DOE High Energy Physics Theoretical Research Program

DOE-HEP Principal Investigator Meeting
APS/DPF - Pheno Meeting Pittsburgh · May 13-17, 2024

https://indico.cern.ch/event/1358339/

William Kilgore
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Office of High Energy Physics

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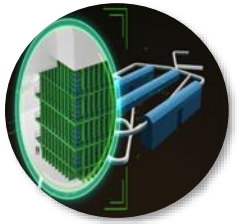


Outline

- HEP Program
- HEP Program Planning
- HEP Theory Program Overview
- Office of Science Early Career Research Program
- HEP Comparative Reviews
- Other Funding Opportunities
- Closing Remarks

This talk will:
(1) Emphasize the HEP Theory program within the broader context of the overall HEP program; *and*
(2) Provide an preview of the FY 2025 comparative review funding opportunity announcement (FOA).
Please refer to the FOA document prior to any submission of an application.

What is the DOE HEP Program?

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DOE Program Model
Mission-driven Science

DOE develops and supports a specific portfolio of projects ⇒ emphasis placed on planning, R&D, building experiments, operating, and publishing results

DOE HEP Mission

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

How do we do this?

- Make significant, coherent contributions to facilities/experiments (*e.g.*, LHC/CMS and ATLAS, LBNF/DUNE, …), including project management under DOE project system
- Support science collaborations in all stages, leading to the best possible science results
- Support technology R&D to advance state-of-the-art particle accelerators and detectors that will lead to new and more capable facilities
- Form partnerships with other agencies (*e.g.*, NSF, NASA) to help deliver our mission

DOE supports about 85% of the U.S. HEP effort (in $), including U.S. national laboratories

HEP Program Guidance

- FACA panels are the official advisory bodies to U.S. government agencies.
- The 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)

A Global Vision for Particle Physics

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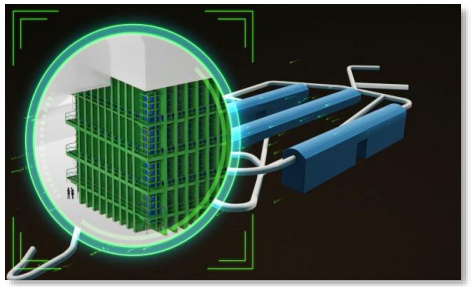
- **The global vision presented in the 2014 P5 report addressed the five Science Drivers with a balanced program that deeply intertwines U.S. efforts with international partners**
- **The 2023 P5 report builds on the 2014 report and sets new goals for the coming decade.**

  The HL-LHC, DUNE and VRO remain the highest priorities for our program, while we continue the existing program and develop new, smaller projects in the short term and conduct R&D for the long-term future.
- **DOE execution of the P5 strategy requires navigating many factors, including:**
  - Balancing HEP program for projects, operations, research
  - U.S. budget formulation and execution
  - Coordination among U.S. and international partners
  - This strategy is still under development



