DOE Office of High Energy & Nuclear Physics Report

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Physics Research Director, HENP

May 15, 2026

The Honorable Darío Gil, Under Secretary for Science

Office of Nuclear Physics at a Glance

Mission: Discover, explore, and understand all forms of nuclear matter.

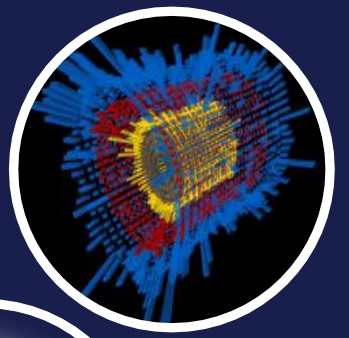
Seeks to understand **subatomic matter**, including exotic matter inside neutron stars and in the early days of the universe, **and how that knowledge can benefit society (critical technologies, medicine, and national security)**.

Largest supporter (>95%) of U. S. nuclear physics research

FY 2026 Enacted $866.141M

Supports over **1,400 Ph.D. staff** and **720 graduate students**

FY 2026 Research: 23%



Facilities**: ATLAS**, **CEBAF**, and **FRIB**, and **RHIC**

FY 2026 Operations: 57%

>4,000 users annually

In construction: Electron-Ion Collider will probe the inside of the proton

FY 2026 Construction: 20%

NP Avenues for Discovery

Probing Proton Substructure

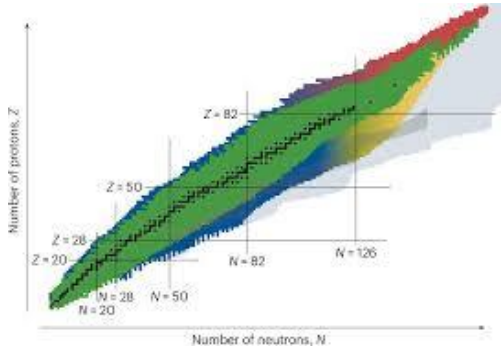
Reveals dynamics, structure, and spin for protons and neutrons

- Heavy ion collisions and electron scattering informs our understanding of nuclear phenomena and the formation of the universe
- U.S. provides the **world's highest intensity**, **polarized** electron beams for this science

Exploring the Isotope Landscape

Enables element and isotope discovery

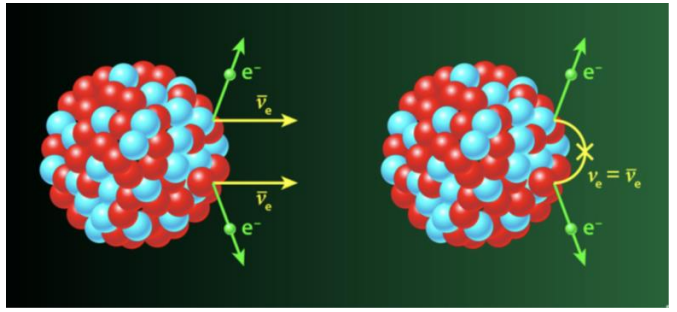
- Reaction rates and structure data for national priorities
- Superheavy elements provide a fertile ground for tests of theory
- **Nuclear data** and capabilities for characterization of electronics (e.g., defects, radiation-induced failures)



Studying Rare Decays

Targets natural processes that break conservation laws and symmetries

- **Data-driven science** to explain the matter-antimatter balance
- Extreme high-precision detectors translate to other applications
- Nuclear-science-based innovation for **Quantum Information Science**



Crosscutting: Theory, AI, Advanced Computing, Accelerator & Detector R&D

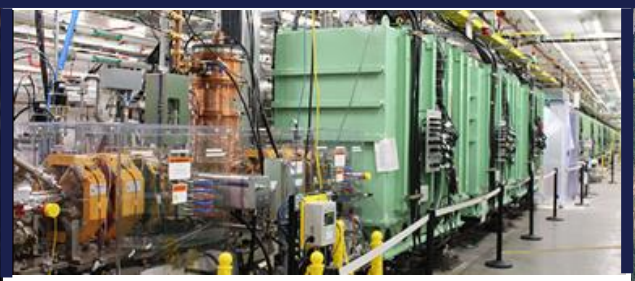
NP user facilities provide critical capabilities to maintain U.S. scientific leadership

- Access to three accelerator-based facilities for exploring nuclear matter in all forms
  - **Facility for Rare Isotope Beams** and **Argonne Tandem Linac Accelerator System** study how protons and neutrons combine to form the atomic nucleus.
  - **Continuous Electron Beam Accelerator Facility** seeks to understand quarks and gluons, the elementary building blocks of protons and neutrons.
- Open to all scientists, this suite of facilities forms the backbone of the nation's nuclear physics research infrastructure.
- Over 4,000 users from the scientific community access these facilities annually.
- **Relativistic Heavy Ion Collider** ended operation in FY 2026 – support continues for users to analyze data and for hadron injector operations for isotopes and microelectronics testing missions.

