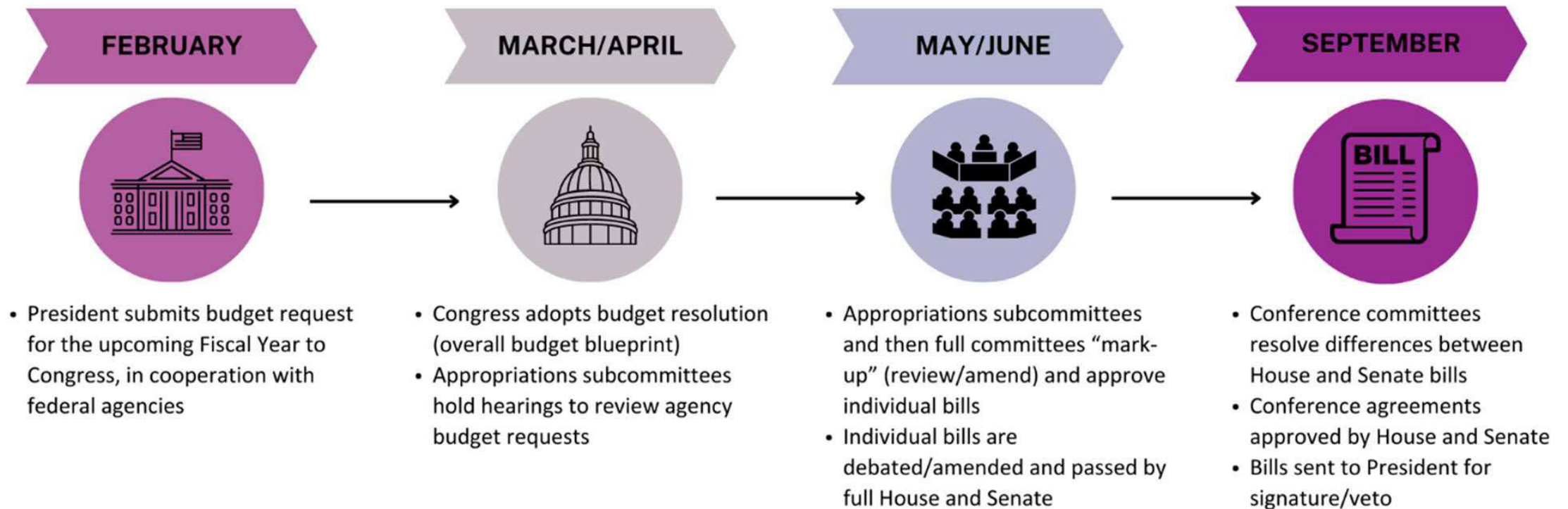
U.S. Const. art. I, §9, cl. 7.

What are Appropriations?

- Annual spending bills required by the Constitution to distribute around \$1.6 trillion in discretionary spending, including healthcare, science, energy, national security, education, and transportation programs.
- Within the committee structure established by Congress, the Appropriations Committees of the House and Senate develop the appropriations legislation.
- Each committee has a series of 12 subcommittees that develop and manage the consideration of one regular appropriations bill each fiscal year.

The Appropriations Process

- Typically, the subcommittees begin their work after the President submits an annual budget request to Congress and the individual agencies and departments submit detailed budget justifications for each agency.
- The subcommittees also usually host key officials from the agencies in their jurisdiction for hearings to get additional information on the justifications for the President's budget.
- Regular process for the appropriations cycle is the consideration of 12 separate bills that are passed by Congress (both House and Senate) and signed into law by the President by September 30, the end of the fiscal year.



Appropriations and the Indiana Congressional Delegation

- During the development process, the Appropriations Committees will invite input from Members, both on and off the committee, to develop priorities for the individual bills.
- As part of this aspect of the process, Members will solicit input from their constituents.
- These priorities are often referred to as “Congressional adds” and Congress directs the agencies to spend the money a certain way.
- Note that these are different from grants, which is money provided by agencies with funds appropriated from Congress. These are also different from community projects, formerly known as “earmarks.”