High Energy Physics: A Mission-Driven Agency

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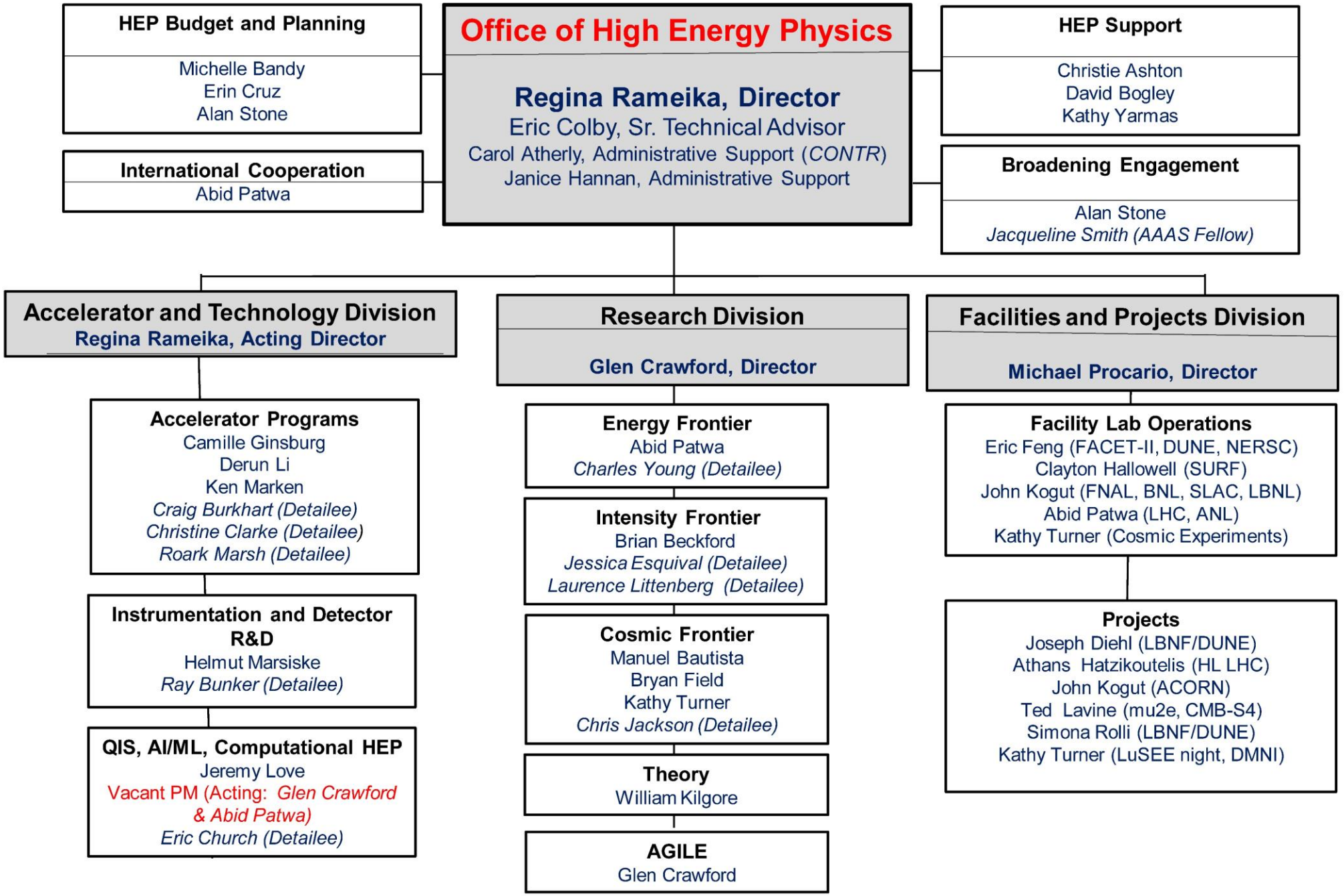
- **The mission of the HEP program is to understand how the universe works at its most fundamental level by discovering the elementary constituents of matter and energy, probing the interactions between them, and exploring the basic nature of space and time.**
- **Office is divided into the Research, Accelerator & Technology, and Facilities & Operations Divisions**
  - This talk will focus on the **Research Division**
- **Research and Technology programs are "mission-driven":**
  - Each HEP experimental subprogram develops and supports a specific portfolio of projects and emphasis is placed on the research needed to conduct the experiments and obtain results.
  - The HEP technology subprograms support R&D that advances the state-of-the-art in particle accelerators, detectors, computing, and quantum information that will lead to new, more capable facilities.
  - Each HEP experimental subprogram supports collaborations in different development stages, to maintain a balanced and sustainable program to deliver scientific results.