RHIC@BNL

ATLAS@ANL

FRIB@MSU



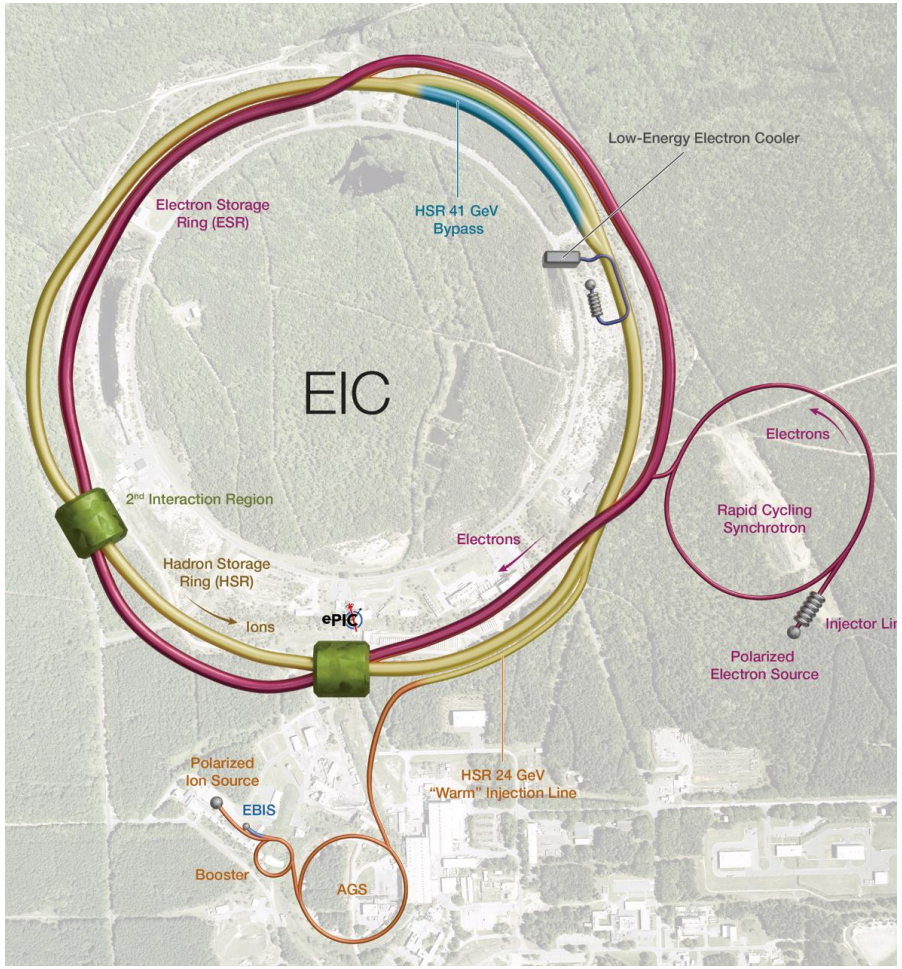
CEBAF@TJNAF

NP Projects Status

Project	Location	Status	Cost	CD-4
Construction Projects				
Electron-Ion Collider (EIC)	BNL	CD-3B	$1.7B to $2.8B (Est)	Q1 FY36 (Est)
Major Items of Equipment				
Gamma Ray Energy Tracking Array (GRETA) Fully Funded, Delegated	LBNL	CD-4A	$58.3M (TPC)	Q2 FY28
Measurement of a Lepton-Lepton Electroweak Reaction (MOLLER) Fully Funded	TJNAF	CD-2/3	$48.66M (TPC)	Q4 FY28
High Rigidity Spectrometer (HRS) High Transmission Beam Line (HTBL) SPectrometer Section (SPS)	MSU	 CD-2/3 CD-1	 $49.7M (TPC) $65.5M - $87.3M (Est)	 Q3 FY30 Q2 FY32 (Est)
Ton Scale Neutrinoless Double Beta Decay (TS-NLDBD) Near-term LEGEND-1000	 ORNL	 CD-0	 $409M to $665M (Est)	 TBD

Electron-Ion Collider: Top Priority for New Facility Construction in the Nuclear Science Long Range Plan

- Located at BNL, using existing RHIC assets, with TJNAF as a major partner.
- Estimated cost range of $1.7 billion to $2.8 billion.
- In-kind contributions: New York State and International partners
  - $100M grant from New York supports civil construction
  - ~$90M anticipated for the detector ePIC (~30%)
  - ~$50M anticipated accelerator scope (~5%)
- Critical Decision-3A (long lead procurement): March 2024
- Critical Decision CD-3B (second long lead procurement request) approved January 2026.
- Project elaborating its subproject strategy.

