DOE High Energy Physics
Intensity Frontier Program and Funding Opportunity Announcements

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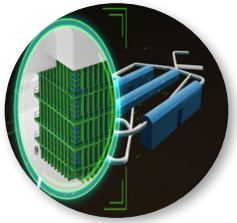
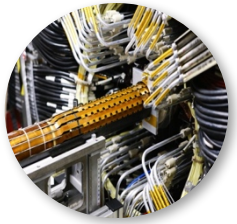
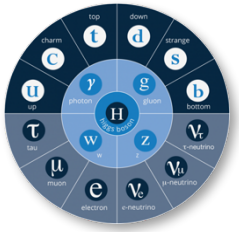
2024 DOE-HEP Principle Investigator Meeting
APS DPF
May 13-16, 2024





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Outline

- DOE High Energy Physics Program: Planning and Budget Cycle
- Intensity Frontier Program Overview
- Update to DOE/HEP Comparative Review Process
- DOE/HEP Early Career Research Program
- Other Funding Opportunities
- Summary

This talk will: (1) emphasize the Intensity Frontier program within the broader context of the overall HEP program;
and
(2) provide a planned-overview of the upcoming funding opportunity announcement.

DOE Office of Science

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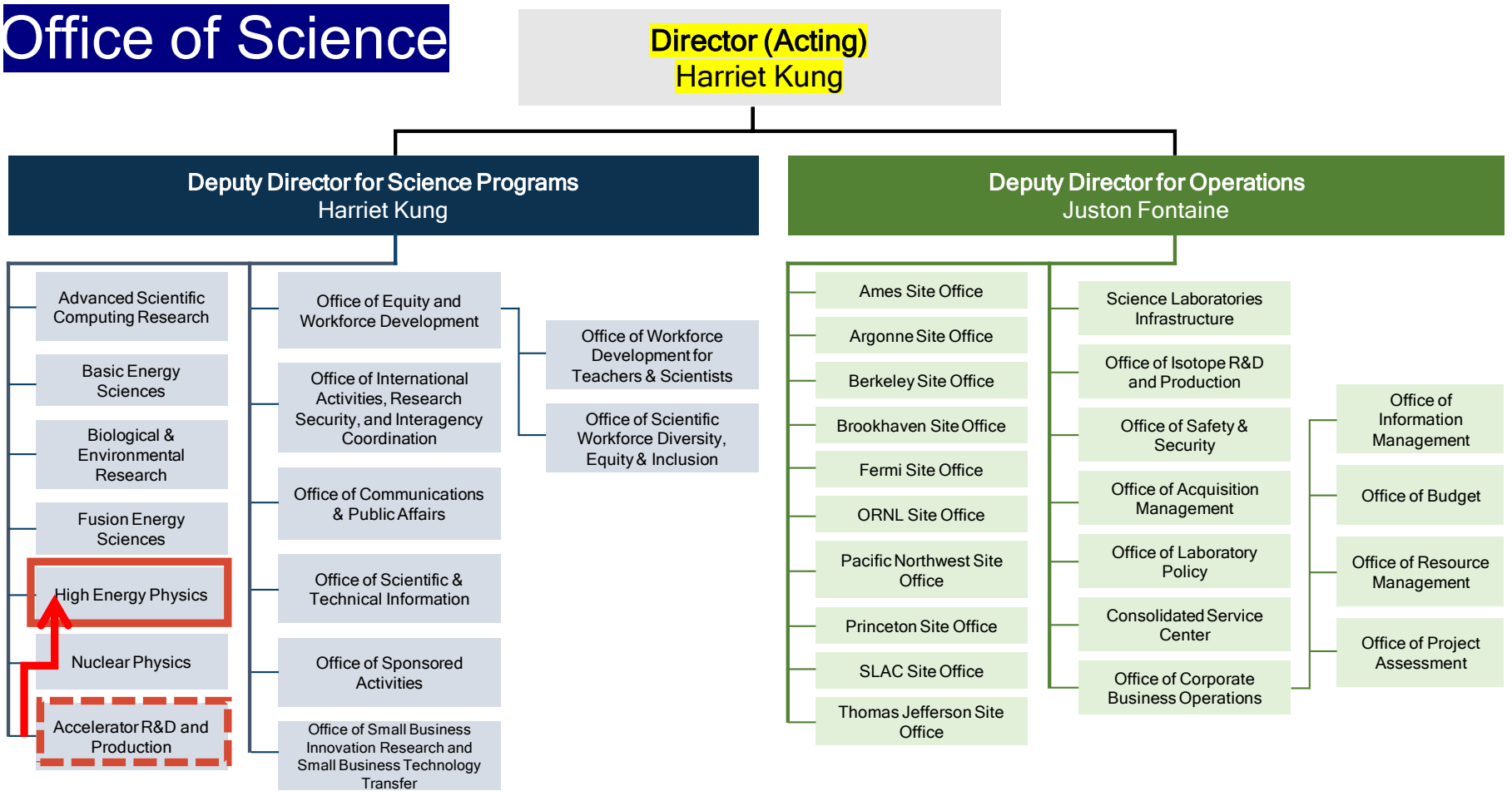
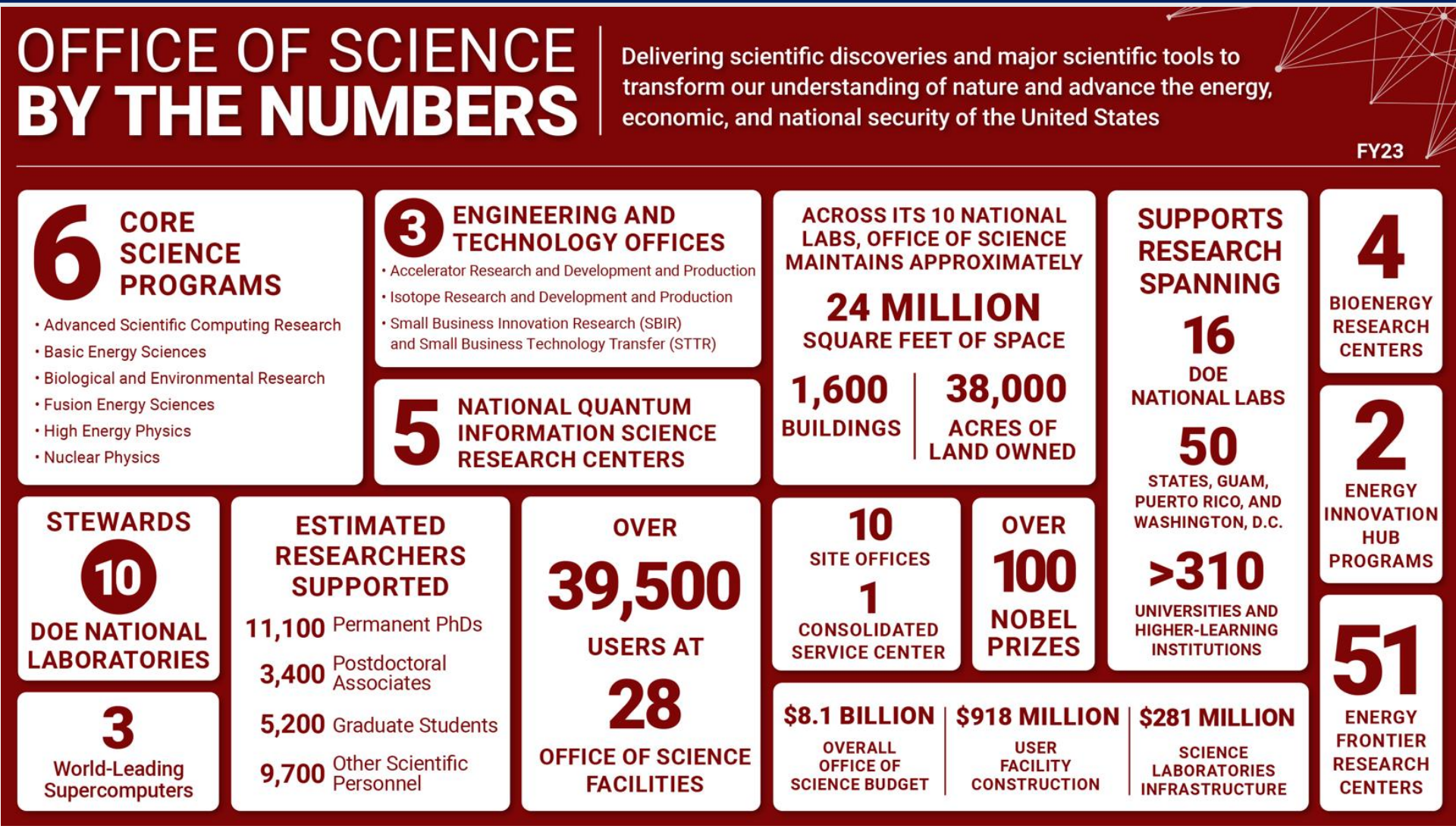
DOE Office of Science



Impact of Office of Science



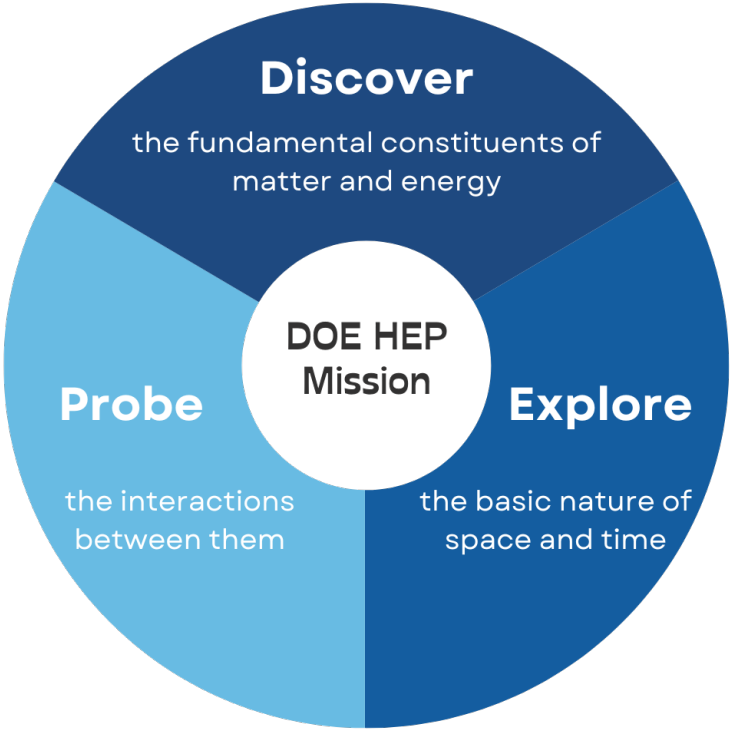
The DOE High Energy Physics Mission

Office of High Energy Physics (HEP) Mission: *Understanding how the universe works at its most fundamental level*

- **Discover** the most elementary constituents of matter and energy
- **Probe** the interactions between them
- **Explore** the basic nature of space and time

HEP carries out the DOE mission and objectives through a balanced portfolio to work at the cutting edge of science.

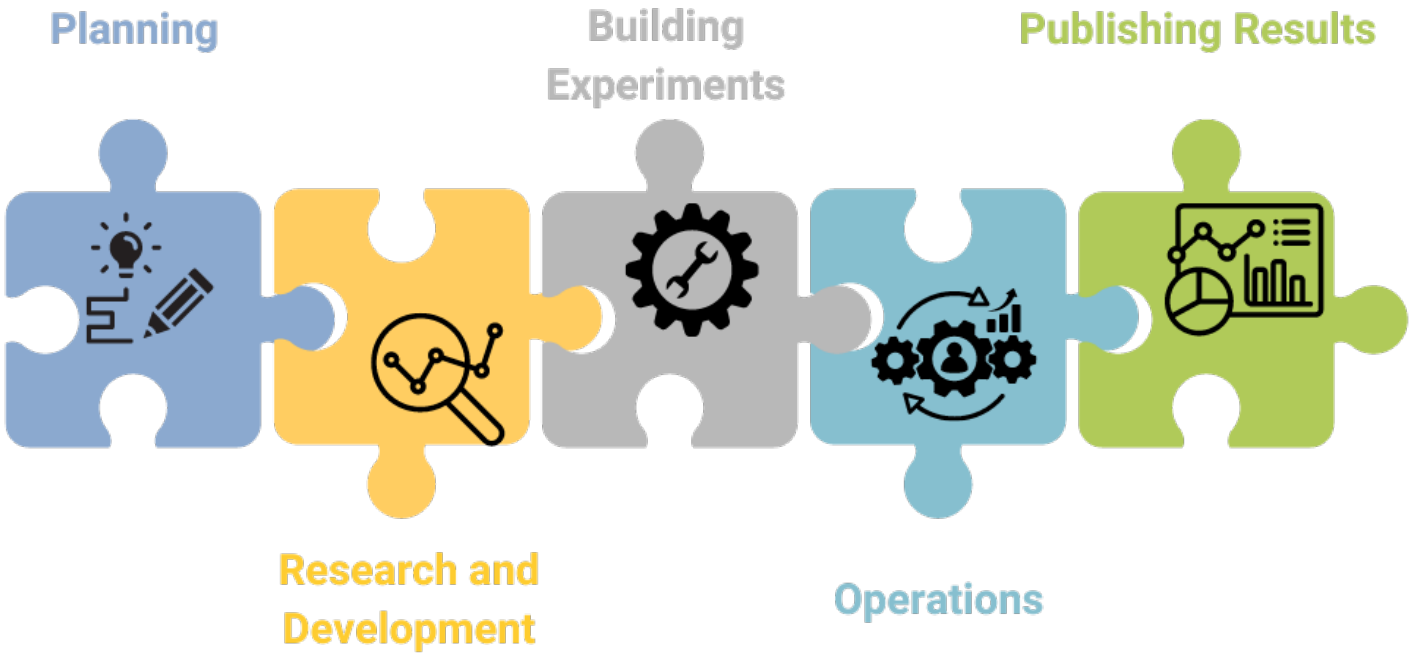
The Science done within DOE HEP is ***Mission-Driven***