  - The Theory subprogram seeks to support theoretical activities that **provide the vision** and the mathematical framework for understanding and **extending our knowledge** of particles, forces, space-time, and the universe.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Alan Stone
International Cooperation
Abid Patwa
Office of High Energy Physics
Regina Rameika, Director
Eric Colby, Sr. Technical Advisor
Carol Atherly, Administrative Support (CONTR)
Janice Hannan, Administrative Support
HEP Support
Christie Ashton
David Bogley
Kathy Yarmas
Broadening Engagement
Alan Stone
Jacqueline Smith (AAAS Fellow)
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Regina Rameika, Acting Director
Accelerator Programs
Camille Ginsburg
Derun Li
Ken Marken
Craig Burkhart (Detailee)
Christine Clarke (Detailee)
Roark Marsh (Detailee)
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Laurence Littenberg (Detailee)
Cosmic Frontier
Manuel Bautista
Bryan Field
Kathy Turner
Chris Jackson (Detailee)
Theory
William Kilgore
AGILE
Glen Crawford
Facilities and Projects Division
Michael Procario, Director
Facility Lab Operations
Eric Feng (FACET-II, DUNE, NERSC)
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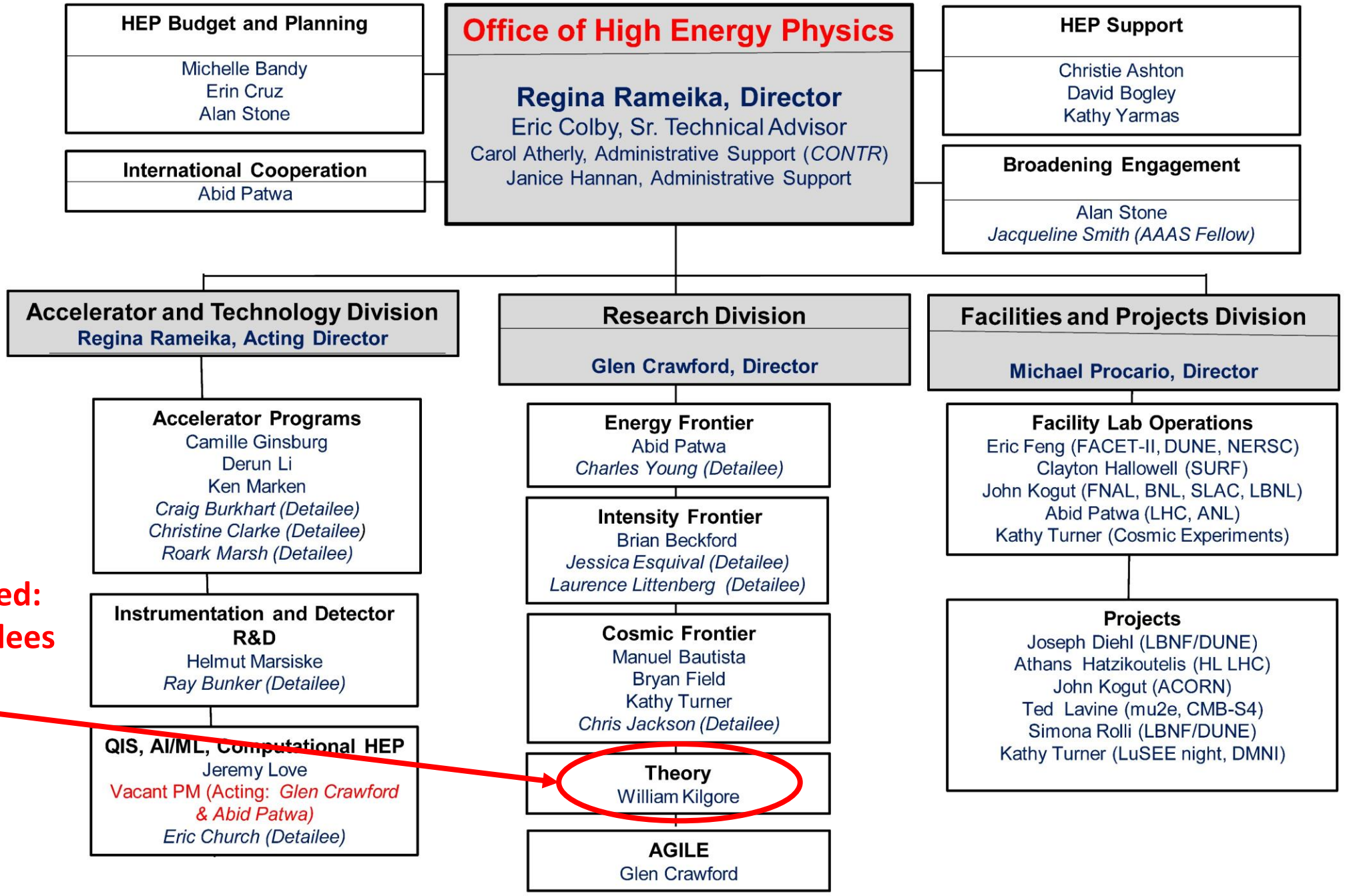
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Help Wanted:
IPAs, Detailees
Welcome!