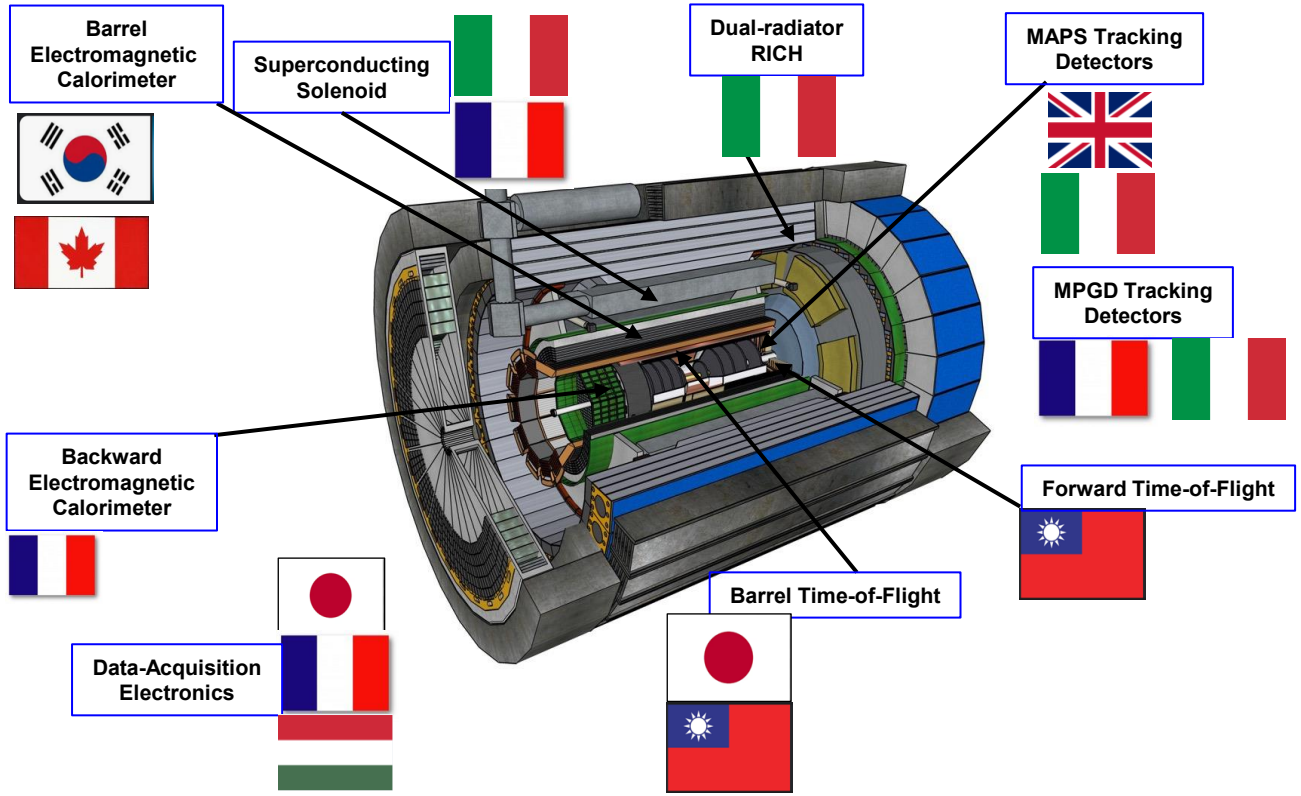


NP International Engagement Continues to Grow

Topics of mutual interest:

- Alignment with NP mission and scope.
- Alignment with mission and scope of international partners.
- Capabilities of the participating international partners.

EIC User Group: 1,562 members from 310 Institutions in 41 countries (March 2026)



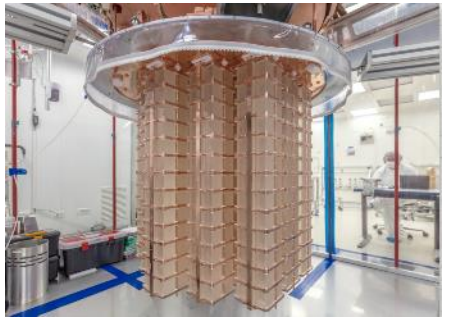
Expressed interests in the ePIC central detector subsystems labeled by country

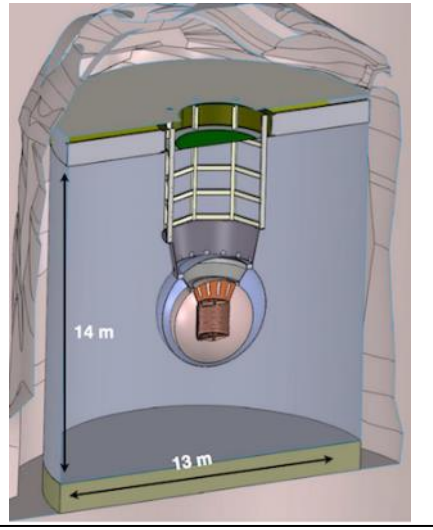
Neutrinoless Double Beta Decay: Top Priority for New Experiment Construction in the Nuclear Science Long Range Plan

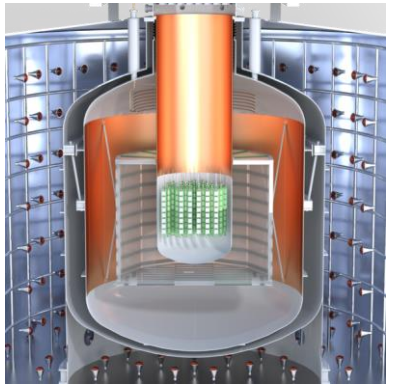
- Roughly $20.0M has been allocated since 2020 to explore three technologies: CUPID, LEGEND-1000, nEXO, and; supporting conceptual design and R&D.
- **In December 2024, LEGEND-1000 selected as the first priority for NP investment.** (est. cost $500 M)
- A multi-pronged campaign to detect neutrionless double beta decay is an international enterprise.
- Funding agencies representatives from Canada, France, Germany, Spain, United Kingdom, and the U.S. (DOE and NSF) are working to establish a framework for continued coordination.

Three proposed technologies:

- Scintillating bolometry (CUPID, ^{100}Mo enriched Li_2Mo_4 crystals)
- **Enriched ^{76}Ge crystals (LEGEND-1000, drifted charge, point contact detectors) – 1st priority for NP support**
- Liquid Xenon TPC (nEXO, light via SiPM, drifted ionization)





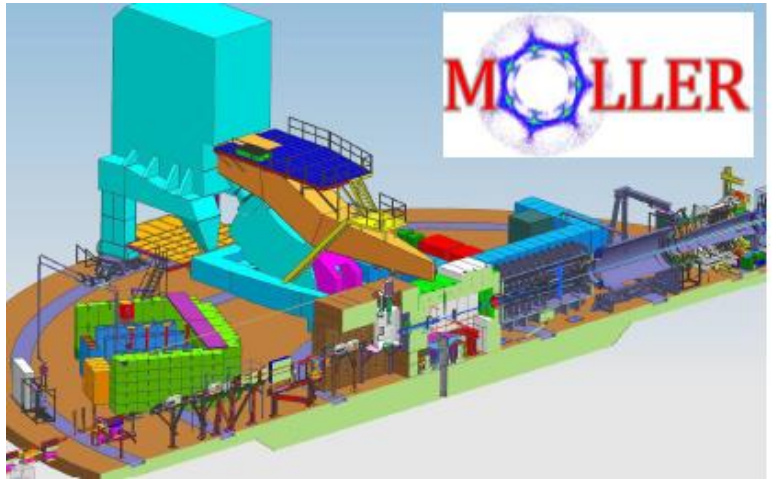


Status of other MIE projects

Gamma Ray Energy Tracking Array (GRETA)
for FRIB, ATLAS (LBNL)