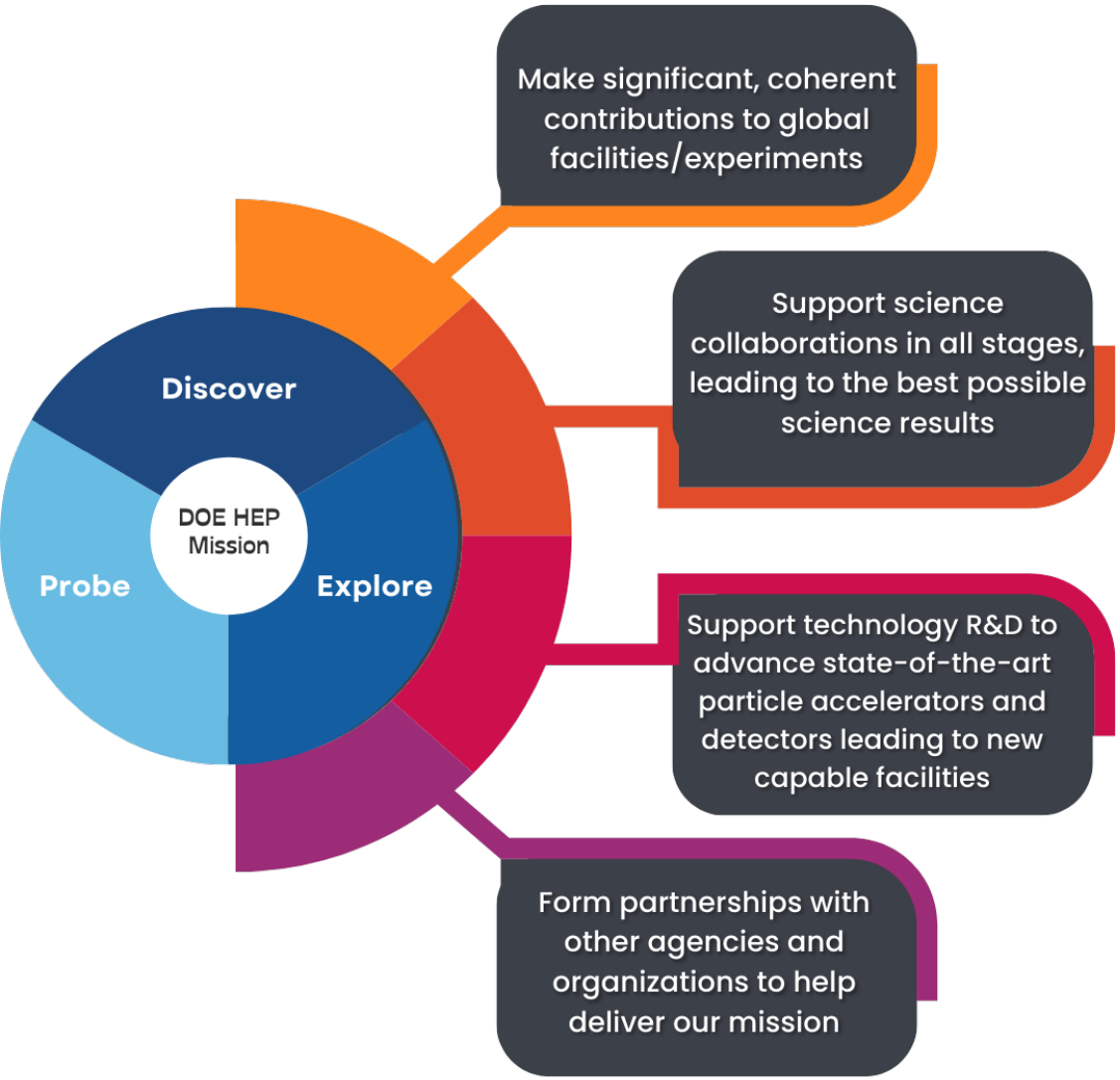
What is the DOE HEP Mission Driven Program

DOE Program Model

DOE develops and supports a specific portfolio of projects with emphasis on



DOE HEP

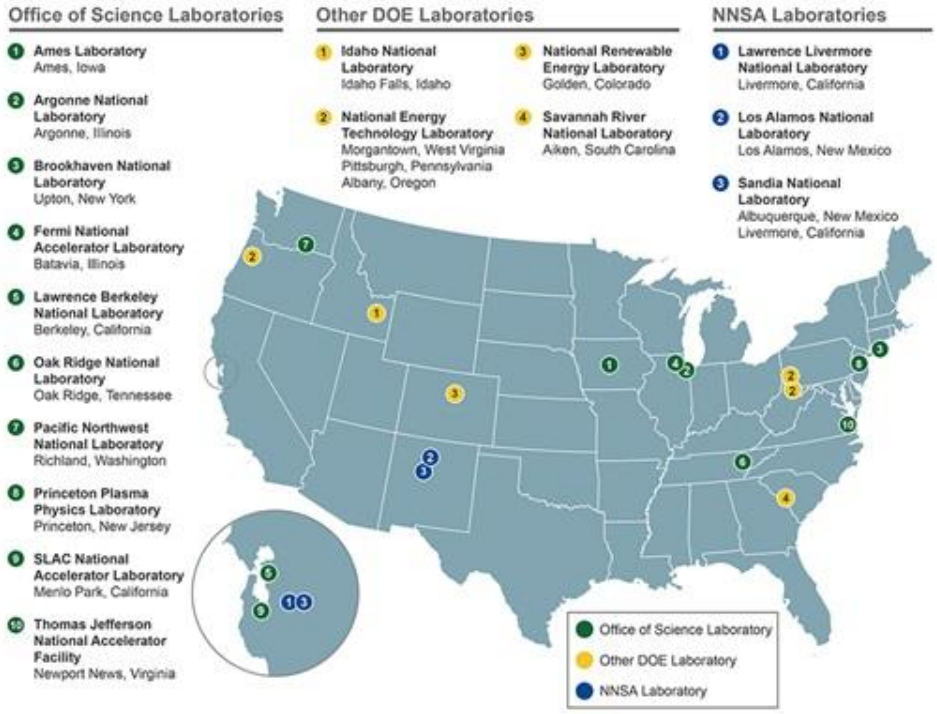


- **DOE supports about 80-85% of the U.S. HEP effort (in $), including the U.S. national laboratories**
- **HEP Program Guidance**
  - Federal Advisory Committee Act (FACA) panels – official advisory bodies to the U.S. government
  - *for e.g.*, High Energy Physics Advisory Panel (HEPAP) provides the primary advice for HEP program to DOE and NSF and includes subpanels for detailed studies (*e.g.*, *P5* subpanel, HEPAP's "International Benchmarking Study" subpanel)

High Mission and Support at DOE National Labs

DOE National Labs – Our Crown Jewels

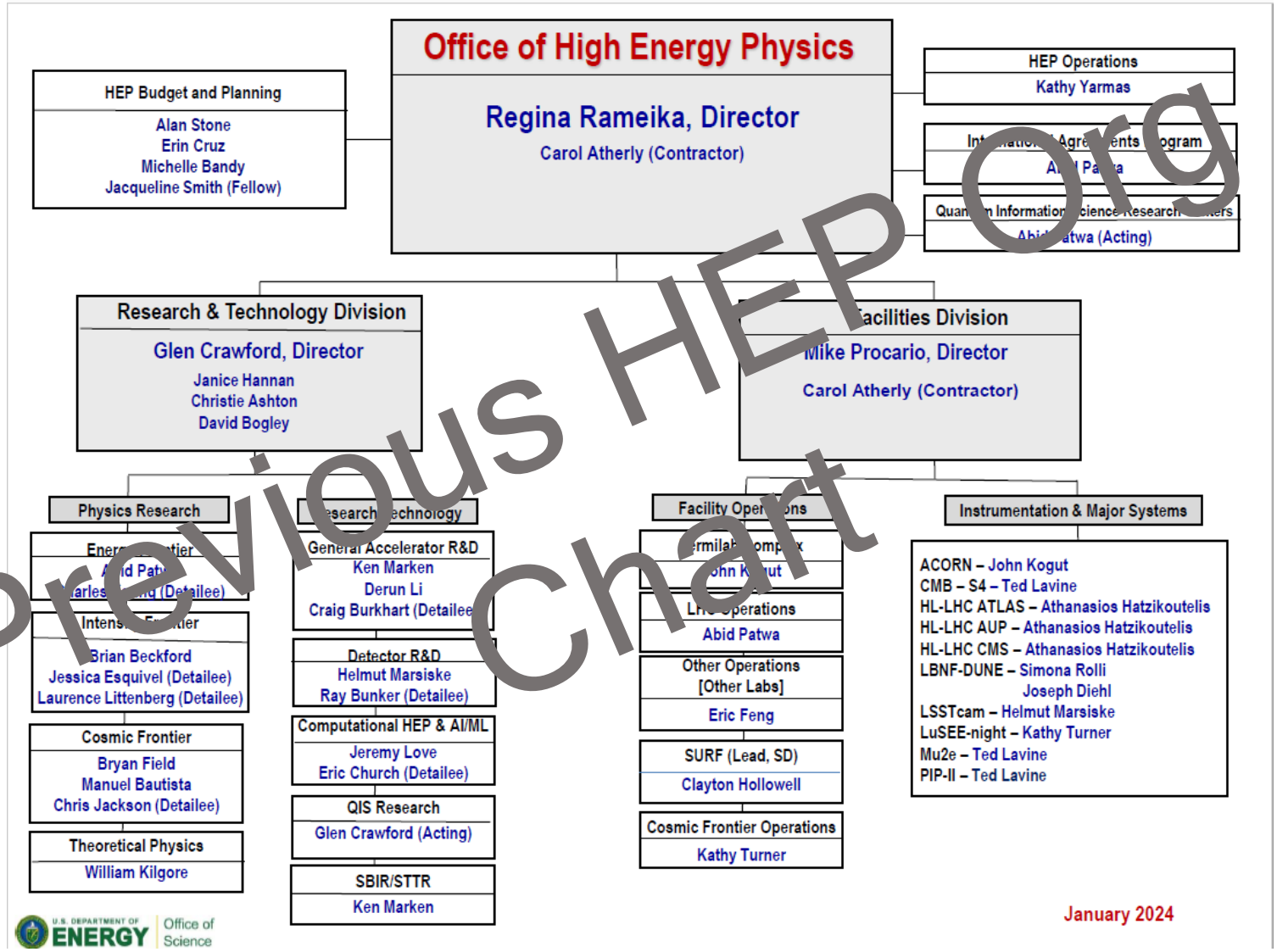
Together, the 17 DOE laboratories comprise a preeminent federal research system, providing the Nation with strategic scientific and technological capabilities.



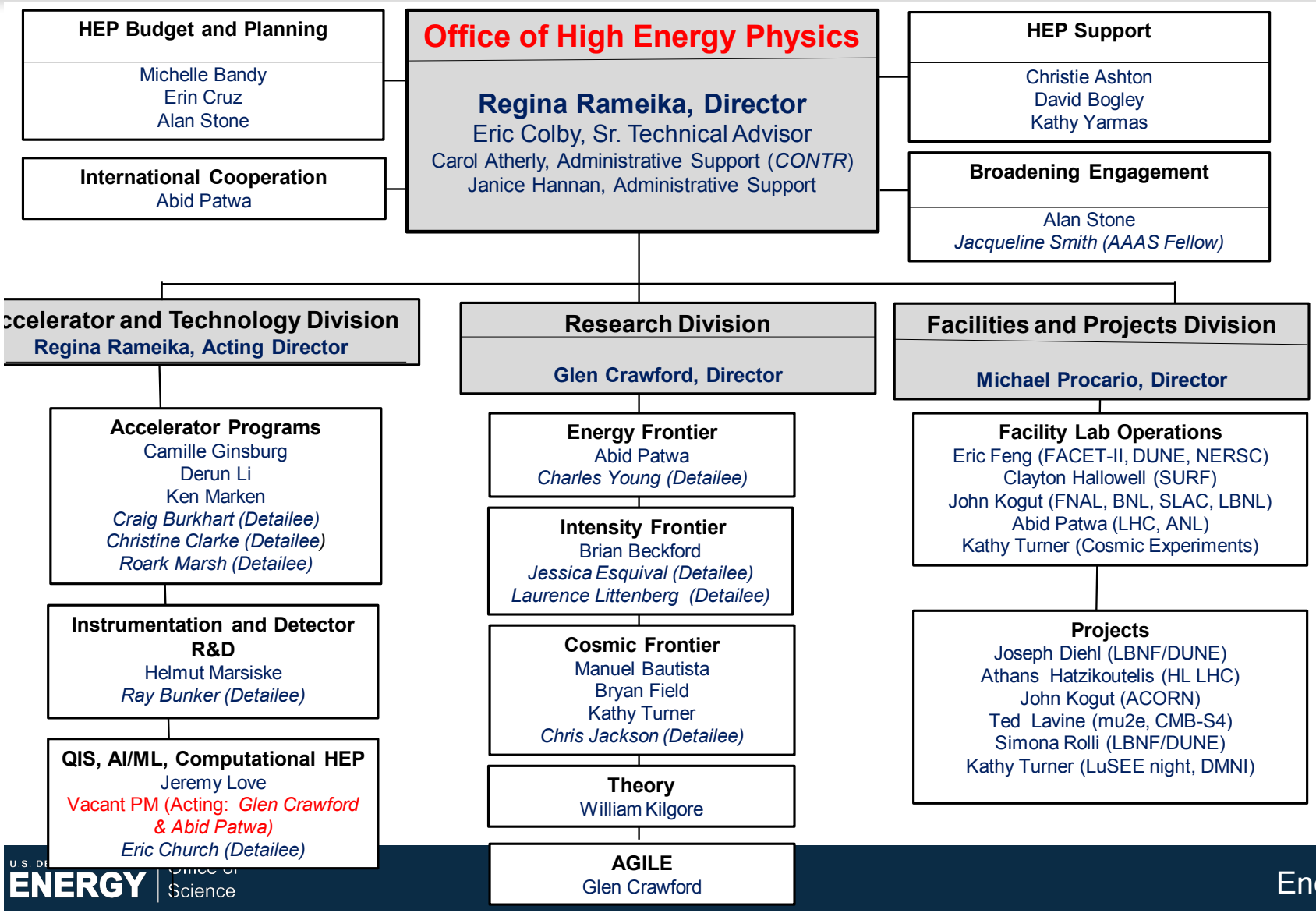
The laboratories:

- Execute long-term government scientific and technological missions, often with complex security, safety, project management, or other operational challenges;
- Develop unique, often multidisciplinary, scientific capabilities beyond the scope of academic and industrial institutions, to benefit the Nation's researchers and national strategic priorities; and
- Develop and sustain critical scientific and technical capabilities to which the government requires assured access.