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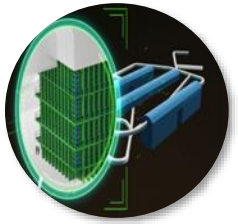
HEP Budgets and Funding






The U.S. Federal Budget Cycle

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- The President submits a Budget Request ("PBR")

For the next fiscal year, FY 2025, we are here;
and await the release of the House and Senate Marks

- Each house of U.S. Congress passes their vision of a draft budget called a "Senate or House Mark"
- Both houses agree on a single bill (a process through "reconciliation")
  - No amendments are allowed beyond this point ⇒ ensures that the process converges
- Congress passes this legislation
- The President signs it and it becomes law

"I'm Just a Bill"
Credit: America Rocks, 1976.
3rd season, Schoolhouse Rock.

- If this process is not completed by the end of a fiscal year (September 30th), Congress may pass a "continuing resolution" (or CR), or without any action, the U.S. Government can [partially] "shutdown"

DOE-HEP Budget ($k): FY 2014-2024

Research, Operations, Projects (Construction and MIEs)

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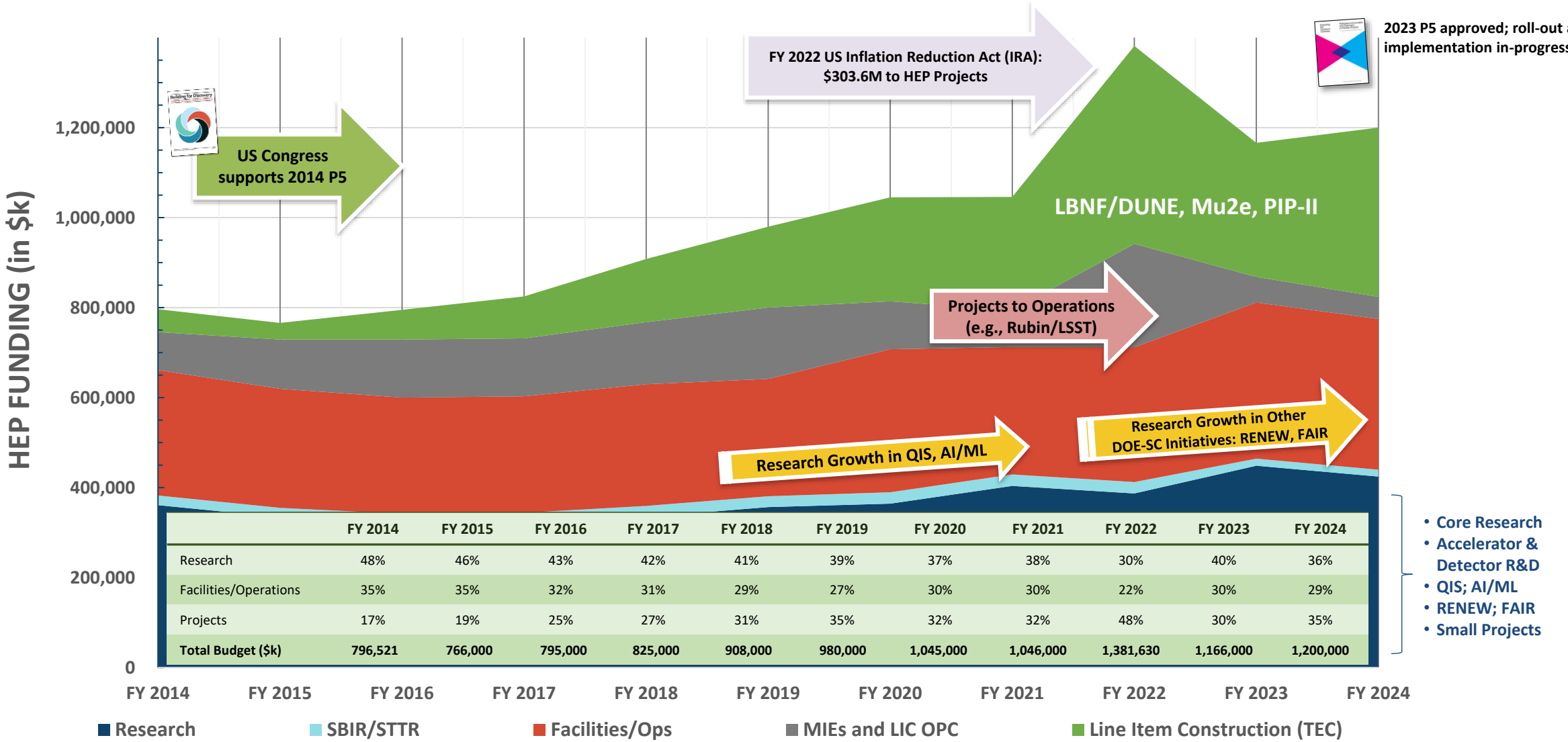

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Research	48%	46%	43%	42%	41%	39%	37%	38%	30%	40%	36%
Facilities/Operations	35%	35%	32%	31%	29%	27%	30%	30%	22%	30%	29%
Projects	17%	19%	25%	27%	31%	35%	32%	32%	48%	30%	35%
Total Budget ($k)	**796,521**	**766,000**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

- Core Research
- Accelerator & Detector R&D
- QIS; AI/ML
- RENEW; FAIR
- Small Projects