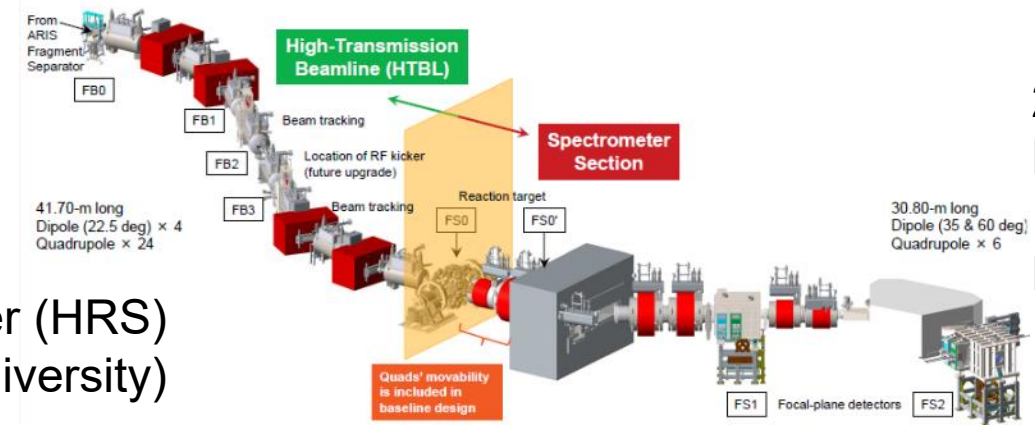
Fully funded and delegated: Approved for early science

Measurement of a Lepton-Lepton
Electroweak Reaction (MOLLER) for CEBAF



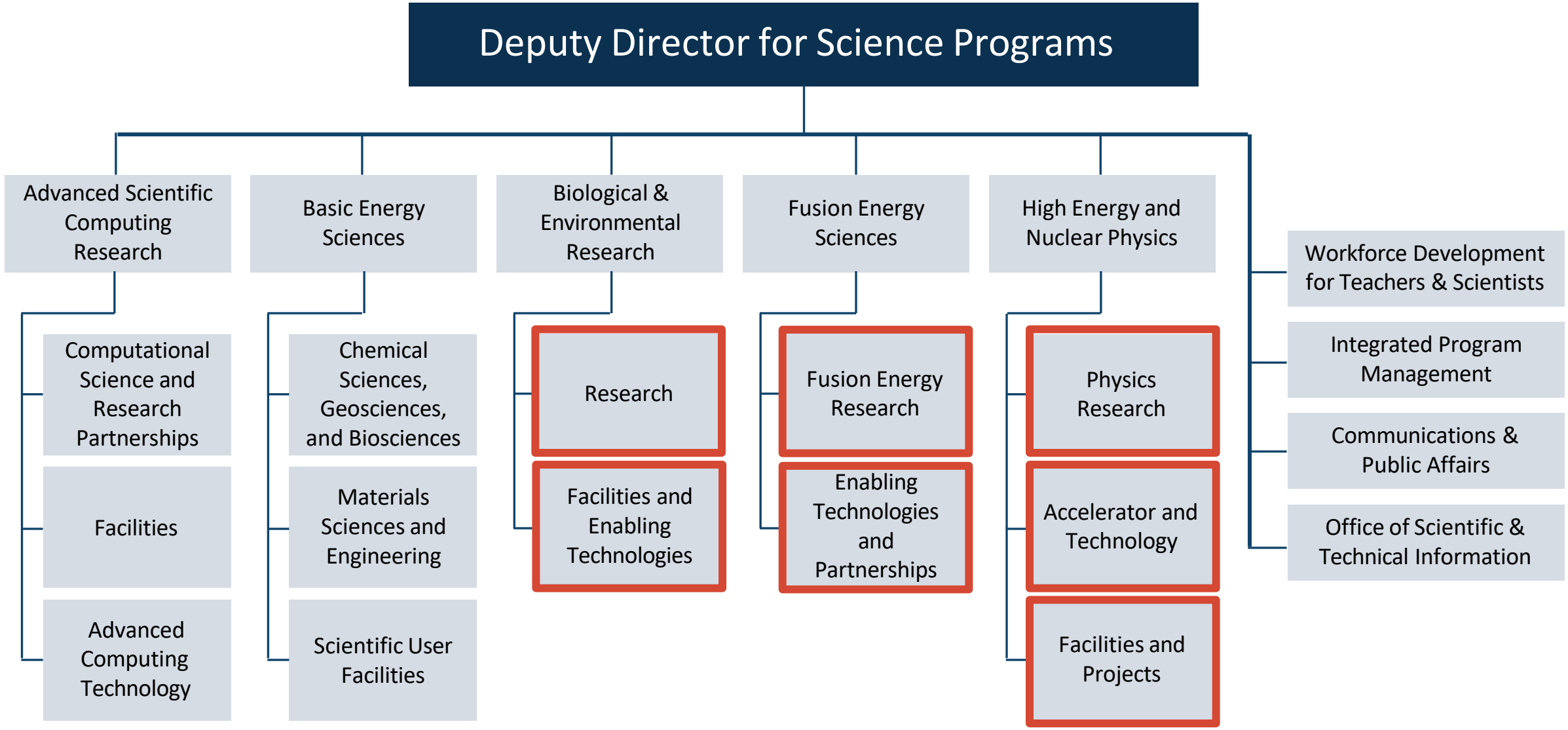
Fully funded: CD-2/3 achieved May 2024

High Rigidity Spectrometer (HRS)
for FRIB (Michigan State University)