Purdue's Process



Purdue can play a role in shaping policy.



Annual process that begins with call for proposals from faculty.



Because this is a long, complicated process, submissions received after the September 15 deadline will not be considered.

What to Consider

- How is Purdue uniquely positioned to be part of this proposal?
- Requests should not replicate what is typically funded through federal competitive grant processes and existing funding solicitations.
- Requests should be aligned with federal agency priorities and investment areas.
- Partnerships with entities outside of Purdue can often be beneficial. The more partners involved the more congressional delegations Purdue can engage.
- Throughout the process Congress will communicate with the relevant agency. After the appropriations process is completed, we will need to work to ensure the funding actually comes to Purdue. This requires good relationships with the relevant agencies.

Collaboration

- The most competitive ideas will be advanced based on Purdue strategic priorities, alignment with federal government investments, and Indiana congressional delegation topics of interest.
- Once Purdue has identified its priorities, we work with the Indiana Congressional delegation to familiarize them with these priorities so they can champion them with the Appropriations Committees in both the House and Senate.

Examples of FY 2025 Purdue Appropriations Priorities

- Mach-8 quiet wind tunnel construction (\$10 million)
- Hydrogen gas turbine demonstration (\$10 million)
- Agrivoltaics demonstration (\$10 million)
- In-space Manufacturing Institute (\$20 million)
- Tech Diplomacy Training Program at State
Department

Advanced Hydrogen Gas Turbine

Request amount (if applicable): \$10 million

Subcommittee: Energy and Water

Request type (program or language): Report Language

Agency: Department of Energy

Program: Fossil Energy and Carbon Management

Account: Carbon Management Technologies/Hydrogen with Carbon Management

FY 2023 Enacted for Hydrogen with Carbon Management: \$95 million

FY 2024 Appropriations for Hydrogen with Carbon Management: \$85 million

FY 2025 President's Budget Request: \$85 million and DOE will continue to invest in "the development of hydrogen combustion systems"

Report Language Request: Within funding for Carbon Management Technologies, the Committee recommends \$10,000,000 for a full-scale demonstration of a hydrogen-fueled rotating detonation combustion gas turbine.

Summary

In FY 2025, \$10 million is requested to advance research, development, and demonstration activities for the Rotating Detonation Combustion Turbine Integration Program (RDGT). Gas turbine engines using rotating detonation and hydrogen are innovative and can significantly increase operational efficiency and reduce greenhouse gas emissions. This technology is innovative because a novel type of combustor is attached to a gas turbine that uses supersonic shockwaves instead of traditional burning to combust more efficiently. Prior DOE funding has demonstrated the feasibility of this new approach, but additional funding is needed for a larger-scale demonstration to commercialize the technology.

Background

In 2021, DOE awarded Purdue University \$1.1 million to perform a limited-scope technology demonstration of an Indiana-built Rolls-Royce M250 gas turbine with hydrogen-fueled rotating detonation. DOE is investing in rotating detonation gas turbine technologies because they can achieve a 5 percent improvement in overall cycle efficiency. This efficiency improvement is considered significant because typical gas turbine improvements are usually a tenth of a percent. Such a step change in efficiency over current power plants would provide dramatic cost and carbon emissions savings. These investments would also maintain U.S. leadership in this area of technology, in which China is also investing heavily. This new technology could also leverage DOE's large-scale hydrogen investment as the Hydrogen Hubs, since hydrogen would be a critical feedstock for this new technology. The chemical properties of hydrogen make it uniquely suited for rotating detonation combustion.

The first phase of DOE funding ends in 2024. Despite DOE support and positive results of the feasibility study, DOE plans to prioritize additional materials research over continuing to advance the demonstration of rotating detonation combustion. The request would build on prior DOE funding program success and fund the next demonstration phase of the technology to further de-risk the technology and move toward commercialization and adoption. This work would be in partnership with Rolls-Royce and the DOE National Energy Technology Laboratory. This would also be consistent with

report language in the FY 2023 Energy and Water bill promoting RDGT: "The Committee is encouraging ongoing research and development activities related to hydrogen-fueled rotating detonation combustion...The Department is encouraged to consider support for a full-scale demonstrator program for this device."