DOE-HEP Research ($k): FY 2014-2022

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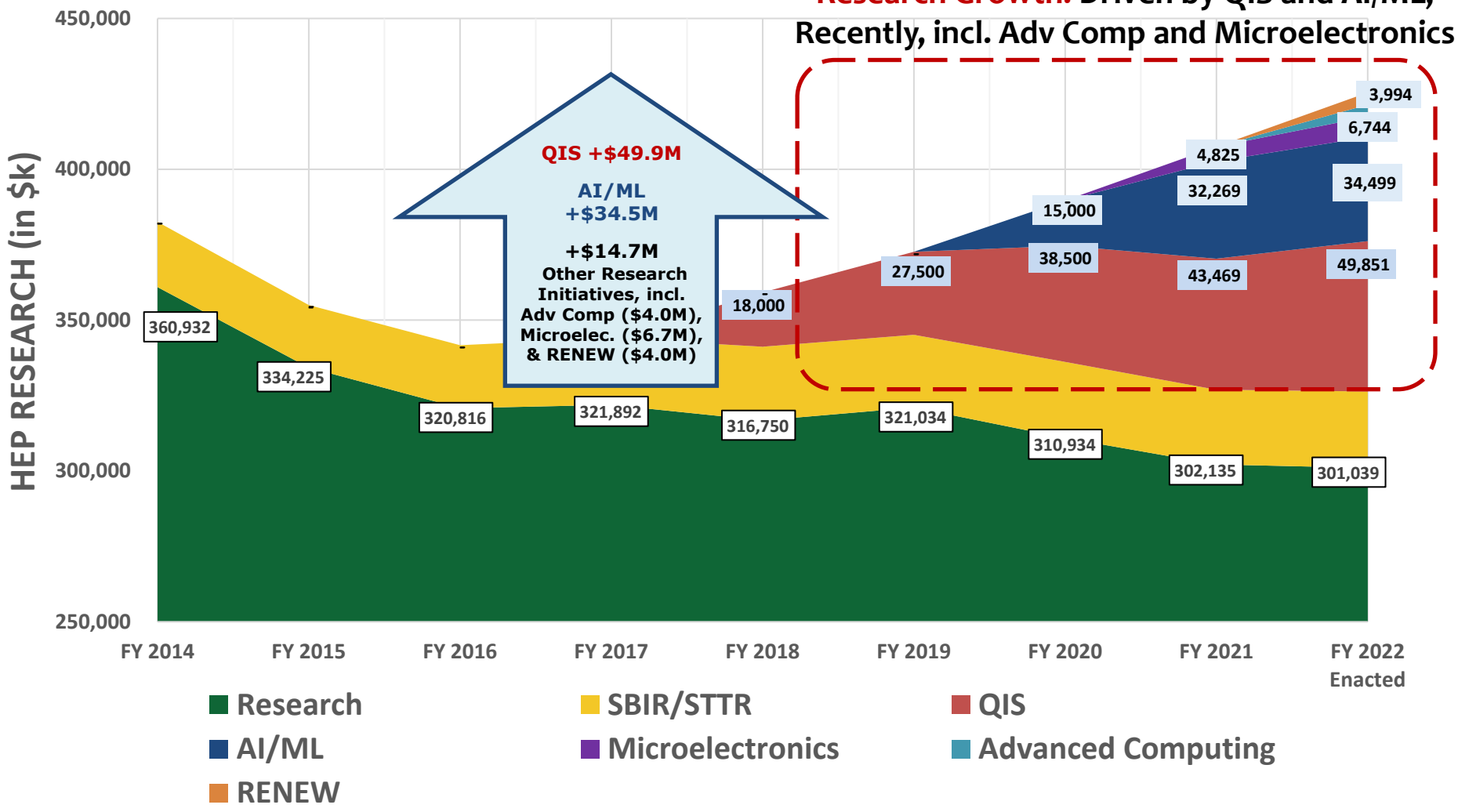
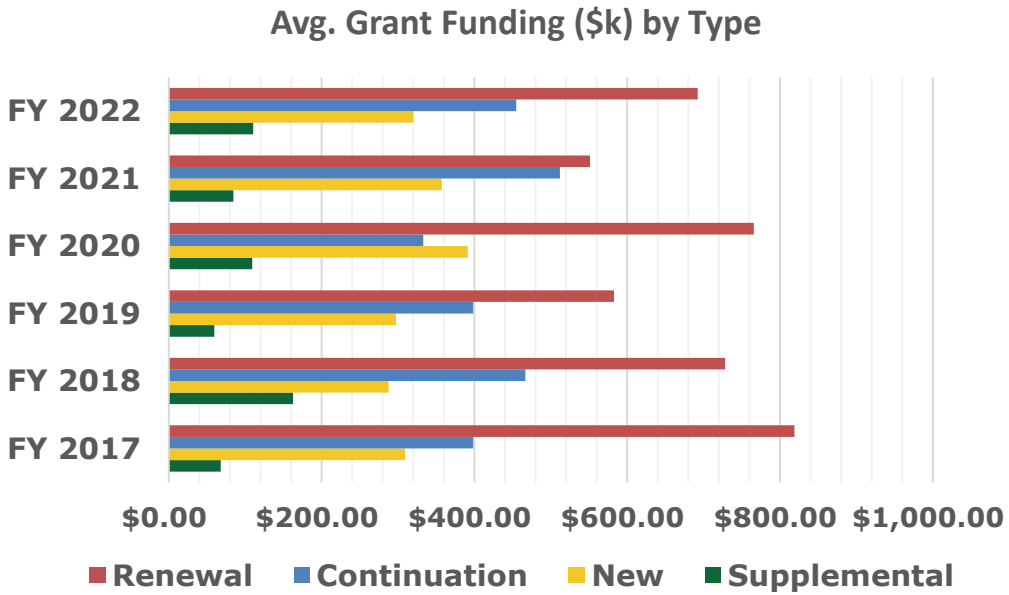
- Distinguishing HEP Research into: HEP "Core" Research, QIS, AI/ML, and Other Research Initiatives
- HEP "Core" Research ≈ Energy, Intensity, and Cosmic Frontiers; Detector and Accel R&D; and HEP Theory
- In recent years, dedicated AI/ML, Adv Comp, and Microelectronics funds have helped offset some fraction of reductions to "Core" Research
- FY 2022 IRA funds to projects – including to HL-LHC upgrades, LBNF, and PIP-II – allowed for some modest increases in the FY 2023 appropriated budget to "Core" Research