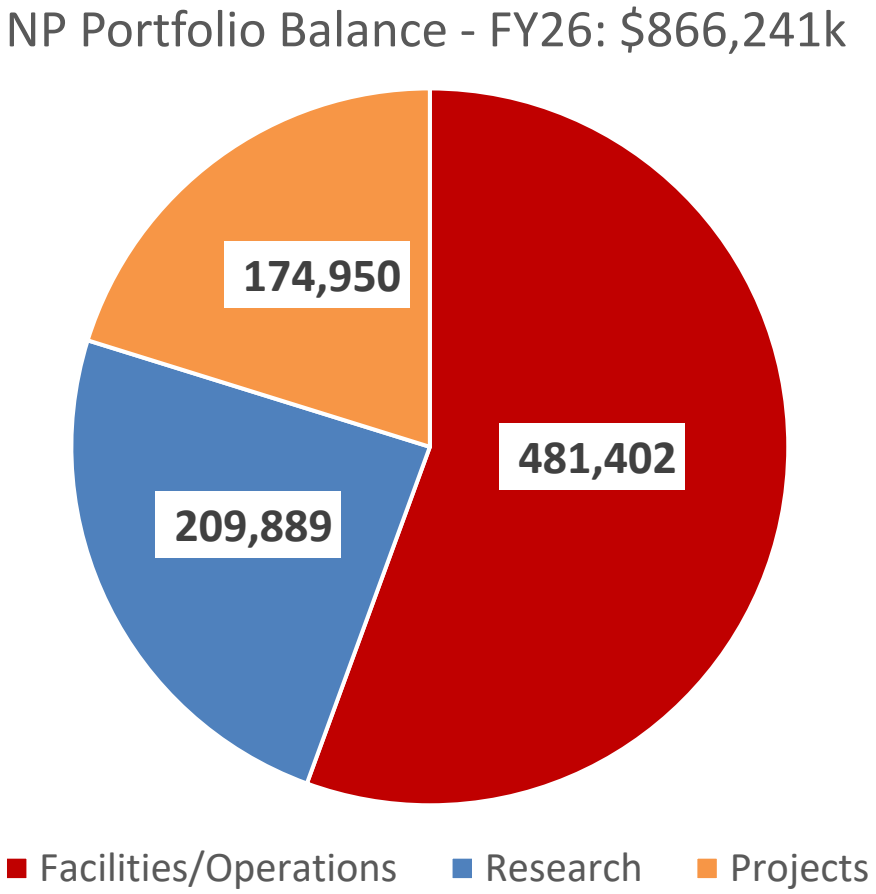


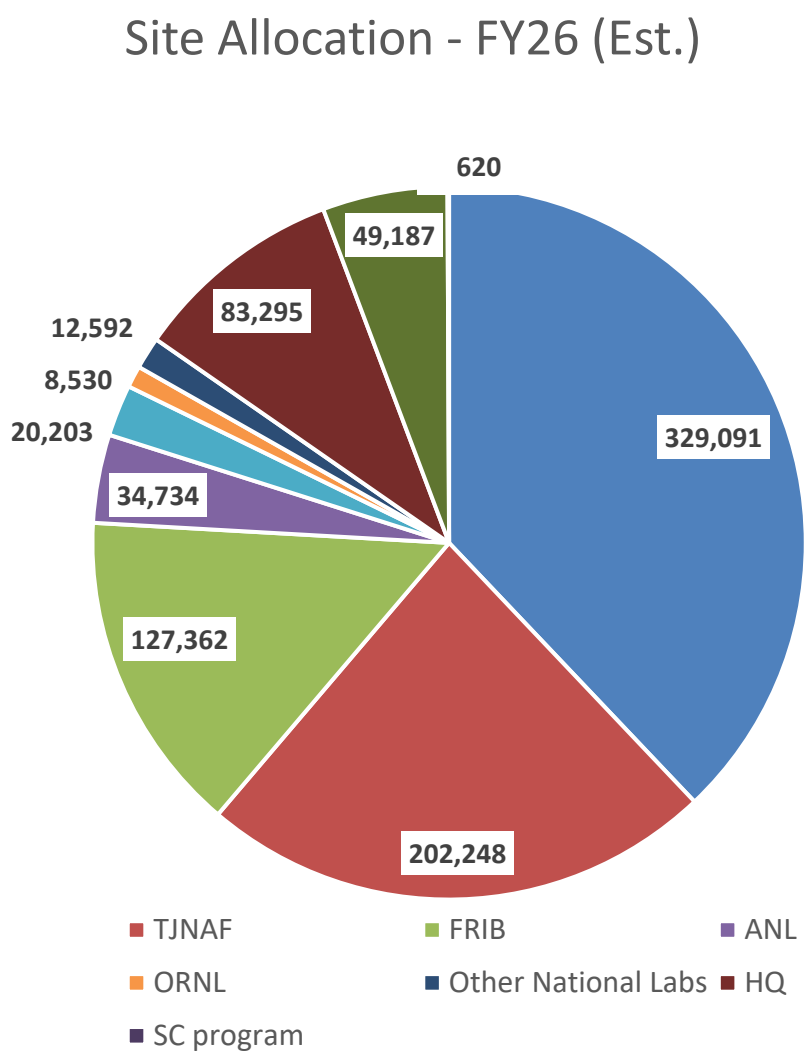
2 subprojects – Spectrometer plus
High-Transmission Beamline (HTBL)

HTBL CD-2/3 achieved Feb 2025


Deputy Director for Science Programs
Advanced Scientific Computing Research
Basic Energy Sciences
Biological & Environmental Research
Fusion Energy Sciences
High Energy and Nuclear Physics
Workforce Development for Teachers & Scientists
Integrated Program Management
Communications & Public Affairs
Office of Scientific & Technical Information
Computational Science and Research Partnerships
Facilities
Advanced Computing Technology
Chemical Sciences, Geosciences, and Biosciences
Materials Sciences and Engineering
Scientific User Facilities
Research
Facilities and Enabling Technologies
Fusion Energy Research
Enabling Technologies and Partnerships
Physics Research
Accelerator and Technology
Facilities and Projects