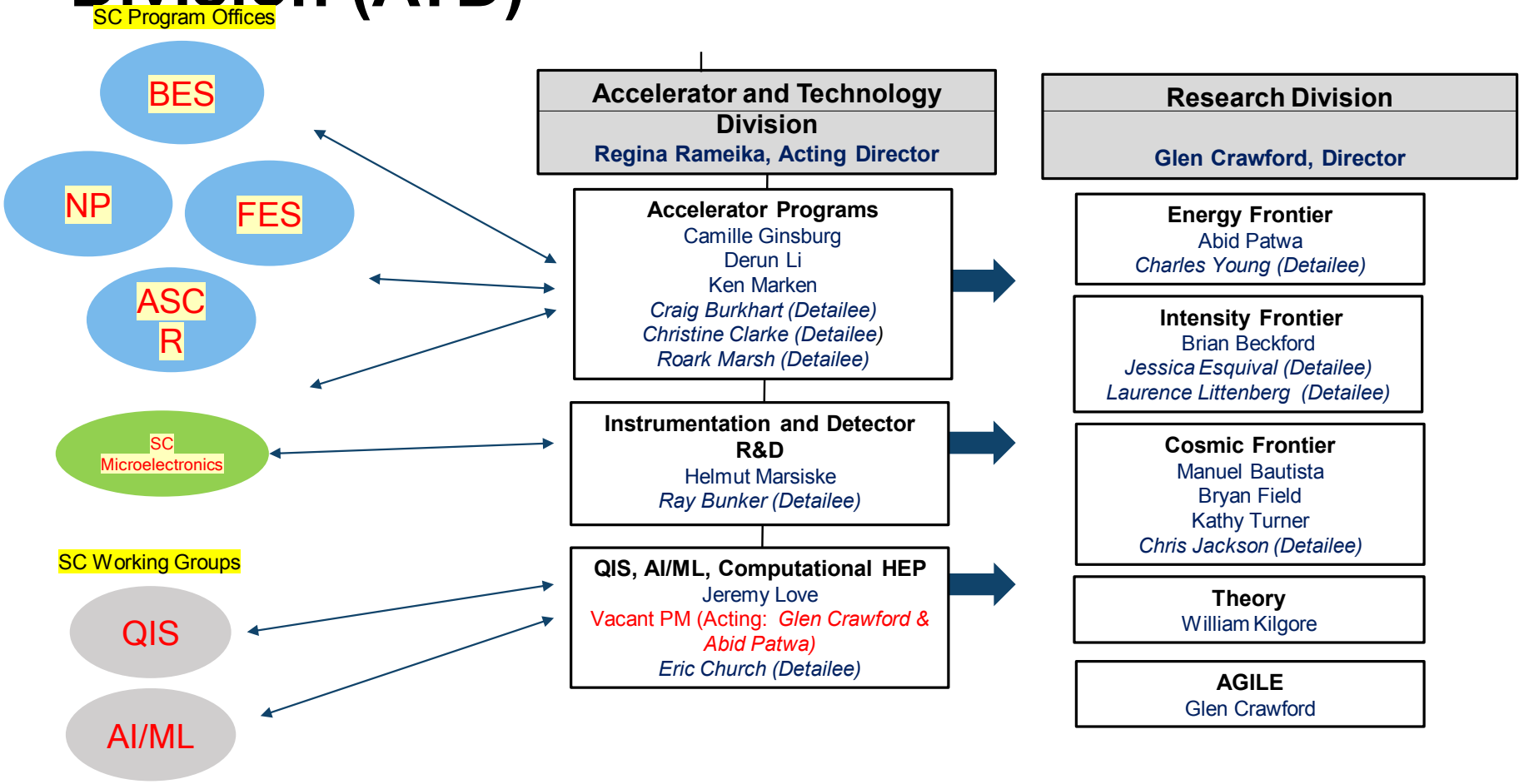
DOE Office of High Energy Physics Organization



DOE Office of High Energy Physics Organization

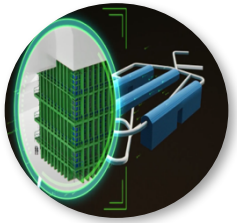


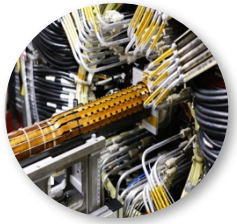
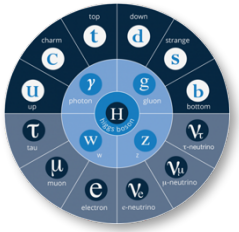
Introducing the Accelerator and Technology Division (ATD)



U.S. Budget and DOE High Energy Physics





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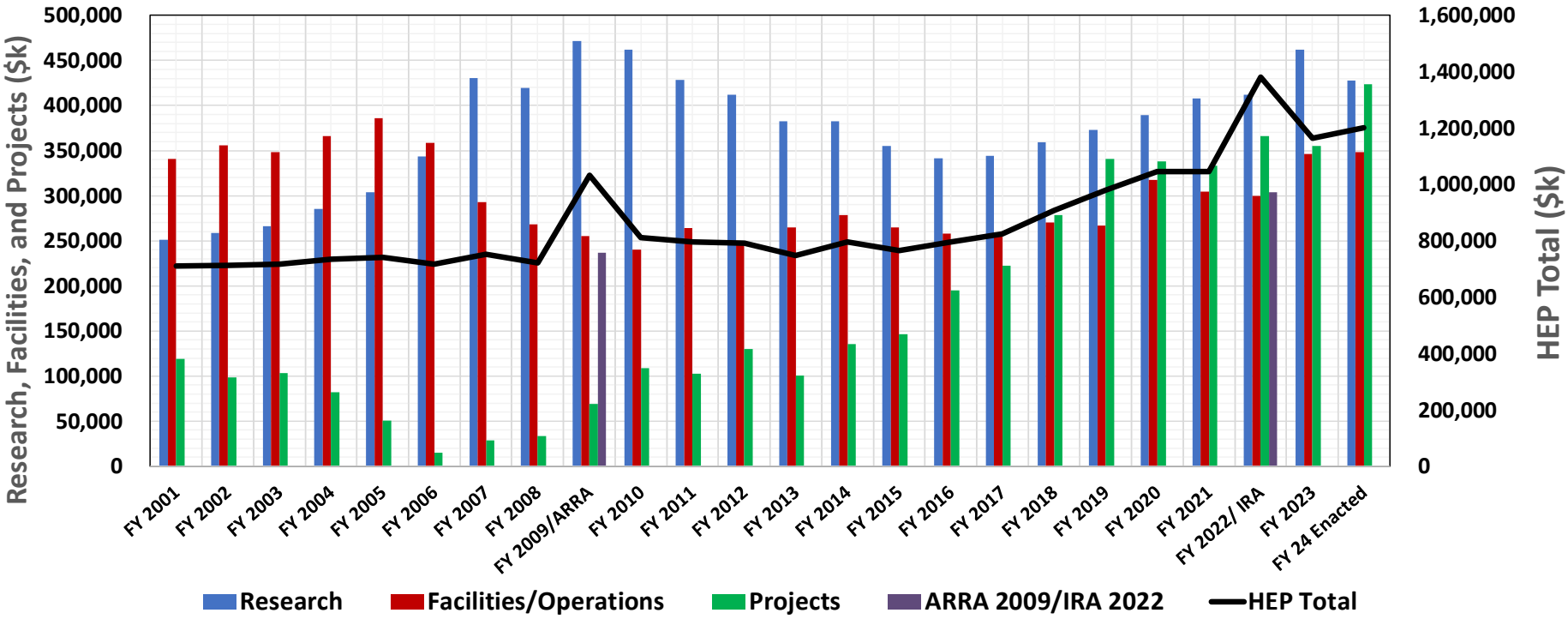
DOE HEP Budget ($k) FY 2001-2024

HEP Budget ($K): Research, Facilities & Projects

FY 2001 – FY 2024



ARRA 2009 funds supported Research, Facilities, and Projects
IRA 2022 funds supported Projects only

DOE HEP Budget ($k) FY 2014-2024

HEP Budget ($K): Research, Facilities/Ops, Projects

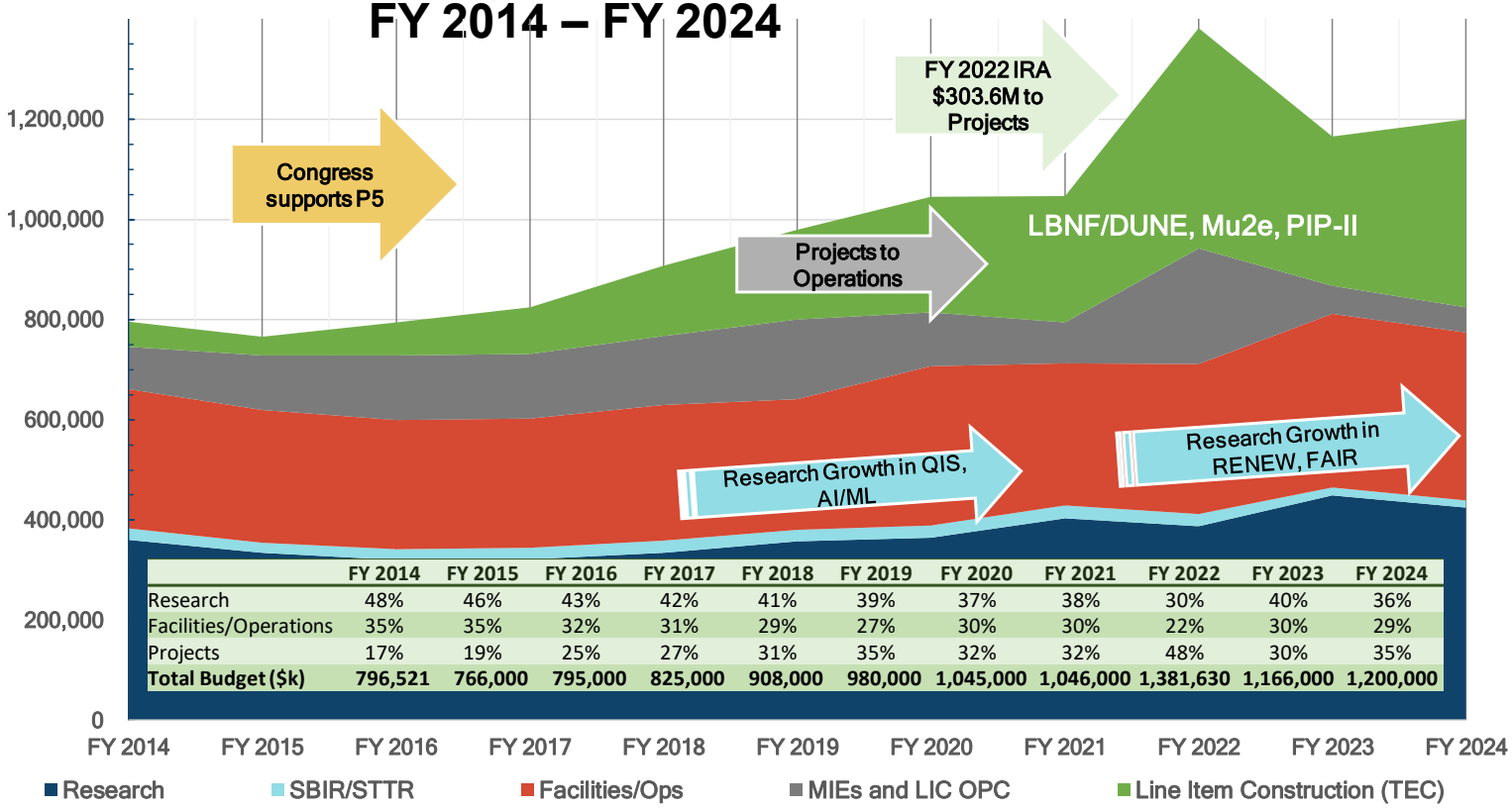
FY 2014 – FY 2024

Strategic Plan for U.S. Particle Physics next 10 years

Particle physics is global

Community made difficult choices

Increase investment in construction

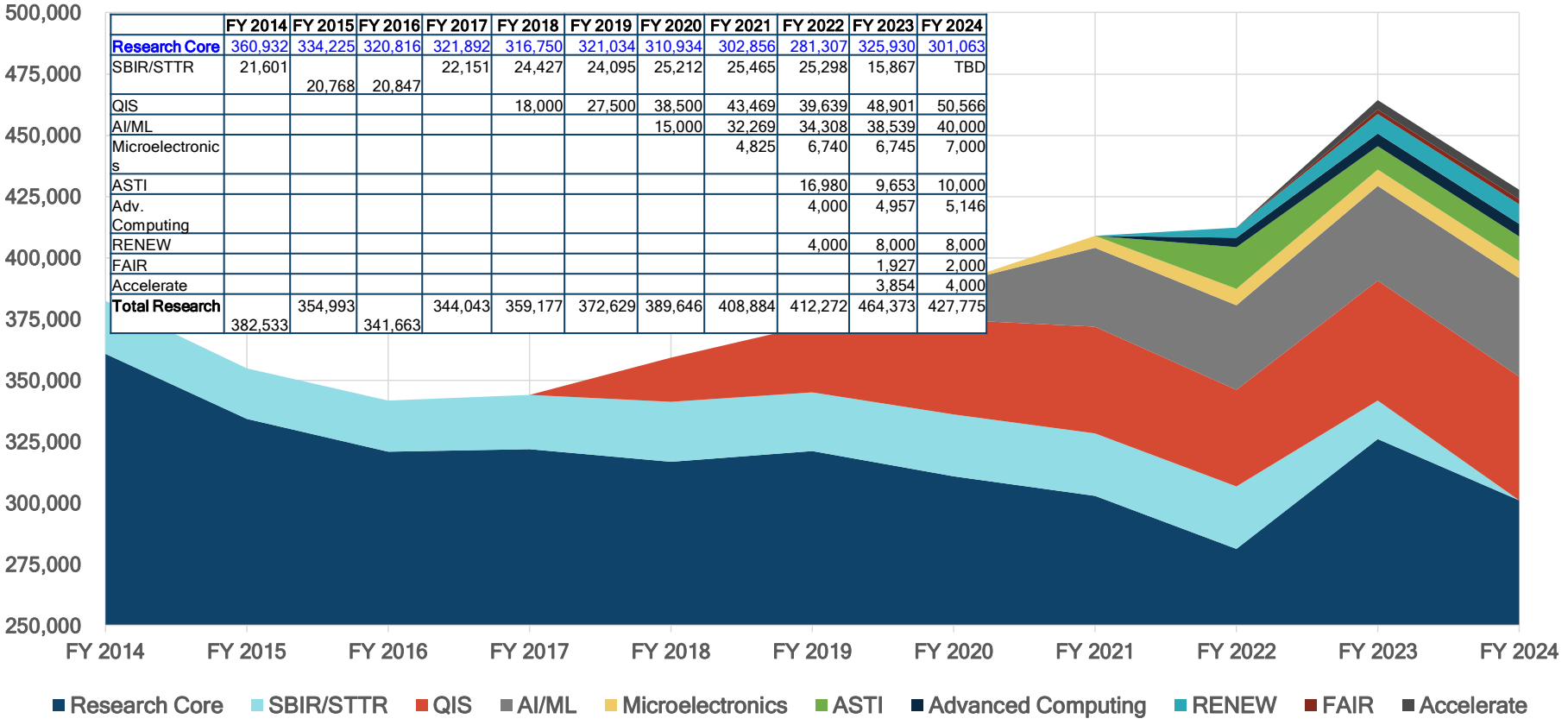


	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Research	48%	46%	43%	42%	41%	39%	37%	38%	30%	40%	36%
Facilities/Operations	35%	35%	32%	31%	29%	27%	30%	30%	22%	30%	29%
Projects	17%	19%	25%	27%	31%	35%	32%	32%	48%	30%	35%
Total Budget ($k)	**796,521**	**766,000**	**795,000**	**825,000**	**908,000**	**980,000**	**1,045,000**	**1,046,000**	**1,381,630**	**1,166,000**	**1,200,000**

DOE HEP Budget ($k) FY 2014-2024

HEP Research Breakdown ($k) FY 2014-2024

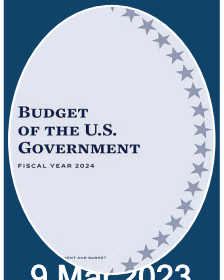
	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Research Core	360,932	334,225	320,816	321,892	316,750	321,034	310,934	302,856	281,307	325,930	301,063
SBIR/STTR	21,601	20,768	20,847	22,151	24,427	24,095	25,212	25,465	25,298	15,867	TBD
QIS					18,000	27,500	38,500	43,469	39,639	48,901	50,566
AI/ML							15,000	32,269	34,308	38,539	40,000
Microelectronics								4,825	6,740	6,745	7,000
ASTI									16,980	9,653	10,000
Adv. Computing									4,000	4,957	5,146
RENEW									4,000	8,000	8,000
FAIR										1,927	2,000
Accelerate										3,854	4,000
Total Research	382,533	354,993	341,663	344,043	359,177	372,629	389,646	408,884	412,272	464,373	427,775



DOE HEP Budget Timeline

Timeline of FY 2024 Budget Headlines

Request

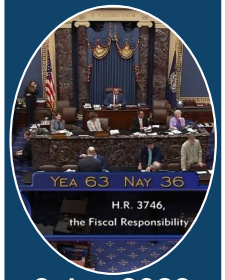


9 Mar 2023

President's 2024 $1.73T discretionary budget request submitted to Congress

Would increase non-defense appropriations by about $96B (5.9%) over the 2023 enacted level

1.226B HEP



3 Jun 2023

HR. 3786, Fiscal Responsibility Act, signed into law

Suspends debt limit through Jan 1, 2025.