DOE/HEP University Research Grants



- **Cyclical effects between "New/Renewal" and "Continuations" for university grant funding**
  - Note: the full-funding effect to average Renewal grant funding not unfolded in the histogram
- **But total grant funding growth has been anemic, far below inflation, programmatic need, or 2014 P5 guidance**
  - Grant funding amounts include awards in DOE Office of Science initiatives (*e.g.*, AI/ML, QIS, Microelectronics) and Accelerator Stewardship
- **FY2022 IRA funds to HEP projects enabled, to some degree, an increase for core research in FY2023 to DOE-supported institutions relative to past years**

DOE Office of HEP	# of Procurement Requests						Funds Awarded ($)					
	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Award Revisions	5	6	8	8	11	6	-$74,424	$33,468	-$200,950	-$961,264	$0	$702,050
Continuations	134	155	180	163	152	180	$53,377,000	$72,350,000	$71,705,000	$54,277,242	$77,819,970	$81,869,209
Incr. Funding*	0	0	0	1	1	1	$0	$0	$0	$235,000	$240,000	$250,000
New Awards	69	92	54	33	48	48	$21,333,000	$26,463,429	$16,063,816	$12,913,000	$17,150,986	$15,370,950
No-Cost Extension	34	48	58	74	85	55	$0	$0	$0	$0	$0	$0
Renewal Awards	45	36	56	66	60	49	$36,859,000	$26,210,000	$32,635,500	$50,547,000	$33,082,000	$33,921,000
Supplemental	9	12	7	11	13	12	$610,603	$1,951,000	$417,000	$1,200,638	$1,097,384	$1,323,749
TOTAL:	**296**	**349**	**363**	**356**	**370**	**364**	**$112,105,179**	**$127,007,897**	**$120,620,366**	**$118,211,616**	**$129,390,340**	**$133,436,958**

*Does not include Sanford Underground Research Facility (SURF) Cooperative Agreement with DOE.

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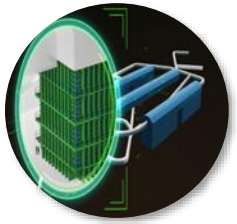
HEP Theory Research Program






HEP Theory Portfolio

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- Topics studied in theoretical high energy physics research include but are not limited to:
  - Phenomenological studies
  - Precision calculations
  - Development of new models
  - Progress in Quantum Field Theory
  - Development of analytical and numerical computational techniques
- The program is distributed across several research areas:
  - Standard Model Phenomenology
  - Beyond the Standard Model Phenomenology
  - Cosmology and Astroparticle Theory
  - Lattice Field Theory
  - Formal Theory and Mathematical Physics
- Topics in theoretical physics are not bounded by the HEP experimental Portfolio
  - Physics at non-HEP experiments, e.g. LIGO, EIC, … , can still be in-scope for HEP theory.
  - Theoretical research on non-HEP topics (CM-QFT, heavy ions, …) should clearly state how such research benefits the HEP program.

Annual Budget Process

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- The Program Manager receives an allocation from DOE-HEP leadership , i.e. the total budget for a given fiscal year.
  - First, the Program Manager fulfills commitments on continuing university grants (~33%)
  - Second, the Program Manager fulfills commitments to labs (~50%).
  - Remaining funds are available for new grants, renewals, supplements, conferences, summer schools, etc. etc. (~17%)
- The Comparative Review only determines how this remaining piece is divided. Commitments from previous years (for both universities and labs) can greatly affect the availability of funds. The Program Manager must balance the program across many years at once, even in the face of uncertain and, too often, declining budgets.