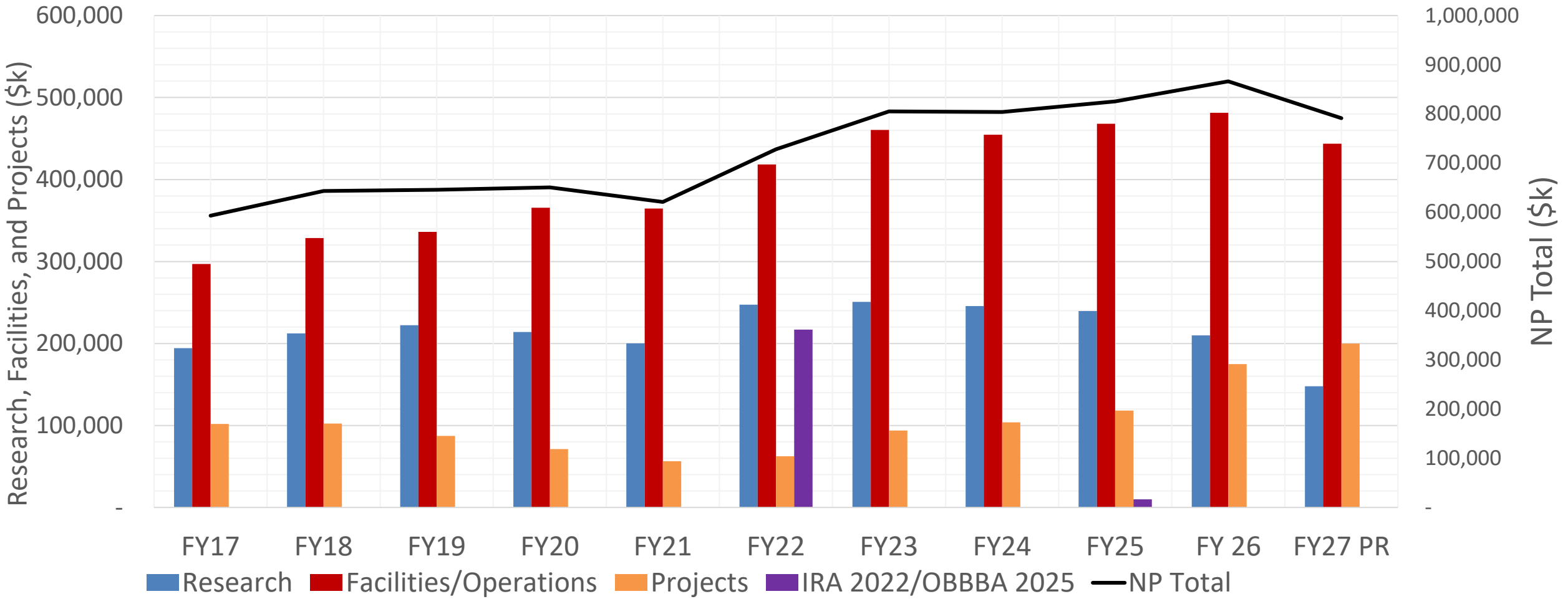
NP FY 2026 Allocation Distribution (Est.)





FY26 SBIR and SC program support included, ~$10,000k

Trends in DOE-NP Appropriations



FY 2027 PR $791.4M: Facility operations at ~90%, EIC support at $200.0M. Research down $62.1M compared to FY 2026 Enacted.

FY 2026 Notices of Funding Opportunities (NOFOs)

Title	Release Date
FY 2026 Continuation of Solicitation for the Office of Science Financial Assistance Program	9/30/2025
Early Career Research Program	3/3/2026
Building EPSCoR-State/National Laboratory Partnerships	2/18/2026
The Genesis Mission: Transforming Science and Energy with AI	3/17/2026

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DOE Office of Science WDTS programs

Funded through DOE SC's Workforce Development for Teachers and Scientists (WDTS) program. Other programs complement the SCGSR for workforce development.

All areas of NP are supported by this program.

DOE Office of Science Graduate S... | U.S. DOE Office of Science (SC)

Science Undergraduate Laboratory Internships (SULI)

Community College Internships (CCI)

Visiting Faculty Program (VFP)

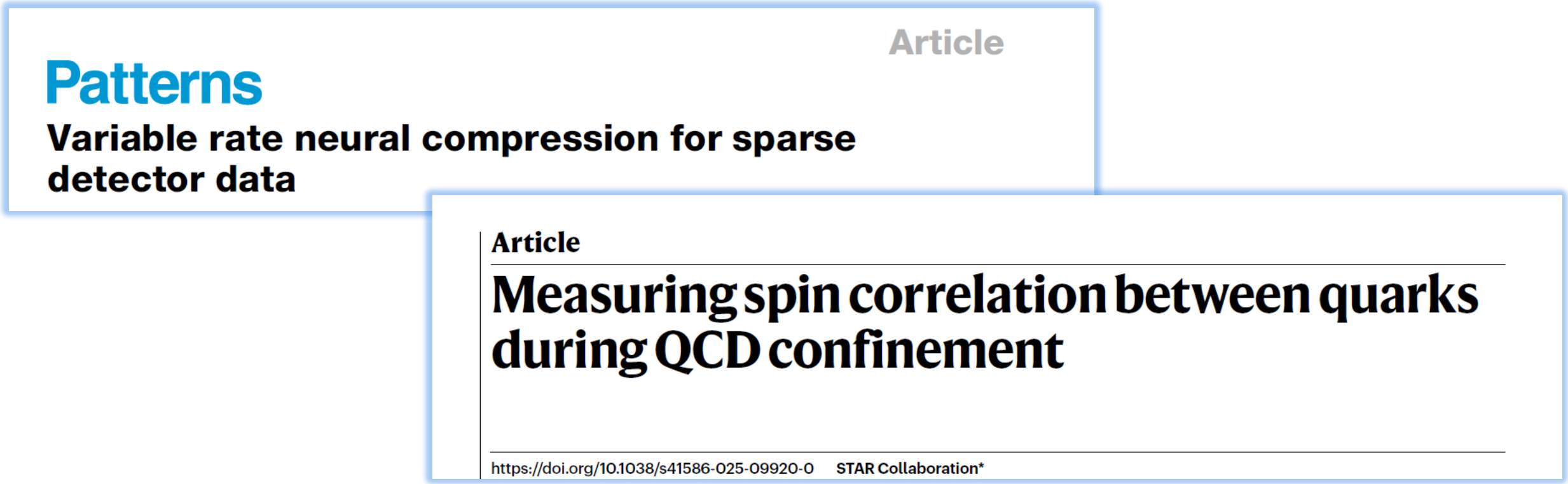
Office of Science Graduate Student Research (SCGSR)

Relevant NP priorities

2025: Successful completion of the Au+Au sPHENIX campaign to measure “jet and heavy flavor observables with unprecedented statistical precision and accuracy” ☑

2025: Continued timely and impactful science results from STAR and PHENIX to fully realize the RHIC scientific mission

2025: Crucial data and analysis preservation to usher in the ‘multimessenger’ era



End of an Era at RHIC

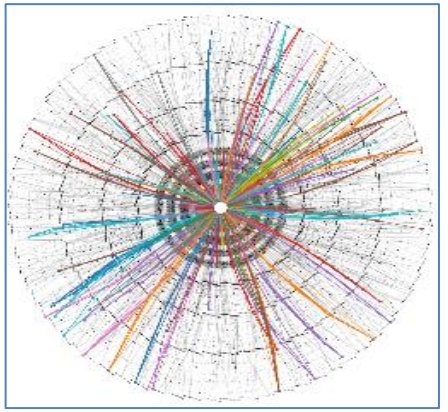
At approx. 9:00 am ET on February 6, 2026, the DOE Undersecretary for Science brought operations of the RHIC collider to a close.