Sets statutory caps on non-defense appropriations for FY 2024 (flat) and FY 2025 (+1%). No adjustments for inflation.

Markup

23 Jun 2023

House Appropriations Subcommittee for Energy and Water Development, and Related Agencies released a summary for the FY 2024 House Mark

1.192 HEP

Markup

28 Jun 2023

Senate Appropriations Subcommittee for Energy and Water Development, and Related Agencies released a summary for the FY 2024 Senate Mark

1.226B HEP

30 Sep 2023

HR. 5860, Continuing Appropriations Act, 2024 and Other Extensions Act, signed into law

Continuing resolution temporarily extends fiscal year 2023 spending levels until Nov 17, 2023.

Nov 2023 - Mar 2024

Congress passed three additional Continuing Resolutions.

1) Nov 18 - Jan 19

2) Jan 20 - Mar 1

3) Mar 2 - Mar 8

Enacted

9 Mar 2024

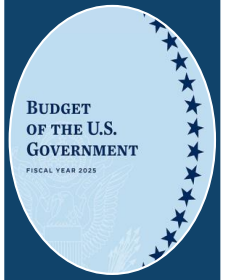
HR. 4366, Consolidated Appropriations Act, 2024, signed into law

Office of Science increases 1.7% from to 8.24B

•Office of High Energy Physics increases 2.9%

•1.2B HEP

Request



11 Mar 2024

President's 2025 $1.67T discretionary budget request submitted to Congress

Would decrease non-defense appropriations by about $60B (3.4%) over the 2024 Request

1.231B HEP

High Energy Physics Research & Technology

HEP at a Glance
(FY2024 Enacted $1.196B, FY2025 Request $1.231B)

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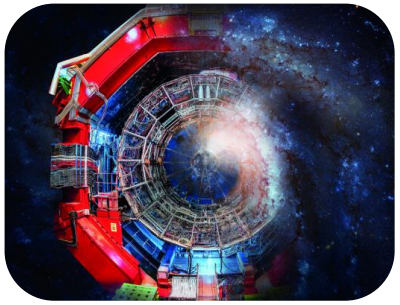
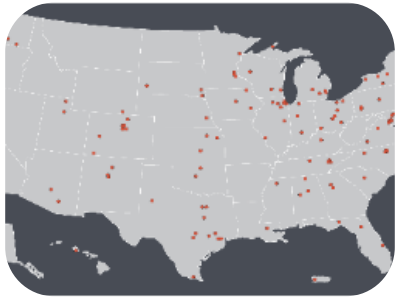


Largest Supporter (**~85%**) of Particle Physics in the U.S.



Funding at **>160** Institutions, including **12** DOE Labs

Over **1,175** Ph.D. Scientists and **525** Grad Students Supported

Over **2,325** Users at **2** SC Scientific Facilities

Research: 40% Budget

~30% of Research to Universities

Projects: 30% Budget

Facility Operations: 30% Budget

High Energy Physics FY24 Budget

FY 2024 HEP Budget

- Office of Science increased 1.7% from 8.1B in FY 2023 to 8.24B in FY 2024
- Office of High Energy Physics increased 2.9% (+34M) from 1.166B in FY 2023 to 1.2B in FY 2024
- Congressional direction set LBNF/DUNE and PIP-II at 255M and 125M, which is +$80M over FY 2023 funding levels
- Additional direction provided floor/ceiling limits for SURF, CMB-S4, ACORN, HL-LHC Upgrade projects, and LBNF/DUNE OPC.
- Congressional directional at the SC level for QIS and AI/ML propagated down to HEP and holds FAIR and RENEW at FY 2023 levels
- Overarching language included a note stating House and Senate marks carry same weight as the final appropriation language

	FY 2023 Enacted	FY 2024 Request	FY 2024 House	FY 2024 Senate	FY 2024 Approp
High Energy Physics	868,000	850,334	842,334	850,000	824,000
Construction					
LBNF/DUNE	176,000	251,000	225,000	251,000	251,000
PIP-II	120,000	125,000	125,000	125,000	125,000
Mu2e	2,000	-	-	-	-
HEP Total	1,166,000	1,226,334	1,192,334	1,226,000	1,200,000

The agreement provides not less than $35,000,000 for the Sanford Underground Research Facility and not less than $5,000,000 for the Accelerator Controls Operations Research Network.

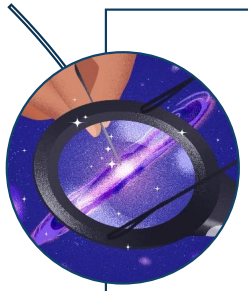
Funding for HEP Research and Operations, which supports all Research, Facilities/Operations, and MIE Projects, decreased 5% from 868M in FY 2023 to 824M in FY 2024.

High Energy Physics	FY 2023	FY 2024**
Research	446,037	424,561
SBIR/STTR	15,867	15,267
Facilities/Ops	349,096	334,972
Projects (excl LIC TEC)	57,000	49,200
Total	868,000	824,000

**Final year distributions may be adjusted (~± 0.2%)

High Energy Physics FY25 Budget Request

FY 2025 Request Highlights



Research $395.8M (-$30.4M, -7.1% from FY 2024 Enacted)

- **$24M increase** for AI/ML. **$8M increase** for RENEW and FAIR
- **$4M decrease** as Accelerate Innovations in Emerging Technologies concludes
- QIS, Microelectronics, Advanced Computing, and Accelerator Science and Technology continue at the FY 2024 Enacted Level
- **$59.9M decrease** to Core Research. Focus support on high-profile research topics and early research results; key contributions and critical U.S. commitments to experiments & projects; University research & training; other priority cross-cutting initiatives

Facilities Operations $381.7M (+$33.2M, +9.5% above FY 2024 Enacted)

- **Fermilab Accelerator Complex** $166.9M (**+$25.3M**, +17.9% above FY 2024 Enacted): 5,180 hours
- **SLAC FACET-II** $17.6M (**+$1.1M**, +6.9% above FY 2024 Enacted): 3,120 hours
- U.S. LHC Detector Operations $57.3M (**+$4.5M**, +8.5% above FY 2024 Enacted)
- Vera Rubin Operations $33M (**+$2.1M**, +6.7% above FY 2024 Enacted)
- Sanford Underground Research Facility $35M (**No change** from FY 2024 Enacted)

Projects $453.2M (+$28.0M, +6.6% above FY 2024 Enacted)

- **LBNF/DUNE** $280M (+$25M, +10% above FY 2024 Enacted to support LBNF/DUNE's five subprojects)
- **ACORN** $10M (+$5M, +100% above FY 2024 Enacted)
- **CMB-S4** $4.5M (level funding from FY 2024 Enacted)
- **ATLAS and CMS Detectors** $33.7M (-$2M, -6% below FY 2024 Enacted): as per the baselined profiles
- **PIP-II** $125M (level from FY 2024 Enacted): continue support for baseline profile

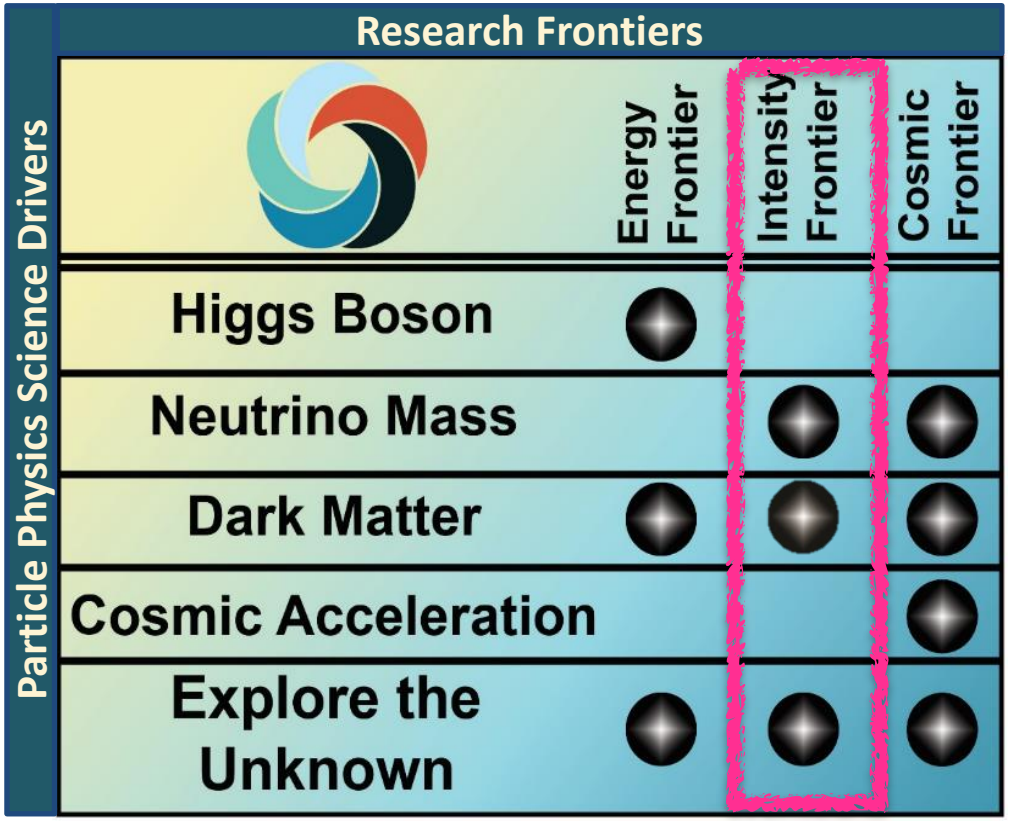
Intensity Frontier Program

Program Layout

- **HEP is carried out along 3 Research Frontiers are useful categorization of experimental techniques and serve as the basis of the budget process**

- **Intensity Frontier**
  - **3 out of the 5 drivers: science of the Neutrino, Dark Matter, and Exploring the Unknown**

- **Research Frontiers are complementary**
  - **No one Frontier addresses all science drivers**
  - **Each Frontier provides a different approach to address science driver**
  - **Enables cross-checking scientific results**



DOE HEP Research Priorities: Snapshot

- Energy Frontier
  - Analysis of LHC Run 2 data
  - Contribute to operational responsibilities and complete “Phase I” upgrades
  - Scientific support for HL-LHC program
- **Intensity Frontier**
  - **Support ProtoDUNE, LBNF/DUNE, and closely related efforts (e.g. DUNE computing, DUNE ND detector R&D)**
  - **Data analysis and operations support for High-priority operating experiments : NOvA, T2K (incl upgrade)**
  - **Data analysis and ops support for other operating experiments: MicroBoone, Daya Bay, SBN (FD), muon g-2, Belle II, HPS**
  - **Pre-operations/project support activities for future approved expts: Mu2e, SBN (ND)**
  - **Support for provisional future experiments: COHERENT upgrade, PROSPECT, LDMX, other accel-based light DM**
  - **Longer-term R&D: ANNIE, WATCHMAN/AIT, Snowmass studies**
- Cosmic Frontier
  - Dark Matter: Scientific support for G2 experiments (in fabrication)
  - Dark Energy: DES analysis; scientific support for LSST and DESI (in fabrication)
  - Continue science planning for CMB-S4

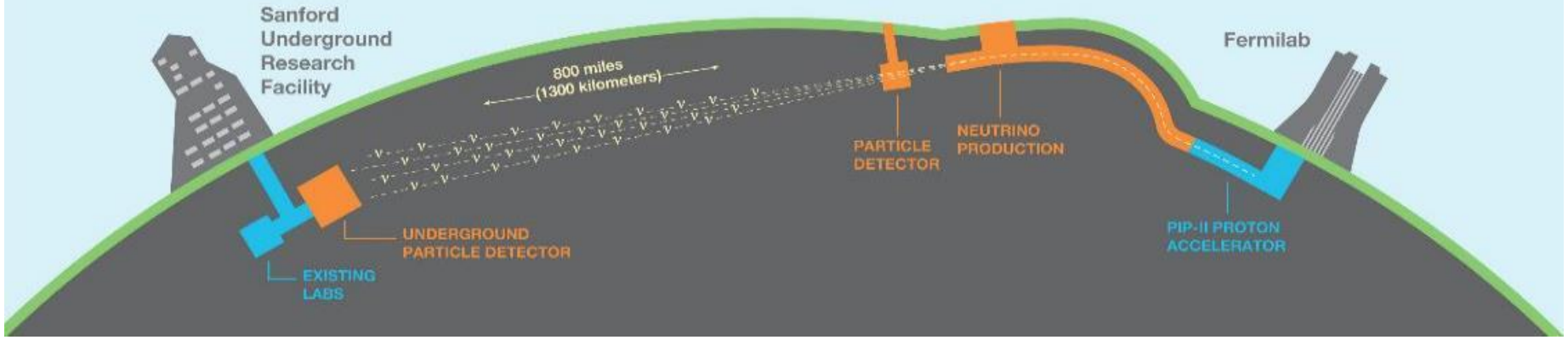
- Accelerator R&D
  - Focus on outcomes and capabilities that will dramatically improve cost effectiveness for mid-term and far-term accelerators
  - Hosting workshops to develop and implement R&D plan following P5 and GARD panels
- Detector R&D
  - Developing process to identify highest priority R&D activities for current phase of implementing P5
  - Long-term “high-risk” R&D with potential for wide applicability and/or high-impact
  - “Blue-Sky” scientific research on innovative technologies not already in contention for implementation in future DOE HEP projects
- HEP Theory
  - Phenomenological Studies and Data Interpretation
  - Precision Calculations and Quantum Corrections
  - Model Building: Unification and Describing New Phenomena
  - Quantum Field Theory, Quantum Gravity, Strings, and Mathematical Physics