Request Justification

The request would fund the next phase of the current DOE-funded project. The next phase involves designing and testing a closed-loop gas turbine engine to demonstrate continuous operation with improved efficiency and reduced carbon emissions power generation. With soaring temperatures and huge temperature swings, the gas turbine needs new thermal management solutions alongside rotating high-temperature alloys. The inherent unsteady flow dynamics warrant an in-depth exploration of structure interactions, vibratory behaviors, and resulting noise generation. Central to this effort will be refining turbomachinery blade designs, harnessing flow control, and advancing exhaust nozzle strategies to minimize engine noise through acoustic liners, shielding, and innovative flow approaches.

Critical to this effort is holistic engine optimization, underpinned by high-frequency instrumentation capturing intricate performance nuances across all components. The demonstration project will leverage the modularly-designed Rolls-Royce M250, a platform amenable to instrumentation and component replacements. Simultaneously, Computational Fluid Dynamics (CFD) will offer analytical insights, complementing experimental data.

In summary, the highest priorities for the next phase include:

- optimizing the M250 engine's exhaust management, encompassing exhaust fume routing, treatment, and the integration of enhanced electrical systems;
- add permanent hydrogen and nitrogen lines with necessary components like valves;
- direct the compressor discharge to the combustor inlet, requiring specialized equipment procurement and adaptations in the engine control system; and
- advance health and safety protocols and
- introduce cutting-edge thermal management, tailoring a combustor for higher temperature operations and reduced dilution ratios.

Purdue Strengths

Purdue University is currently leading the DOE-funded feasibility study. Purdue University is home to the Purdue Experimental Turbomachine Aerothermal Laboratory (PETAL), and it would be the site for the next phase of the project. The facility can provide air mass flows up to 30 kg/s, temperatures up to 1000 K and pressures up to 8 bar in the settling chamber. The PETAL facility is uniquely suited for extended duration tests, sometimes over an hour, and short transients for heat flux measurements. This experimental tri-sonic facility can operate continuously and perform transients needed for accurate flux, performance, and optical measurement techniques. PETAL owns two modular wind tunnels with two separate settling chambers and two sonic valves. The two wind tunnels have three different test sections. The team would also have access to Purdue's state-of-the-art Hypersonic Ground Testing Center.

Additionally, several Rotating Detonation Combustor facilities were developed in recent years. The Turbine High pressure-integrated Optical RDE (THOR) rig can be equipped with several

Examples of FY 2025 Purdue Appropriations Priorities

Execution of Appropriations Add

- It may take as long as two years to receive funding through the congressional appropriations process
- Nuclear Energy Example:
 - January 2022: Purdue advanced concept for a nuclear university research infrastructure program
 - December 2022: Congress passed final FY 2023 appropriations bill including:

Within available funds for NEUP, SBIR/STTR, and TCF, the agreement provides up to \$12,000,000 to revitalize existing university nuclear research infrastructure, especially in support of nuclear cyber-physical protection, new digital technologies in advanced nuclear reactors, and the development and safety assessments of small modular reactors.

- March 2023: DOE releases request for information
- December 2023: DOE released funding solicitation
- May 2024: Purdue awarded \$6 million

FY 2023 President's Budget Request: Not yet available

FY 2023 funding request: \$12 million to upgrade and refurbish existing university nuclear research infrastructure

FY 2023 report language request: Within funding for the Nuclear Energy University Program, the Committee recommends \$12,000,000 to revitalize existing university nuclear research infrastructure, especially in support of nuclear cyber-physical protection, new digital technologies in advanced nuclear reactors, and the development and safety assessments of small modular reactors.

Program and Funding Justification: Currently, approximately 20 percent of America's electricity comes from nuclear power and is the largest carbon free energy source. Meeting ambitious net zero clean energy goals will require nuclear energy, including a skilled workforce and advanced nuclear technologies that can be integrated with the grid of the future. To fully take advantage of nuclear energy, the U.S. must modernize its nuclear energy research infrastructure.