RHIC's Greatest Hits

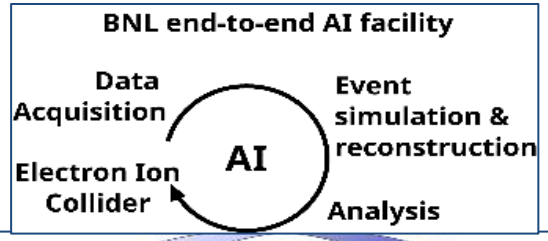
2005 Discovery of a hot, dense "perfect liquid"
2010 The liquid's temperature, at 4 trillion degrees Celsius, confirms it is a quark-gluon plasma
2014 Gluons are found to contribute to the spin of the proton
2015 Discovery that antiprotons attract each other like regular protons
2017 The quark-gluon plasma is deemed to be the "swirliest" fluid ever
2021 Discovery that colliding photons may make matter and antimatter
2023 Spins of gluons are found to align with the spin of the proton they're inside, further evidence that gluons make up proton spin
2024 Discovery of the heaviest antimatter nucleus, antihyperhydrogen-4

Genesis Mission and Nuclear Physics

- Coordinating with ASCR, HEP, and other SC programs, **NP is advancing its mission through the development of AI-ready datasets and AI models that can take advantage of them.**
- Two discovery science national challenges targeted:
  - Unifying Physics from Quarks to the Cosmos
  - Enhancing Particle Accelerators for Discovery
- While the NP community has actively employed AI methods, the Genesis Mission offers a unique opportunity to overcome workflow pinch points and synthesize data from disparate domains.
- The development of domain-specific data standards and metadata for multi-modal data, including expert knowledge documentation, **will feed the American Science Cloud (AmSC)**, using the power of AI to accelerate **discovery of new physics** and progress on the fundamental questions on the nature of nuclear matter.



Event Reconstruction with Geometric Deep Learning



Genesis Mission

The Genesis Mission: Transforming Science and Energy with AI

- DOE Funding Opportunity DE-FOA-0003612 Announced: March 17, 2026. DOE anticipates a total of $293.76 million in prior and current fiscal year funds will be used to support awards under this RFA.

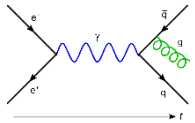
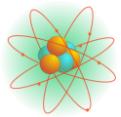
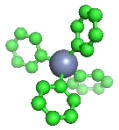
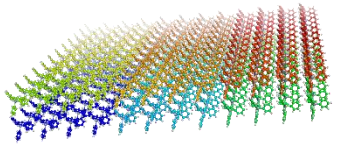
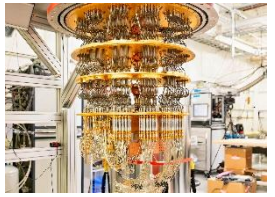
- RFA is a collaboration between Office of Science (SC), Office of Critical Minerals and Energy Innovation (CMEI), Office of Environmental Management (EM), Office of Electricity (OE), Hydrocarbons and Geothermal Energy Office (HGEO), and Office of Nuclear Energy (NE) covering many focus areas within 21 distinct topics.

- The RFA is open to interdisciplinary teams from DOE National Laboratories, U.S. industry, and academia. Phase I awards will range from $500,000 to $750,000 and will support a nine-month project period. Phase II awards are expected to be significantly larger for a three-year project period. Teams may apply directly to either phase in FY 2026, and successful Phase I teams will be eligible to compete for larger Phase II awards in future cycles.

- **The Phase I applications and Phase II letters of intent are under review. Phase II applications are due May 19, 2026.**

Note: The Genesis Mission Consortium will offer a partnership service to facilitate finding partners for this RFA. Use of the service is optional and membership in the consortium is not required to use the partnership service.

SC's QIS Portfolio Spans its Technical Breadth

	Subatomic	Nuclear	Molecular	Material	Quantum Device
Length Scale:					

SC's portfolio of fundamental science and enabling capabilities and infrastructure for QIS spans its six core science programs and the Isotope Program.

ASCR	BES	FES	BER	HEP	NP	IP
Quantum Algorithms; Computer Science; Networking; Testbeds and HPC	New Quantum Phenomena; Quantum Computing for Materials and Chemistry; Infrastructure	Qubit Synthesis; Quantum Computing and Sensing for Fusion and Plasma Science	New Quantum-Enabled Methods for Bioimaging and Biosensing	Quantum Theory, Sensing, and Computing for Physics; Technology Development	Spin Qubits; Quantum Computing, Simulators and Sensors; Nuclear Clocks	Isotope Research, Production, and Distribution for QIS

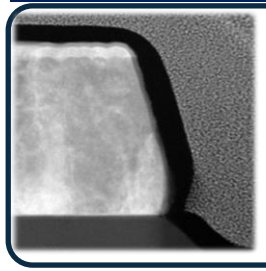
National QIS Research Centers | Q-NEXT, C^2QA, SQMS, QSA, QSC