Long Baseline Neutrino Facility & Deep Underground Neutrino Experiment: US Scope

Delivered at Two Sites through Five Subprojects

Far Site – SURF in Lead, SD
Facility/Infrastructure and Far Detectors

Near Site – FNAL in Batavia, IL
Facility/Infrastructure, Neutrino Beamline, and Near Detectors



Three subprojects

- **FSCF-EXC** – Far Site Excavation
- **FSCF-BSI** – Far Site Building & Site Infrastructure
- **FDC** – Far Detectors and Cryogenic Infrastructure

Technically limited schedule

Two subprojects

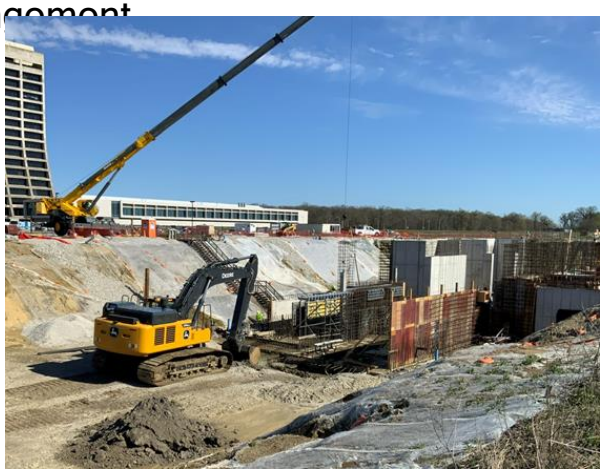
- **NSCF+B** – Near Site Conventional Facilities + Beamline
- **ND** – Near Detectors Funding limited schedule

Largest **DOMESTIC** project in Office of Science (TPC = $3.2B)

PIP-II Project Highlights

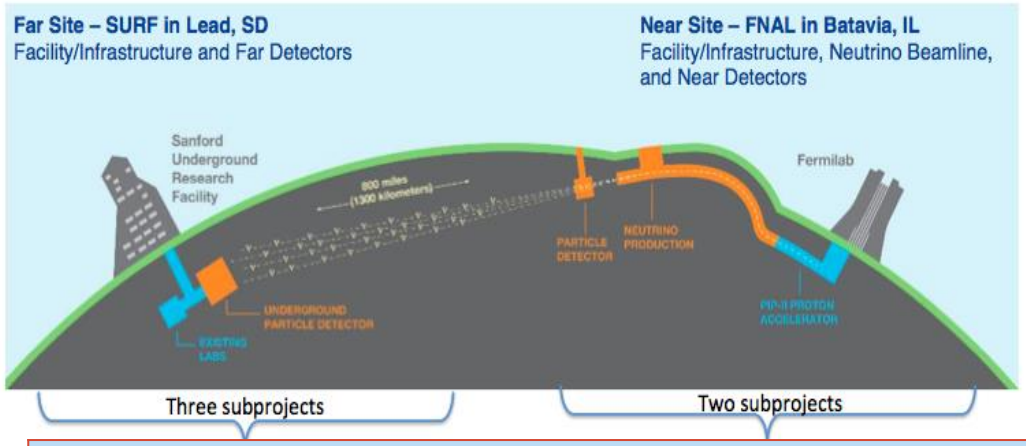
- Fermilab capability modernization
  - 1.2 MW proton beam for LBNF
  - Upgradable to 2.4 MW
  - CW compatible
  - Beams customizable for multiple users
- First US accelerator project to incorporate significant international contributions
- Partner laboratories in France, Italy, Poland, and UK bring experience from XFEL, ESS, etc.
- Project Early Finish Q1FY30
- Project Completion Baseline is 1Q FY 2033.

- Major accomplishments since May 2023
  - Recovery from May 25, 2023 construction injury accident. Full work restarted by January 5, 2024 with augmented processes for construction safety, work planning and authorization.
  - Rebuilt Project Management Office staff following turn-overs of key positions in accelerator physics, project, engineering, procurement, and technical management



LBNF DUNE Project

LBNF/DUNE-US Project



Subproject	Cost	Scope	Critical Decision Status
FSCF-EXC	$644M	Excavation to support up to 4 far detector modules	CD-2/3 approved 08/2022
FSCF-BSI	$211M	Utilities and outfitting to support up to 4 far detector modules	CD-2/3 approved 03/2023
FDC	$1,119M	Fabricate and install 2 far detector modules and cryogenic systems (includes international contributions)	Preparing for CD-2/3
NSCF+B	$1,103M	1.2 MW upgradeable beam, facilities for beam and near detector (includes international contributions to the beam)	Preparing for CD-2/3 approval in first half of FY25
ND	$200M	Fabricate and install near detector and cryogenic systems (includes international contributions)	Optimizing given DOE cost cap and expect CD-2/3 in

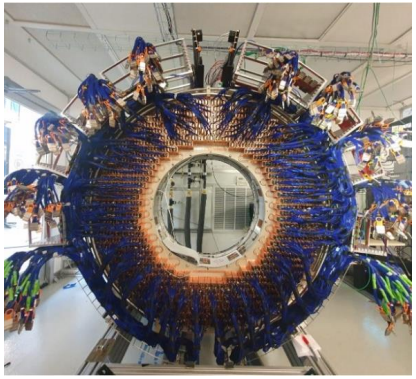
Mu2e Project Highlights

Transport Solenoid Magnets are in final position in the experimental area.

Delivery of the Production Solenoid and Detector Solenoid are expected from General Atomics in late 2024 and early 2025.

Sub-system assembly and testing are progressing at Fermilab

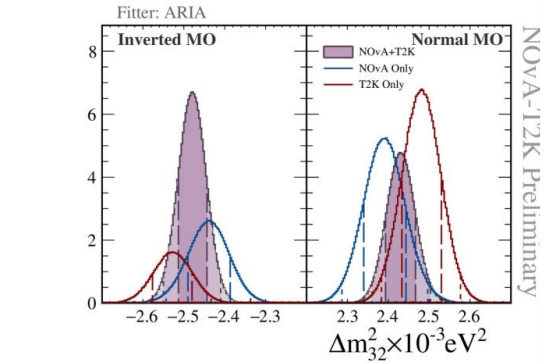
- Straw-tube Tracker
- Cs-I Calorimeter (INFN)
- Cosmic-ray Veto (UVa)
- Triggering & DAQ System
- Electrostatic septa
- AC-dipoles for beam extinction
- Next IPR in June 2024
- Project completion baseline is January 2028.

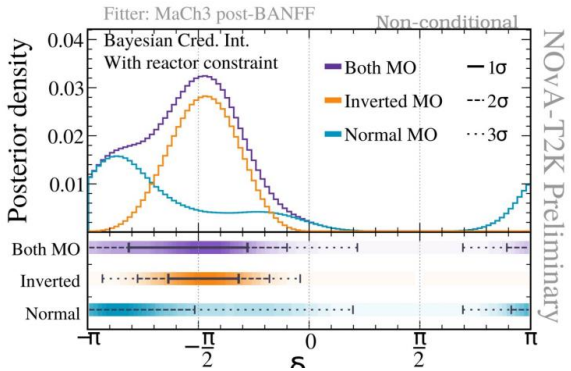


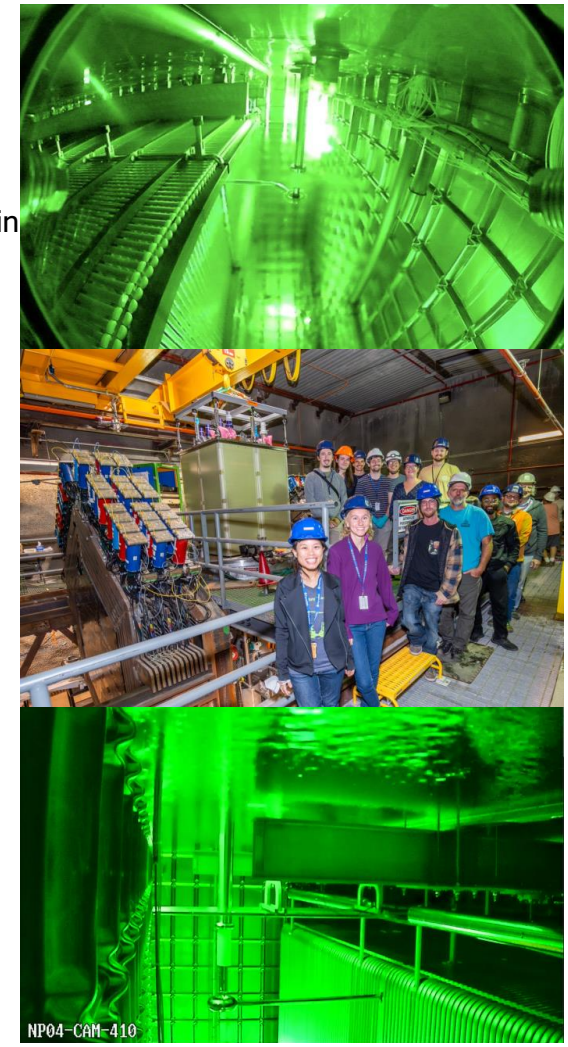
Fermilab is planning initial run of the Mu2e experiment in 2027, prior to the two-year Booster shut-down for construction of the PIP-II beam transfer line.

HEP Intensity Frontier Updates

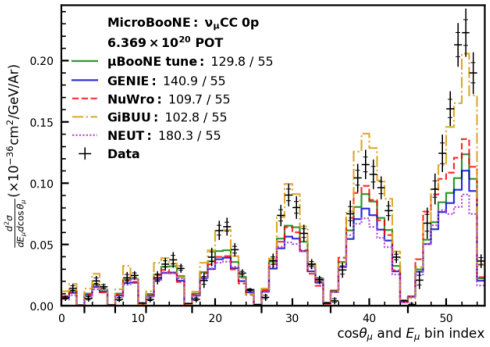
- NOvA & T2K Joint Results
  - Good agreement on allowed values for Inverted Ordering
  - Doubles total statistics
  - Joint result slightly disfavors Normal Orderin compared to individual experiments





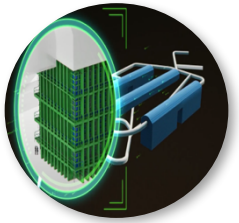


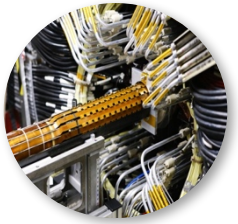
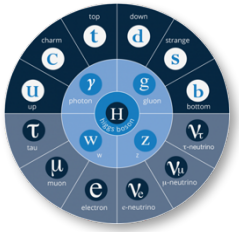
- MicroBooNE
  - First simultaneous measurement of ν_μ CC XP
- SBND
  - Cryogenics commissioning completed
  - Cryostat filled with LAr
- DUNE
  - DUNE ND LAr 2x2 installed in NUMI
  - NP04 Protodune filled with LAr



Response to P5





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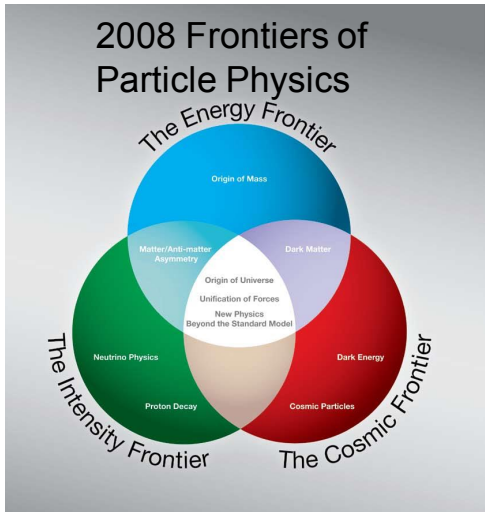
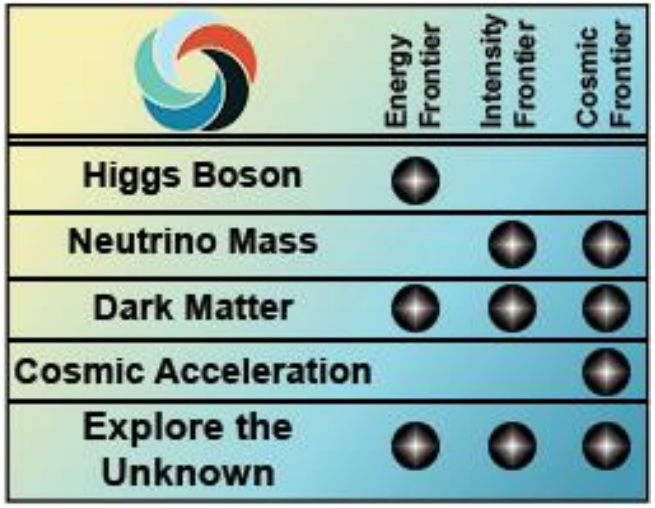
US P5 Evolution

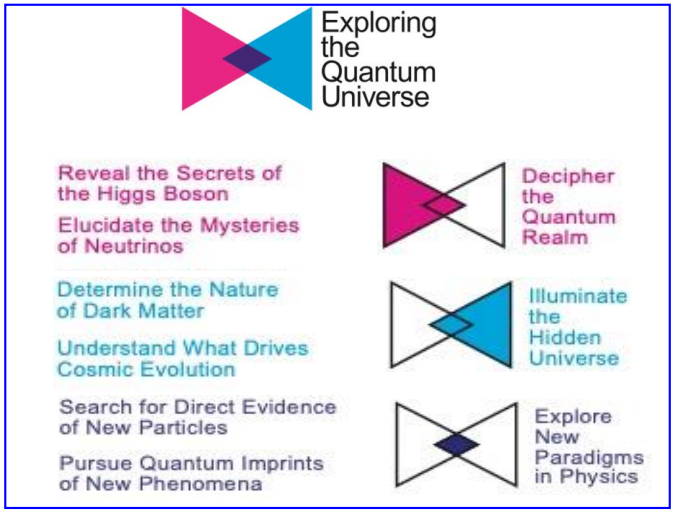
Evolution of the key questions in particle physics