The current nuclear science and engineering infrastructure at U.S. universities originated in the 1950s and 60s. It is nearly 70 years old and has achieved its objectives, return on investment, and exceeded its design lifetime. Its funding levels are modest and maintenance oriented. In fiscal year (FY) 2021, DOE provided \$5.9 million through its Nuclear Energy University Program to support 25 existing university-based research and test reactors as well as other research infrastructure. This level of funding year over year is not sufficient to maintain existing capabilities let alone grow capabilities needed to support the next generation of advanced reactors and future nuclear workers.

We propose doubling funding to \$12 million in FY 2022 to begin making necessary infrastructure investments at the country's 35 nuclear science and engineering research universities. This type of investment would be consistent with bipartisan calls to invest more in



REQUEST FOR INFORMATION (RFI)

DE-SOL-0008318

Base: April 13, 2015
MOD 0001: July 19, 2018
MOD 0002: March 30, 2023

Input on Potential Office of Nuclear Energy Infrastructure Areas for Competitive Opportunities

Office of Nuclear Energy
Office of Nuclear Energy Technologies

FINANCIAL ASSISTANCE FUNDING OPPORTUNITY ANNOUNCEMENT



U. S. Department of Energy

Idaho Operations Office

Fiscal Year 2024 University Nuclear Research
Infrastructure Revitalization

Funding Opportunity Announcement: DE-FOA-0003042

Announcement Type: Initial
Assistance Listing Number: 81.121

Issue Date: December 6, 2023

Informational Webinar: December 13, 2023

Video links and presentations will be available at www.NEUP.gov

Application Due Date: February 14, 2024, at 5:00 p.m. Eastern Time

Purdue leading \$6M DOE-sponsored research for small modular reactor and advanced reactor technologies



Conclusion

- Note the deadlines on the website.
- Strong candidates will balance Purdue's strengths with federal priorities and national interests.
- This is a long process that will not conclude until the President signs the appropriations bills into law.

Frequently Asked Questions

Question: I have a good idea with a developed outline and most of the pieces, but I am not sure what agency could fund this.

Answer: Submit your proposal and we can work with you on agencies' interest and how to fine tune your proposal.

Question: If my proposal is selected by Purdue as a priority, what are the next steps?

Answer: We will work with the PI and colleagues to develop a 2-3 page document that lays out the proposal, the partners (if applicable), relevant requested language, and other details. This document is used to submit the priority to the Indiana delegation. The individual members of the delegation then decide what are their priorities and submit them to the Committees. Then the Committees decide what to include in their bills. Then those bills need to move through the process.

Question: What is the difference between a congressional add and an earmark/community project?

Answer: A congressional add provides guidance to a federal agency to prioritize funding for a specific program or project but it is still competitive. In most cases a federal agency will put out a solicitation and a research university must submit a proposal and go through peer review or program manager review. An earmark directs money directly to a research university but there are specific rules that must be followed, many types of activities are not allowed (no construction), and it is a highly competitive process

Frequently Asked Questions (cont'd)

Question: What are my options if my proposal is not selected as Purdue priority?

Answer: The Office of Research can help coordinate feedback.

Question: How many priorities does Purdue have each fiscal year?

Answer: The goal is to not have more than one priority in each of the 12 Appropriations bills.

Question: If I submitted a proposal that was selected in FY 2025 and I need additional support in FY 2026, do I need to resubmit.

Answer: Yes. Everyone must resubmit proposals each year. Please include any changes to proposed funding or scope of work.

Question: If I submitted a proposal in the past and it wasn't selected, should I resubmit again?

Answer: Yes. Priorities change each year and your proposal could be selected in the next cycle.

Question: Do I need to have previously responded to a funding solicitation or socialized this idea with federal agency officials?

Answer: In general, yes. We like to build on prior federally-funded work that is aligned with agency priorities and typically has a program manager as a champion of associated research activities. If it is a novel program, the first step is usually creating a new program through authorizing legislation, such as the annual defense policy bill, farm bill, or energy bill.