Enabling Infrastructure | X-ray light and neutron sources, NSRCs, Foundries, Quantum Testbeds, QC User Program, …

https://science.osti.gov/Initiatives/QIS

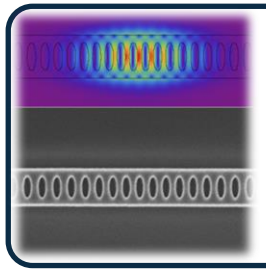
FIVE CENTERS, ONE MISSION – Achieve Critical Breakthroughs in Quantum Science, Technology and Engineering for Scientific Discovery

Addressing key roadblocks to quantum utility with unique solutions



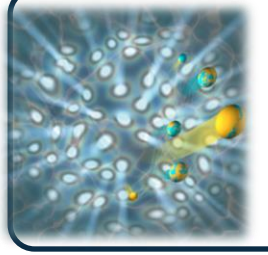
Overcoming errors

- Eliminating material decoherence
- Resource-efficient error correction
- Advanced cryogenics



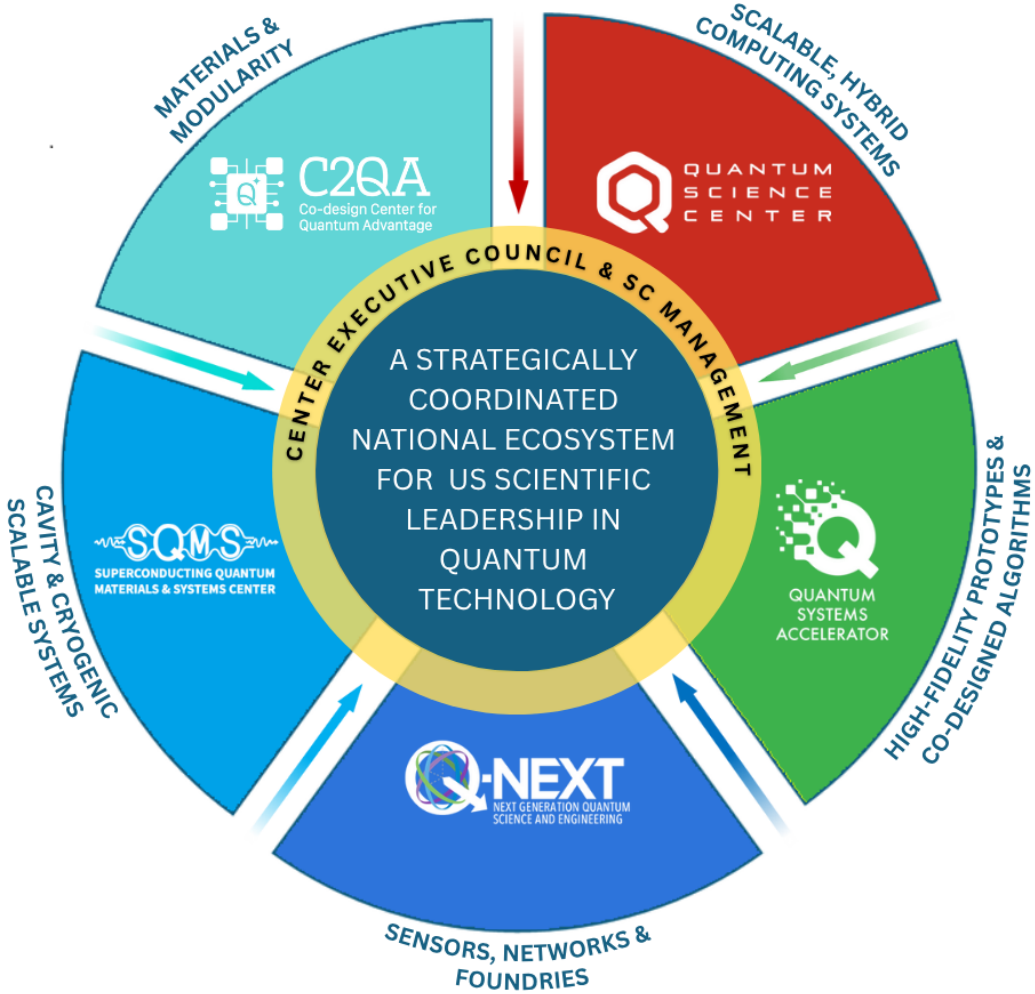
Unlocking scaling

- Distributed entanglement
- Cross-platform architectures
- Hybrid quantum-accelerated HPC



Enabling impact

- Quantum simulations of materials
- Interconnected quantum sensors
- New algorithms for scientific research



Office of Science Advisory Committee Charges

Facilities of the Future Charge

- Review proposed facilities and upgrades, identify any gaps, and prioritize the facilities that are most crucial to the needs of the nation for the next ten years (2026-2036)
- Consider how proposed facilities integrate with and support the Genesis Mission for AI and QIS, as well as other Administration priorities in fusion, microelectronics, biotechnology, and discovery science

AI for Transformative Science Charge

- Identify how to prioritize SC resources to accelerate the application of AI for transformative scientific and engineering discovery focused on pressing national science and technology challenges
- Create a decadal roadmap articulating near, mid, and long-term priorities for SC to achieve the Genesis Mission

Quantum Computing Roadmap Charge

- Create a roadmap to identify near-term steps to a concrete 2028 goal of an error-corrected quantum computer capable of revolutionary science
- Assess current landscape, noting technical opportunities, gaps, and public-private partnerships to leverage impact

HENP Summary

- The HEP and NP programs focus on answering the most fundamental questions about matter, energy, space and time.
- We do this by building and operating state-of-the-art facilities and instruments, collecting and analyzing large, complex data sets and publishing scientific results. Facility operations and data processing continue to be enhanced by the application of AI tools.
- Both programs have been guided by planning processes that evaluate the science and sets priorities such that the focus remains centered on answering the most pressing and compelling questions.

  -- Budget realities have not matched outyear scenarios, making it challenging to execute the vision set out in the plans.

  -- HEP and NP are executing a portfolio of projects launched this decade and should have construction completed within the coming decade, setting us up for producing record breaking quantities of data and world leading results for decades to come.
- The synergies between HEP and NP will enable a smooth transition in support of the SC realignment.

Thank you