2014 Science Drivers

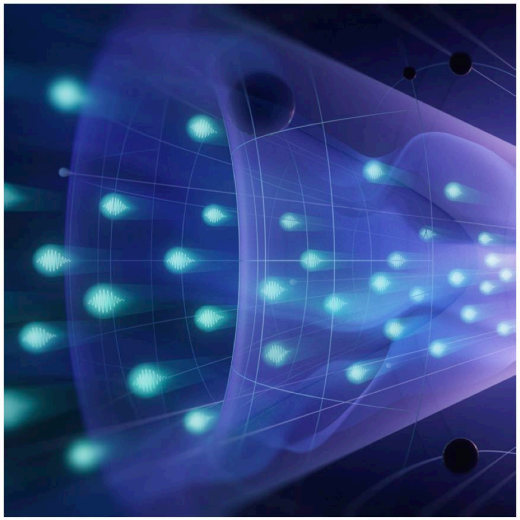


2023 Science Drivers



Science Drivers

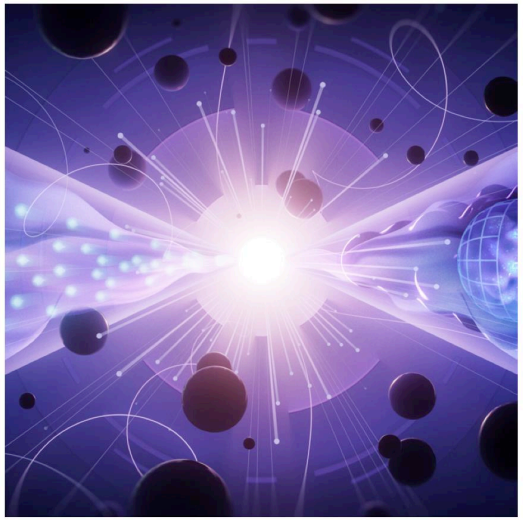
P5 2023 Science Drivers



Decipher the Quantum Realm

Elucidate the Mysteries of Neutrinos

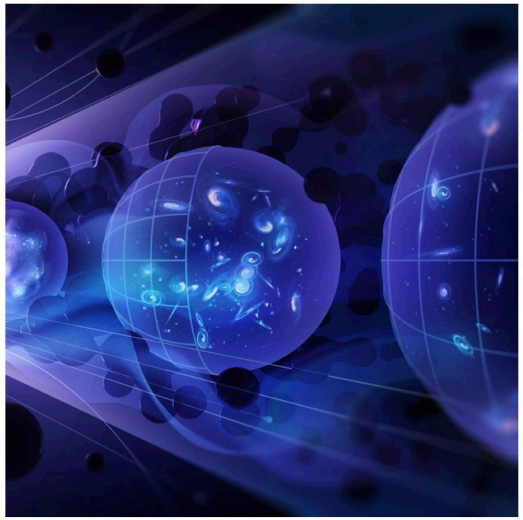
Reveal the Secrets of the Higgs Boson



Explore New Paradigms in Physics

Search for Direct Evidence of New Particles

Pursue Quantum Imprints of New Phenomena



Illuminate the Hidden Universe

Determine the Nature of Dark Matter

Understand What Drives Cosmic Evolution

General Response: Recommendation 1

- As the highest priority independent of the budget scenarios, **complete construction projects and support operations of ongoing experiments and research** to enable maximum science. We reaffirm the previous P5 recommendations on major initiatives:
  - HL-LHC (including **ATLAS and CMS** detectors, as well as **Accelerator Upgrade Project**) to start addressing why the Higgs boson condensed in the universe (reveal the secrets of the Higgs boson, section 3.2), to search for direct evidence for new particles (section 5.1), to pursue quantum imprints of new phenomena (section 5.2), and to determine the nature of dark matter (section 4.1).
  - The **first phase of DUNE and PIP-II** to determine the mass ordering among neutrinos, a fundamental property and a crucial input to cosmology and nuclear science (elucidate the mysteries of neutrinos, section 3.1).
  - The Vera C. Rubin Observatory to carry out the **Legacy Survey of Space and Time (LSST)**, and the LSST Dark Energy Science Collaboration, to understand what drives cosmic evolution (section 4.2).
  - In addition, we recommend continued support for the following ongoing experiments at the medium scale (project costs > $50M for DOE and > $4M for NSF), including completion of **construction, operations and research** on :
    - NOvA, SBN, and T2K (elucidate the mysteries of neutrinos, section 3.1).
    - DarkSide-20k, LZ, SuperCDMS, and XENONnT (determine the nature of dark matter, section 4.1).
    - DESI (understand what drives cosmic evolution, section 4.2).
    - Belle II, LHCb, and Mu2e (pursue quantum imprints of new phenomena, section 5.2).

★DOE fully supports this recommendation and puts it as the highest priority in planning our allocation of funding.

General Response: Recommendation 2

- Construct a portfolio of major projects that collectively study nearly all fundamental constituents of our universe and their interactions, as well as how those interactions determine both the cosmic past and future. These projects have the potential to transcend and transform our current paradigms. They inspire collaboration and international cooperation in advancing the frontiers of human knowledge.
  - **CMB-S4**, which looks back at the earliest moments of the universe to probe physics at the highest energy scales. It is critical to install telescopes at and observe from both the South Pole and Chile sites to achieve the science goals (section 4.2).
  - **Re-envisioned second phase of DUNE** with an early implementation of an enhanced 2.1 MW beam (**ACE-MIRT**), a **third far detector**, and an **upgraded near-detector complex** as the definitive long-baseline neutrino oscillation experiment of its kind (section 3.1).
  - An **off-shore Higgs factory**, realized in collaboration with international partners, in order to reveal the secrets of the Higgs boson. The current designs of **FCC-ee and ILC meet our scientific requirements**. The US should actively engage in feasibility and design studies. Once a specific project is deemed feasible and well-defined (see also Recommendation 6), the US should aim for a contribution at funding levels commensurate to that of the US involvement in the LHC and HL-LHC, while maintaining a healthy US on-shore program in particle physics (section 3.2).
  - An **ultimate Generation 3 (G3) dark matter** direct detection experiment reaching the neutrino fog, in coordination with international partners and **preferably sited in the US** (section 4.1).
  - **IceCube-Gen2** for study of neutrino properties using non-beam neutrinos complementary to DUNE and for indirect detection of dark matter covering higher mass ranges using neutrinos as a tool (section 4.1).

★Recommendation 2 :

- DOE forwarded each of the projects listed in red on slide 7 to the Facilities sub-panel
- These are all large undertakings and will comment on each one separately

General Response: Recommendation 3

- Create an improved balance between small-, medium-, and large-scale projects to open new scientific opportunities and maximize their results, enhance workforce development, promote creativity, and compete on the world stage.
  - Implement a **new small-project portfolio at DOE**, Advancing Science and Technology through Agile Experiments (ASTAE), across science themes in particle physics with a competitive program and recurring funding opportunity announcements. This program should start with the construction of experiments from the Dark Matter New Initiatives (DMNI) by DOE-HEP (section 6.2).
  - Continue Mid-Scale Research Infrastructure (MSRI) and Major Research Instrumentation (MRI) programs as a critical component of the NSF research and project portfolio.
  - Support **DESI-II for cosmic evolution**, LHCb upgrade II and Belle II upgrade for quantum imprints, and US contributions to the global Cherenkov Telescope Array (CTA) Observatory for dark matter (sections 4.2, 5.2, and 4.1). **Support for Belle-II includes contribution to SuperKEKB** .
    - DESI*-II
    - *LHCb*
    - Belle-II*, SuperKEKB
    - *CTA*

* Fall into the DOE portfolio

★Recommendation 3 :

- DOE will implement and execute a plan to address the ASTAE recommendation
- DOE will NOT support scope towards the LHCb Upgrade II
- DOE will continue to meet its on-going commitments to Belle-II; contributions towards SuperKEKB will be considered in the context of accelerator R&D toward e+e- luminosity improvements
- DOE will work with the DESI Collaboration to carefully decide a scope, schedule and cost envelope for the DESI-II upgrade

General Response: Recommendation 4&5

Recommendations 4 and 5

- Recommendation 4 :
  - *Support a comprehensive effort to develop the resources – theoretical, computational and technological – essential to our 20-year vision for the field. This includes and aggressive R&D program that, while technologically challenging, could yield revolutionary accelerator designs that chart a realistic path to a 10 TeV pCM collider.*
- Recommendation 5 :
  - *Invest in initiatives aimed at developing the workforce, broadening engagement, and supporting ethical conduct in the field. This commitment nurtures an advanced technological workforce not only for particle physics, but the nation as a whole.*

★DOE HEP will incorporate actions to address these recommendations in our on-going planning

ASTAE

- From P5 Report recommendation #3 *: Implement a new small-project portfolio at DOE,* ***Advancing Science and Technology through Agile Experiments (ASTAE),*** *across science themes in particle physics with a competitive program and recurring funding opportunity announcements. This program should start with the construction of experiments from the Dark Matter New Initiatives (DMNI) by DOE-HEP (section 6.2).*
- DOE response and actions :
  - DOE will initiate fabrication of 1-3 DMNI projects (5 projects remain under consideration)
  - The key word for new projects is AGILE

P5's call for *agile* implies that we should complete these experiments quickly, and shift course when it comes time to start new ones.

To do this:

- Keep FOA's and # of reviews limited. Select a few (2?) concepts at a time to develop into projects.
- Short R&D/design phase to finalize technology, concept development.
- Keep projects within a set funding envelope and schedule.
- We expect the lead laboratories to develop project execution plans to keep the initiatives on track and within budget

General Response: Recommendation 3

DMNI Status

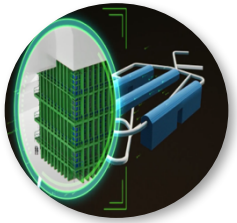
Concept	DM type	Mass range	Lead lab	Orig R&D request ($K)	R&D $K thru FY24	Est. Fab. cost ($M)
ADMX-EFR	Axions	9-17 μeV	FNAL	1,976	3,140	$20
DM-Radio	Axions	<μeV	SLAC	993	1,560	$24
LDMX	Hidden sector	10-300 MeV	SLAC	1,960	2,250	$21
OSCURA	WIMPs	1MeV-1GeV	FNAL	3,943	3,544	$15
TESSERACT	WIMPs	>10 MeV	LBNL	3,975	1,815	<$10
Total				12,847	12,309	$90

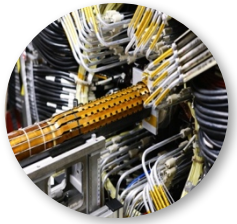
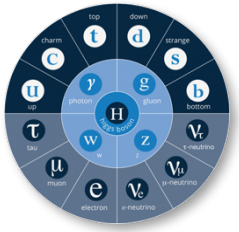
- These are the remaining DMNI proposals.
  - CCM at LANL was funded, fabricated and is operating.
- The French have funded a proposal to host TESSERACT.
- DOE has decided to fund TESSERACT starting in FY25 based on its cost effectiveness and the French offer to host.
  - These considerations made it the ideal concept to go next.
- We are still working on the process to select other DMNI proposals.
  - Most likely start will be in FY 26
- HEP will try to select 2 additional DMNI's to move to fabrication, with the rest folded into the ASTAE program competition. This will also allow new dark matter proposals to be considered.

Funding Opportunities

HEP Comparative Review





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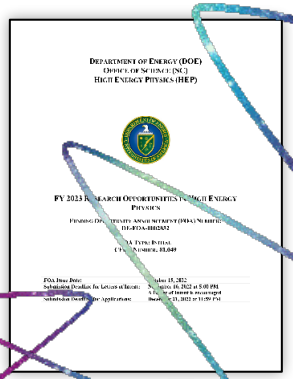
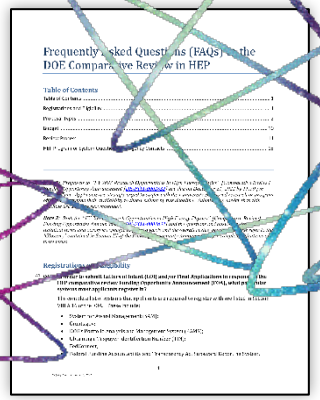
FY 2024 HEP Comparative Review FOA and FAQ

- **DE-FOA-0002832 issued: October 19, 2022**
- **Six core HEP research subprograms**
  - Energy, Intensity, and Cosmic Frontiers
  - HEP Theory, Accelerator Science and Technology R&D, and Detector R&D
- **Letter of Intent (strongly encouraged) due: November 16, 2022**
- **Final Proposal deadline: December 21, 2022**
- **Review process: January – March 2023**



PIs and university SROs should read the FOA carefully to comply with all requirements prior to submitting a proposal.

- **In addition to the FOA, an FAQ is available to address topics:**
  - Registration and eligibility requirements
  - Proposal types and requirements;
  - Guidance for new faculty and those without current grants
  - Guidance for PIs with existing HEP grants
  - Budget information and guidance on scope of request(s)
  - Letter of Intent
  - Information on overall scientific merit review process
  - Contacts for program- or system-related questions



The FOA, FAQ, and a recording of an informational webinar are available at: *https://science.osti.gov/grants/FOAs/Open*

Important Changes in FY24 HEP Comparative Review

To help resolve scheduling issues from multiple overlapping FOAs, we are working to move the HEP Comparative Review process to earlier in the Fiscal Year.

For FY24+, this means **changing the application process:**

- **No stand-alone HEP Comparative Review FOA**
- **Applications will be accepted through the FY24 SC Open Call (release in Oct)**
- **FY24 Proposals (New and Renewals) will be due in ~early December 2023**

-FY25 Proposals will be due in ~Sept 2024.
Check Open Call FOA for exact dates, when issued

Because the SC Open Call has somewhat different requirements, there will be differences in detail from "traditional" HEP Comparative Review FOA: page limits, appendices, budget forms, etc.

★Read the FOA when it is issued!

FY 2024 HEP Comparative Review FOA and FAQ

FY24 HEP Comparative Review DE-FOA-0003177

- **Call for proposals issued as part of FY24 SC Open Call** (also included FY25 HEP call)
- Applications for support of HEP research activities in any of the 6* areas identified below may be submitted to this FOA. HEP expects to convene comparative merit review panels on a yearly basis, as described below, for both New and Renewal applications devoted to these research activities.
  - Experimental HEP: **Energy Frontier, Intensity Frontier, Cosmic Frontier**
  - **HEP Theory**
  - Technology R&D: **General Accelerator R&D (GARD), Detector R&D**
- HEP allows applications from single institutions that span multiple research areas described in this FOA, including applications that span multiple HEP subprograms (a.k.a "umbrellas") or research thrusts.

*__Computational HEP/AIML__ and __HEP-QIS__ covered in separate FOAs in FY24 (see later slides)

Status : in final decision process. Decisions anticipated by late May/early June.