Theory in HEP Research Funding

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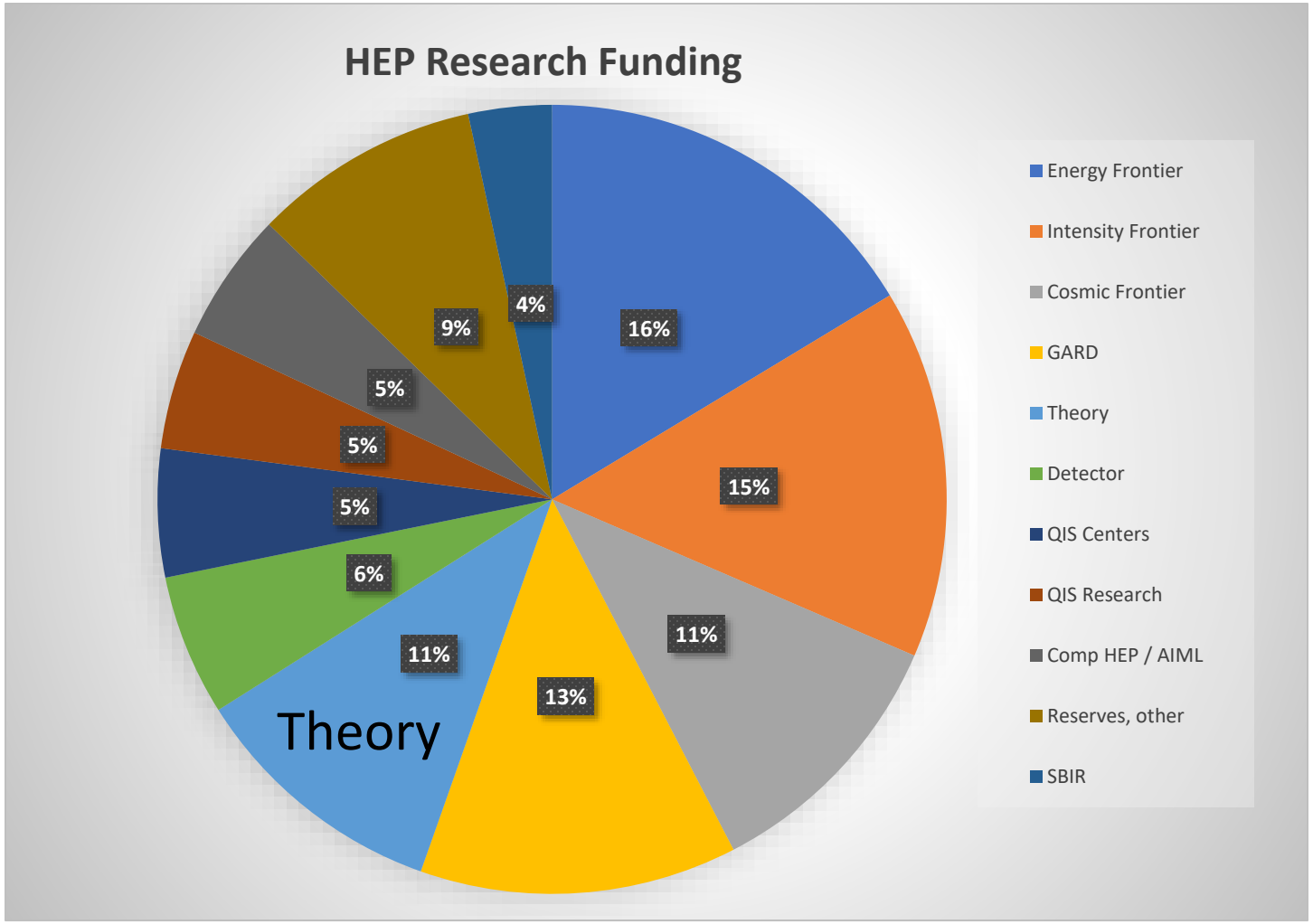
The theory program only supports research. Since research funding makes up only ~40% of all HEP funding, theory is a small part of the whole but a substantial fraction of the research portfolio.