For more information (FAQ, webinar) : https://science.osti.gov/hep/Funding-Opportunities

University HEP Comparative Reviews

- **Since FY 2012, DOE/HEP uses a process of Comparative Grant Reviews for university research grants – those scheduled for renewal and any new proposals**
  - **The FY 2022 Funding Opportunity Announcement (FOA) marks 11th round in the process**
  - **Each HEP subprogram at the DOE national laboratories is also reviewed every 3-5 years**

- **Process was recommended by several DOE advisory committees, including the 2010, 2013, 2016 and 2020 HEP Committee of Visitors (COV):**
  - 2010 COV: *"In several of the cases … proposal reviewers expressed negative views of the grant, but only outside of their formal responses. Coupled with the trend in the data towards very little changes in the funding levels over time, this suggests that grants are being evaluated based on the historical strength of the group rather than the current strength or productivity of the group. This is of particular concern when considering whether new investigators, new science, or high-risk projects can be competitive. Comparative reviews can be a powerful tool for addressing these issues and keeping the program in peak form."*
    - use comparative review panels on a regular basis
  - 2013 COV: Continue comparative reviews. Augment with independent mail-in reviews
  - 2016 *and* 2020 COV: Continue comparative reviews
    - Continue communicating with PIs about program priorities at DOE-HEP PI meetings
    - Provide guidance to reviewers on, e.g., more uniform scoring, DE&I, …

Goal: improve overall quality and efficacy of the HEP research program by identifying the best proposals with highest scientific impact and potential

Other Important items

- Proposed research reviews best if closely aligned with the DOE/HEP mission, its program, and P5 strategy

- Investigators in experimental HEP research frontiers [Energy, Intensity, Cosmic] review best if they are closely integrated into HEP collaborations and have key roles and responsibilities on those experiments

- **"Generic" research that is not to be carried out as part of a specific HEP experimental collaboration should be directed to the Detector R&D or HEP Theory programs, as is appropriate**

- **Read the FOA carefully and follow the requirements on content, length, etc. Several requirements in the FOA are set from outside the DOE/HEP office, and there is little to no flexibility to modify. Non-compliant proposals submitted to the FOA will not be reviewed.**
  - In recent years, ~5% of incoming proposals are declined without review. Requirements that are most often missed or overlooked include: DMPs, page limits, separate budget sheets (if needed) for each research subprogram or thrust, and inclusion of Personally Identifiable Information (PII)
  - Most declinations occur for "new" proposals. Ask a mentor or experienced PI for help
  - Proposal types and requirements;

- **During and prior to the proposal submission, work with your university sponsored research/program office to ensure all FOA requirements are met**

Proposal: Project Narrative

- **The Project Narrative comprises the *research plan* for the project**
  - Should contain enough background material in the introduction to demonstrate sufficient knowledge of the research
  - Devote main portion to a description and justification of the proposed project, include details of the methods to be used and any relevant results
  - Indicate which project personnel will be responsible for which activities
  - Include timeline for the major activities of the proposed project

- **Project Narrative must not exceed X pages per senior investigator when printed on standard 8 ½" x 11" paper with 1-inch margins on all sides. Font must not be smaller than 11 point.**
  - Senior investigator means active tenured or tenure-track faculty member at the sponsoring institution
  - Non-tenure track faculty (e.g., research scientists) or senior research staff with term appointments are not included in the X-page limit per senior investigator unless they are the sole senior investigator on the application
  - Faculty members at collaborating institutions listed on the proposal (if any) are not included

- **PIs encouraged to refer to Section IV of the planned FOA Registration and eligibility requirements**
  - Includes useful information to help PIs in preparing better narratives — for e.g.:
    - What to address for the Background/Introduction
    - Multiple Investigators and/or Multiple Research Subprograms or Thrusts
    - Common narrative with overview of each group's activities in different research areas
      - Discussion of any synergies and connections between areas
    - Proposed Project Objectives, Research Methods, Resources
    - Timetable and Level of Effort of different activities, …

Artificial Intelligence and Machine Learning (AI/ML)

AI/ML continues to be a priority in the Administration, the U.S Congress, and across the HEP program

- FY 2020 and 2021 appropriations provided dedicated funds in DOE/HEP Research Program to advance AI/ML initiatives
- **Further enhancements to the science output of data-intensive experiments through improved pattern recognition, anomaly detection, and background rejection**
- **There are typically two categories of AI/ML-based experimental proposal narratives:**

  -Developer: PIs and their research teams are explicitly leading efforts to develop ML-based tools and algorithms for the collaboration to enhance sensitivity in physics studies.

  -End-user: PIs and their research teams are implementing ML-based algorithms , which were developed by other collaborators on the experiment, in an analysis.

  -"Developers" usually draw better reviews in research proposals than "end-users"..

- **FY 2024 FOA encourages investigators to narrate any research group's AI/ML efforts, where applicable, in the submitted proposal (*see Section IV of FOA*)**
  - Prefer a narrative describing category #1 above in research proposals
  - Identify any personnel and resources (*e.g.,* students, postdocs, etc.) devoted to efforts
- **During the panel deliberations, panelist are encourage to evaluate AI/ML activities of a group in the experiment**
- *Independent of the Comparative Review process, DOE/HEP is considering a separate dedicated AI/ML funding opportunity announcement in FY 2022. Stay tuned …*

HEP Research Activities Supported

✓What DOE supports

- **Efforts that are in direct support of our programs**
  - Support depends on merit review process, programmatic factors, and available funds
  - Research efforts (mainly scientists) on R&D, experiment design, fabrication, data-taking, analysis-related activities
  - Some engineering support may be provided in the Detector R&D subprogram
  - Theory, simulations, phenomenology, computational studies
- **Faculty support**
  - Based on merit reviews and/or optimizing the number of research personnel supported by financial assistance awards, support of up to 2-months faculty summer salary
  - Summer support should be adjusted according to % time the faculty is on research effort
- **Research Scientists**
  - Support may be provided, but due to long-term expectations, need to consider case-by-case on merits: whether the roles and responsibilities are well-matched with individual capabilities and cannot be fulfilled by a term position
  - Efforts are related towards research; not long-term operations and/or project activities

✗What's not supported by 'Research' grants

- **Any significant HEP operations and/or project-related activities:**
  - Engineering, major items of equipment, consumables for prototyping or production
- **Non-HEP related efforts (*e.g.* gravitational waves (LIGO), heavy-ion (RHIC/LHC), AMO Science)**

Programmatic Considerations

- **It is generally very useful to have head-to-head reviews of PIs working in similar areas, particularly for large grants**
  - Discussion of relative strengths and weaknesses of individual proposals and PIs
  - Many factors weigh into final funding decisions

  - ***Compelling research proposal*** for next ~3-4 years
    - ✓ **Interesting? Novel? Significant? Plausibly achievable?**
    - ✗ **Incremental? Implausibly ambitious? Poorly presented?**
  - ***Significant recent contributions*** in last 3-4 years
    - Synergy and collaboration within group (as appropriate)
    - Contributions to the research infrastructure of experiments
  - ***Alignment with HEP*** programmatic priorities
  - ***Balanced program*** of R&D/design, support of construction or operations, data analysis
    - This may span multiple experiments over a 3+ year proposal

- **Supportive of excellent research, including excellent research by *new* people, even when times are tough!**
- **Corollary: Some proposals, including some from senior personnel, ranked below average may not be funded**

Merit Review Criteria

DOE SC's standard merit review criteria are set forth by 10 CFR Part 605.10 and may include additional criteria relevant to the scope and objectives of the solicitation.

Unless otherwise tailored in the solicitation (Funding Opportunity Announcement or DOE Laboratory Call), the merit review criteria for the evaluation of applications are as follows, in descending order of importance:

- Scientific and/or Technical Merit of the Project;
- Appropriateness of the Proposed Method or Approach;
- Competency of Applicant's Personnel and Adequacy of Proposed Resources;
- Reasonableness and Appropriateness of the Proposed Budget; and
- **Quality and Efficacy of the Plan for Promoting Inclusive and Equitable Research.**

The sponsoring SC Program Office may elect to modify this order at the time the solicitation is developed, as appropriate for the scope and objectives of the solicitation.

Promoting Inclusive and Equitable Research (PIER)

- **The Office of Science introduced a new Merit Criterion to all FOAs in 2023:**
- **Quality and Efficacy of the Promoting Inclusive and Equitable Research (PIER) Plan**
  - Is the proposed Promoting Inclusive and Equitable Research (PIER) Plan suitable for the size and complexity of the proposed project and an integral component of the proposed project?
  - **To what extent is the PIER plan likely to lead to participation of individuals from diverse backgrounds, including individuals historically underrepresented in the research community?**
  - **What aspects of the PIER plan are likely to contribute to the goal of creating and maintaining an equitable, inclusive, encouraging, and professional training and research environment and supporting a sense of belonging among project personnel?**
  - How does the proposed plan include intentional mentorship and are the associated mentoring resources reasonable and appropriate?
  - For renewal applications only: How does the proposed plan build or expand upon strategies to promote diversity, equity, accessibility, and inclusion of the currently supported research?
  - **Are any plans proposed for recruiting additional scientific and/or technical personnel including new senior staff, students, and postdocs reasonable, justified, and appropriate?**

SC expects to receive a wide range of ideas and approaches in applicants' PIER Plans; these questions do not represent boxes that must all be checked! Some questions may not apply to every PIER Plan.

A large fraction of HEP Research funding is devoted to salary support for faculty, postdocs, and students. It is appropriate that we consider the effectiveness of an applicant's record and plans for conducting research in an inclusive and equitable manner and for recruitment and mentoring in the allocation of research funds.

Promoting Inclusive and Equitable Research (PIER) Plans

At-a-glance:

- Should describe the activities and strategies proposed by the Principal Investigator (PI)/project team to promote equity and inclusion integral to the research project;
- Are between 1-3 pages long, and included as an appendix to the research proposal narrative;
- Will be evaluated as part of the merit review process used to inform funding decisions;
- Are required for all research proposals submitted to SC through FOAs, Laboratory Announcements, and invitational proposals from DOE Labs;
- Are not required for existing awardees unless they are submitting a renewal proposal starting in FY 2023;
- Are not required for applications for supplemental funding on existing awards;
- Are not required for applications requesting funding to support conferences (*but there are new conference proposal requirements for FY 2023*)
- Are not required for proposals submitted to SBIR/STTR Programs announcements. A requirement will be phased in at a later date.

Examples of insufficient PIER Plans

- A copy of a departmental or institutional DEIA plan or listing standard institutional policies and procedures.
- A proposal for STEM K-12 or community outreach that **is not** integral to the proposed research.
- A DEIA activity that is already being carried out by the applicant or partners and is not related to or relevant to the proposed research.

PIER Plans should be integral to the proposed research to be conducted by the PIs.

Guidance on Review Criteria and Policy Factors

For Principal Investigators

- Merit review criteria and corresponding questions are given in Section V of the FOA
- Program Policy Factors, which are also used in selections for an award – including those pertaining to the availability of funds – are given in Section V of the FOA
- These serve as an additional guide for PIs to address in their proposal's project narratives
  - Provide a plan! Do not just write paragraphs explicitly answering each question.
  - Instead, integrate and adapt these (as appropriate) when narrating the group's activities and research plans.

For Reviewers/Panelists

- The same merit review criteria and corresponding sub-questions are given to all reviewers to input their reviews in DOE's Portfolio Analysis and Management System (PAMS)
  - Serves as a guide for reviewers to address each review criteria for written reviews
  - Presented and discussed by individual panelists for each proposal
- Other Program Policy Factors are also to be considered by panelists
  - For e.g., program alignment with respect to the P5 strategic plan, fostering development of diverse cadre of supported researchers, and opportunity for early-stage investigators and/or junior scientific personnel

Proposal Commandments

- **Thou shall read the FoA carefully and comply**.
- **Thou shalt not waste space on boiler plate.** *Unless you've come up with a new virtue of the enormous experiment you and others have been working on for a decade, keep it to a minimum.*
- **Thou shalt not over-claim.** *It will be just your luck that one of the panelists will know the real story.*
- **Thou shalt not over-emphasize past glory. It's a PROPOSAL, i.e. what you are proposing to do.** *There should be enough discussion of previous work to give a context to what is proposed and make the case that you are competent to do what you propose to do. It's not a life achievement award.*
- **Thou shalt detail what you propose to do. Say who will do what, when.**
- **Thou shalt be clear about who will be supported, when they start doing work and when they are expected to stop.** *For each year, it should be very clear how many postdocs will be supported on the proposed award and for how many months. Similarly for graduate students.*
- **Thou shalt trim your CoI list.** *Do not include every name in your 3000-person collaboration, just the ones you actually had significant interactions with in the last four years.*
- **Thou shalt put some real effort into your PIER plan**. *Don't just parrot the university or departmental policy. Make sure your own group's part in it is emphasized.*
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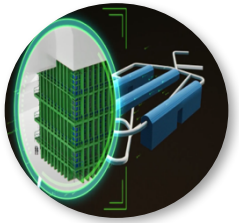
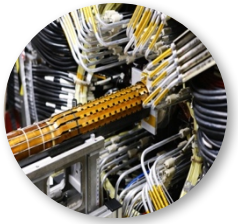
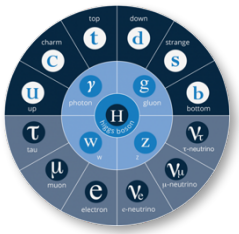
- **Thou shalt not have reviewers guess or assume.** *They review what is presented and it's not their role to fill in unknowns with positive assumptions on your behalf.*

Funding Opportunities

DOE Early Career Research Program





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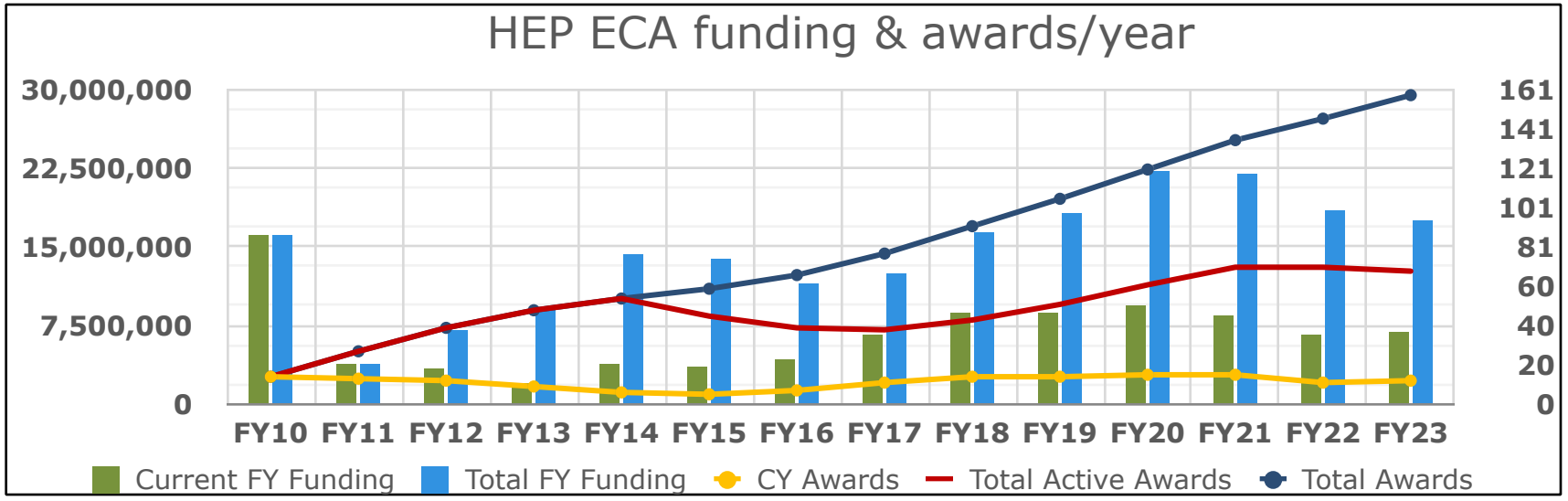
Increasing Investments to Early Career Research Program

https://science.osti.gov/early-career

- **158 total HEP awards to date**: 90 University and 68 National Labs.
- **In FY 2023, 12 awards (4 Univ, 8 Lab) including first-time HEP award to PNNL.**
- 4 HEP awards funded by Established Program to Stimulate Competitive Research (EPSCoR)
- FY 2011 (Theory), FY 2013 (Intensity), FY 2020 (Cosmic), and FY 2021 (Cosmic)



FY24 Early Career Research Program DE-FOA-0003176

- Applications for support of HEP research activities in any of the 8 areas identified below may be submitted to this FOA. HEP expects to convene comparative merit review panels on a yearly basis, as described below, for both New and Renewal applications devoted to these research activities.
  - Experimental HEP: **Energy Frontier, Intensity Frontier, Cosmic Frontier**
  - **HEP Theory**
  - Technology R&D: **General Accelerator R&D (GARD), Detector R&D,** Computational HEP, HEP-QIS
- Eligibility time window (max years past PhD for PIs) increased for this competition for a second year from 10 to 12 years for all applicants. DOE/SC intends to revert to the original 10-year eligibility window in subsequent competitions.

Status : Full proposals due Apr 25, out for review. Decisions anticipated by late June.

For more information (Webinar, previous awards) : https://science.osti.gov/early-career

Preparing an Early Career Proposal 1.0

Plan to issue a FY 2023 FOA for the next round of Early Career applicants in early-Fall 2023

- Stay tuned for further updates at: *https://science.osti.gov/early-career*

In addition to the merit review criteria in the FOA, the following guidance should be applied while preparing the proposal narrative:

- What challenges/problems are you trying to solve? Communicate this in the proposal.
- Is someone else doing it already?
  - Alternatively, aren't those research activities already being funded elsewhere?
  - *i.e.,* if you carry-out these efforts, why are they unique and require "you"?
- How does this research exploit/engage the unique capabilities of your institution?
- What resources are needed to complete the project?
- Does your proposal address a **5-year timeline** with key deliverables and personnel profiled during this project period?
  - If funded, what will be the outcome after 5-years?
- Leadership:
  - Have *you* led the activities that you are proposing?
  - Why are *you* a **future leader in HEP**? For e.g., identify past & present leadership activities in the Collaboration; any in HEP or broader scientific community?
  - Update the bio-sketch in the proposal

Preparing an Early Career Proposal 2.0

General guidance based on well reviewed research proposals submitted in the past

- Tell a **story**!
- Provide ***unique*** capabilities. Impact: what does not get done, if not funded?
  - During preparation, address "why is it critical that I carry-out this research?"
  - How does your work impact the efforts within the international collaboration?
  - To make the point, show any simulation results, trigger efficiency studies, or other quantitative projections *you have completed* on the activity; Include figures/plots/tables!
- Identify, where appropriate, innovative approaches to analysis method
- A ***balanced*** program: strong physics effort + a hardware effort *or* an operations component, where PI takes a lead
- For searches, discuss the ***discovery*** *reach.*
  Do not just state: "in the absence of a signal, a 95% C.L. limit will be set."
- Budget Justifications in the appendix matter: reviewers consider what is being requested
- You may submit proposals of similar scope to Early Career and HEP comparative review
  - Don't just copy/paste one narrative into the other: check FOA instructions (*e.g.,* page limits…)
  - Align the proposal with the process: For Early Career, develop a clear "5-year plan"; and spell out certain details for reviewers from the non-LHC community

Prior to submission, applicants may want to seek guidance from appropriate senior faculty and/or staff while preparing proposals, including a critique of the narrative and appendices

- Applicants encouraged to draw guidance from any members within the international collaboration

ECRP Proposals: Do This

Do Follow the Instructions and Guidelines

Read the current FOA thoroughly, as well as any supporting materials – e.g., FAQ, HEP PI meeting slides.

SC rules & procedures and HEP program requirements are regularly updated.

Do seek out advice & support from trusted colleagues & mentors

Your institution has invested a lot of time and money hiring you. They want you to succeed. Let them help you.

Request a pre-review of the proposal.

There are resources at most institutions; and/ or seek guidance from collaborators.

Do learn the rules, regulations, and costs of your institution

Funds are awarded to the institution. Understand direct and indirect rates, benefits, and restrictions.

Establish a relationship with your budget office and/or sponsored research/ program office;

Remember they submit the proposal for you!

Do follow through on any past reviewer feedback

Give weight to the critical reviews

Arguing with HEP that 3 out of 5 reviewers thought your proposal was excellent does not address the 2 reviewers who had a different opinion

Read the Panel Summaries from past reviews. These contain the panel discussions of your proposal, including any strengths and weaknesses.

Do be clear and follow proper English grammar and composition

Be clear: avoid reviewers having to guess about your research plans;

Careless editing will annoy or confuse reviewers.

Hire someone to proof-read your proposal.

Do ask for what you reasonably need

Standard research requests include:

- Salary (PI and co-PIs)
- Other Personnel including post-docs, students, etc.
- Travel (domestic and foreign)
- M&S, Tuition remission
- Indirect Costs, Rates

Realistic funding expectations

- Early Career >$150k Univ. & >$500k Lab
- ~50% FTE to proposal
- Stagger personnel

ECRP Proposals: Do NOT Do This

Do Not submit a proposal late

You should assume that applications received after the deadline will not be reviewed or considered for award.

Use the weeks or months after the FOA is made public to prepare and then submit your proposal early.

Do Not brag or exaggerate

Be professional and objective.

Fully list your accomplishments in the bio-sketch; Include your mentoring and leadership roles.

Accurately and reasonably describe research plan

Do Not bury the message

The narrative should be accessible to a review panel with a wide range of expertise.

Avoid jargon when possible. Same with acronyms.

Describe in clear and concise language.

Tell a story...

Do Not overly dwell on the past

General rule of thumb (1/3:2/3).

No more than one-third of proposal devoted to past efforts;

Discuss future since DOE investments are meant for the next period.

Majority of proposal narrative should be forward looking.

Do Not submit a sloppy budget or budget justification

The budget sheets and justification should be prepared with the same care as the narrative.

Reviewers will call out any:

- Excessive or inappropriate requests
- Arithmetic errors
- Poorly justified expenses
- Start guessing if not adequately explained

Do Not be discouraged

Competition is strong.

Some very good proposals are declined due to limited resources.

That first feedback is so valuable.

Proposal Commandments

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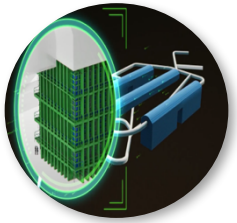
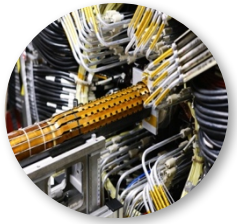
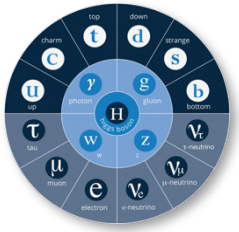
Other Funding Opportunities





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HEP Other Funding Opportunities

Office of Science RENEW and FAIR Initiatives

- **Reaching a New Energy Sciences Workforce (RENEW)**
  - Leverage SC's national laboratories, user facilities, and other research infrastructures to support traineeships for students and postdoctoral researchers at institutions underrepresented in the SC portfolio.
  - Applications to RENEW must include training activities* beyond conduct of research.
- **Funding for Accelerated, Inclusive Research (FAIR)**
  - Build research capacity, infrastructure, and expertise at institutions historically underrepresented in the SC portfolio by funding fundamental research relevant to the SC mission.
- Both initiatives aim to:
  - Increase the diversity of institutions participating in SC research.
  - Build relationships with institutions historically underrepresented in the SC research portfolio.
- Focus on non-R1 emerging research institutions (ERIs) and non-R1 minority serving institutions (MSIs)**

For HEP : Applications must propose subject areas supported by HEP (same as ECRP)

*Traineeships are structured, substantive STEM training programs with measurable expectations and a duration and intensity substantial enough to achieve both short-term and long-term training outcomes.

**Institution Designations and Classifications: https://science.osti.gov/grants/Applicant-and-Awardee-Resources/Institution-Designations

HEP Other Funding Opportunities

FY24 RENEW DE-FOA-0003280

HEP POC: Brian Beckford

FOA Issued : March 12

Pre-applications due: April 30

Pre-app response date: June 4

Full applications due: July 23

Webinar date : March 21

Application Office Hours : July 10, 18

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

- All applications must be submitted on behalf of a lead institution that is a non-R1 ERI or non-R1 MSI.
- The lead institution must partner with **at least one** team member from a DOE-affiliated institution (National Labs, User Facilities, etc). See FOA for additional teaming requirements.
- Limited to one application per PI and no more than 3 applications per program per institution.
- There are two application tracks that are differentiated by the award size and duration:

Application Track	Award Floor (Total)	Award Ceiling (Total)	Award Duration
Exploratory Application	$100,000	$400,000	2 years
Full Application	$750,000	$2,250,000	3 years

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HEP Other Funding Opportunities

FY24 FAIR DE-FOA-0003207

HEP POC: Jeremy Love

FOA Issued : March 12

Pre-applications due: April 23

Pre-app response date: May 28

Full applications due: July 16

Webinar date : March 20

Application Office Hours : July 2, 10

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

- All applications must be submitted on behalf of a lead institution that is a non-R1 ERI or non-R1 MSI.
- The lead institution must partner with a **single** DOE institution (National Labs, User Facilities) OR an R1 ERI/MSI. See FOA for additional teaming requirements.
- Limited to one application per PI and no more than 3 applications per program per institution.
- One application track:

Application Track	Award Floor (Total)	Award Ceiling (Total)	Award Duration
Full Application	$300,000	$800,000	3 years

Summary

- Many opportunities/venues for engagement with HEP Program Managers
  - Take advantage of them! Let us know what works (and what doesn't)
- HEP graduate-level Traineeships are a real success story
  - Accelerator Science and Engineering expanding number of students
  - HEP Instrumentation and Computation launched, plan to recompete in FY25/26
- Progress on main FY24 HEP FOAs (Comparative Review, Early Career)
  - Decisions coming soon(ish)
- Lots of new HEP funding opportunities available, particularly in:
  - Expanding opportunities for historically underrepresented institutions (RENEW, FAIR)
  - Emerging technology areas (AIML, QIS, Microelectonics)

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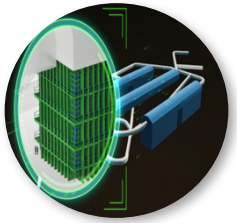
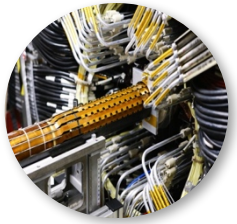
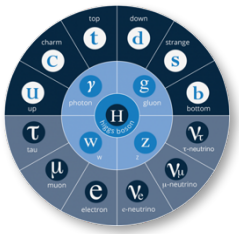
Other Opportunities







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General Response: Recommendation 6

Recommendation 6

- Convene **a targeted panel** with broad membership across particle physics later this decade that makes decisions on the US accelerator-based program at the time when major decisions concerning an off-shore Higgs factory are expected, and/or significant adjustments within the accelerator based R&D portfolio are likely to be needed. A plan for the Fermilab accelerator complex consistent with the long-term vision in this report should also be reviewed.
  - The panel would consider the following: The level and nature of US contribution in a specific **Higgs factory** including an evaluation of the associated schedule, budget, and risks once crucial information becomes available.
  - The panel would consider the following: Mid- and large-scale **test and demonstrator facilities** in the accelerator and collider R&D portfolios.
  - The panel would consider the following: A plan for the **evolution of the Fermilab accelerator complex** consistent with the long-term vision in this report, which may commence construction in the event of a more favorable budget situation.

DOE does not envision a single panel to address this recommendation; rather we will work with NSF, the DOE Laboratories and community at large to convene three separate panels that each will address one of the topics.
Initial thoughts on the following slides ….

Recommendation 6

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Other DOE Opportunities

•There are a growing number of specialized education, training or "workforce development" programs available for interested students in HEP and related fields.

•These allow you to explore and develop new skills and areas of expertise; many also offer networking and career-development seminars and mentoring.

•Workforce Development (WDTS) programs: *https://science.osti.gov/wdts/*

•Office of Science (SC) Graduate Student Research (SCGSR)

- Supports graduate student research at a DOE national laboratory; 3 to 12 months
- Two calls per year, usually opens in February/August
- Applications are typically due May/November, respectively, for following Fall or Summer start

•Science Undergraduate Laboratory Internships (SULI)

- Supports undergraduate research at a DOE national laboratory; 10 to 16 weeks
- Three calls per year, for following Spring/Summer/Fall terms – now open for the 2022 Spring Term

•Visiting Faculty Program (VFP)

- Summer research support for faculty/students from historically underrepresented institutions
- One call per year, usually opens in October; Applications typically due the following January

•Community College Internships (CCI)

- Provide technical training for community college students at DOE laboratories; 10 weeks
- Three separate internship terms: Summer, Fall, Spring – call now open for the 2022 Spring Term

•Traineeships for undergrad and grad students, select institutions

- HEP Traineeships in specific technical areas (graduate level)
- Accelerator Science and Technology, Instrumentation, Computational HEP (planned in FY22)
- MSI STEM Traineeships, undergrad level, joint with DOE NP (see next slides)
- US Particle Accelerator School, grad level university-style courses, 2 sessions a year, credit-earning including a MS option : uspas.fnal.gov

Career Opportunities for Scientists in Government

- **There are several career opportunities available at DOE (not just HEP, also other SC offices and DOE or government-wide programs):**

- **Internships for undergrads and graduate students:**
  - DOE Scholars (formerly *Pathways*) for US citizens who are current or recent students in a STEM field : orise.orau.gov/doescholars/Panel
  - Minority Educational Institution Student Partnership Program (MEISPP) for all US citizens who are full-time students; not limited to MSI students, underrepresented groups, or STEM: doemeispp.org

- **Fellowships for post-graduates**
  - AAAS Science and Technology Policy Fellowship for US citizens with a PhD in science or a MS in engineering, 1 yr renewable : aaas.org/page/fellowship-areas
  - Presidential Management Fellowships for advanced degree recipients, US gov't-wide, 2 yr program, convertible to Fed staff position : pmf.gov

- **Federal jobs (variable education requirements, see individual postings)**
  - All posted on usajobs.gov. Can be entry-level or more advanced.
  - Some agencies (NASA, NIST) have both research scientist (ie active research) positions as well as program management positions; others (DOE, NSF) have only program management with limited opportunities for independent research. Read job description carefully and consult with agency contacts if you have questions.

See funding opportunities talk on Tuesday 11:00 am

DOE Project Management

- Construction projects and fabrication of large pieces of experimental equipment costing over $5M are managed through a series of "**Critical Decision**" milestones
- The CD process ensures successful project execution and scientific return on agency investments, but funding must still be appropriated
  - Projects reaching CD-3 may have technical readiness, but they must be supported in the President's Budget Request and receive funding from Congress before they can begin