Full Funding of Multi-Year DOE Grants

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- **Section 301(D) of the 2014 Consolidated Appropriations Act (CAA), passed by U.S. Congress on January 17, 20214, and subsequent legislations enacted thereafter, requires full funding of multi-year grants and/or cooperative agreements received from academic institutions with total cost less than $1 million.**
  - "Full funding" implies *funds for the entire award* for the proposal's project period is *obligated at the time the award is made*, instead of funding year-by-year.
  - Requirements have continued for such awards since FY 2015.
- **Congress wants the threshold raised from $1 million to $2.5 million in the coming years. For FY 2024, the Office of Science proposes raising the threshold to $1.1 M. We will progress toward $2.5M in future years.**
- **Logistics of full funding:**
  - Process applies to new, renewal, or supplemental grant awards made after merit review.
  - No other exemptions from this provision apply other than grants are of total cost less than $1 million – integrated over the project period *approved by DOE after a proposal's selection for a grant*.
- **During submission of a proposal along with conducting its merit review and making decisions on the award:**
  - There is no change to how an applicant applies for a grant or cooperative agreement.
  - There is no change to the merit review process.
  - There is no change to DOE Program Managers (PM) requesting revised budgets from PIs/institutions.
- **DOE PMs continue to have oversight of the program by requiring PIs to submit an annual research progress report that must be approved by the PM prior to any funds accessed by the PI the following year.**

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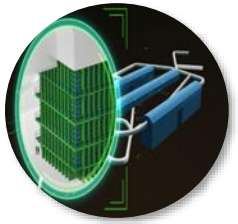
Office of Science Early Career Research Program






Early Career Research Program

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- **ERCP Launched in 2009 across all Office of Science.**
  - Successor to and replacement of highly successful DOE-HEP-OJI program (1978-2009), upon which it is modelled.
- **Open to university tenure-track professors and laboratory scientists holding equivalent appointments who are within ten years of receiving their PhD.**
  - FY 2024 cycle: Proposal under review; awards to be announced this summer.
  - FY 2025 cycle begins TBD. According to past practice, FOA should be open to candidates obtaining Ph.D. in year 2014 or later. In recent years, eligibility extensions have been considered for "major life events".
- **Common Office of Science criteria:**
  - Mandatory five-year program.
  - ≥$875k for university PIs, ≥$2,750K for lab PIs.
  - Funding can be front (or back) loaded
- **Program designed to be highly competitive with high impact.**
  - Identify and support the future HEP research leaders
  - The overall success rate for HEP has been ~12%.

HEP Review Procedure

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- **Three-step merit review process:**
  - Stage 1: Three to six mail-in reviews collected for each candidate in each research subprogram*.
    - * Advanced Accelerator R&D, Cosmic Frontier, Detector R&D, Energy Frontier, Intensity Frontier, Theoretical and Computational HEP.
  - Stage 2: Finalists selected based on mail-in reviews, programmatic priorities, and panel discussions.
  - Stage 3: Panel review of ~24 proposals selected from subprogram reviews, with a super-panel evaluating all proposals together.
- **"Super Panel" approach:**
  - Lab and university proposals are reviewed together.
  - All six subprograms reviewed together.
    - We do not expect panelists to be experts in all proposal topics, but they should take a "big picture" view of which proposals/PIs are most likely to impact HEP.

Early Career Research vs. Core Research

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- **There are many overlaps between proposals to the HEP Early Career program and the HEP core research program.**
  - All proposals are subject to similar scientific/technical merit and program policy factors, and a comparative review is used to select the strongest proposals.
  - ***Alignment*** with programmatic priorities is extremely important
  - The Strongest proposals offer a compelling research program over the entire course of the project period

    ☑ Interesting? Novel? Significant? Plausibly achievable?

    ☒ Incremental? Implausibly ambitious? Poorly presented?
- **There are important differences, however:**
  - The Early Career proposal success rate is much lower (~ 12%) than for regular research proposals
    - The Strong competition favors extremely clear, well-written proposals that leave no question about the PI's scientific vision and capability.
    - Reviewers tend to reward scientific **Vision**, **Innovation**, and **Leadership** over steady, reliable progress.

ECRP Merit Review Criteria

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- **Seven merit review criteria for all proposals across Office of Science:**
  1. Scientific and/or Technical Merit of the Project.
  2. Appropriateness of the Proposed Method or Approach.
  3. Competency of Research Team and Adequacy of Available Resources.
  4. Reasonableness and Appropriateness of the Proposed Budget.
  5. Quality and Efficacy of the Promoting Inclusive and Equitable Research (PIER) Plan.
  6. Relevance to the mission of the specific program (HEP).
  7. Potential for leadership within the scientific community.
- **All are important; the blue ones typically provide more differentiation between proposals.**
- **"Mission relevance" is important; HEP does not like to use the Early Career award to launch a new Project.**
- **There are many styles of "Leadership". Stress those that describe you!**

Early Career Proposal Framework

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1. What are the problems you are trying to solve?
2. Is someone else doing it? Is that already being funded?
3. How does this research exploit/engage the unique capabilities of your institution?
4. What are the resources you need to do this project?
5. Outline a five year timeline, with key deliverables and personnel.
6. Why you are a (future) leader in high energy physics?

Competitive Early Career Proposals

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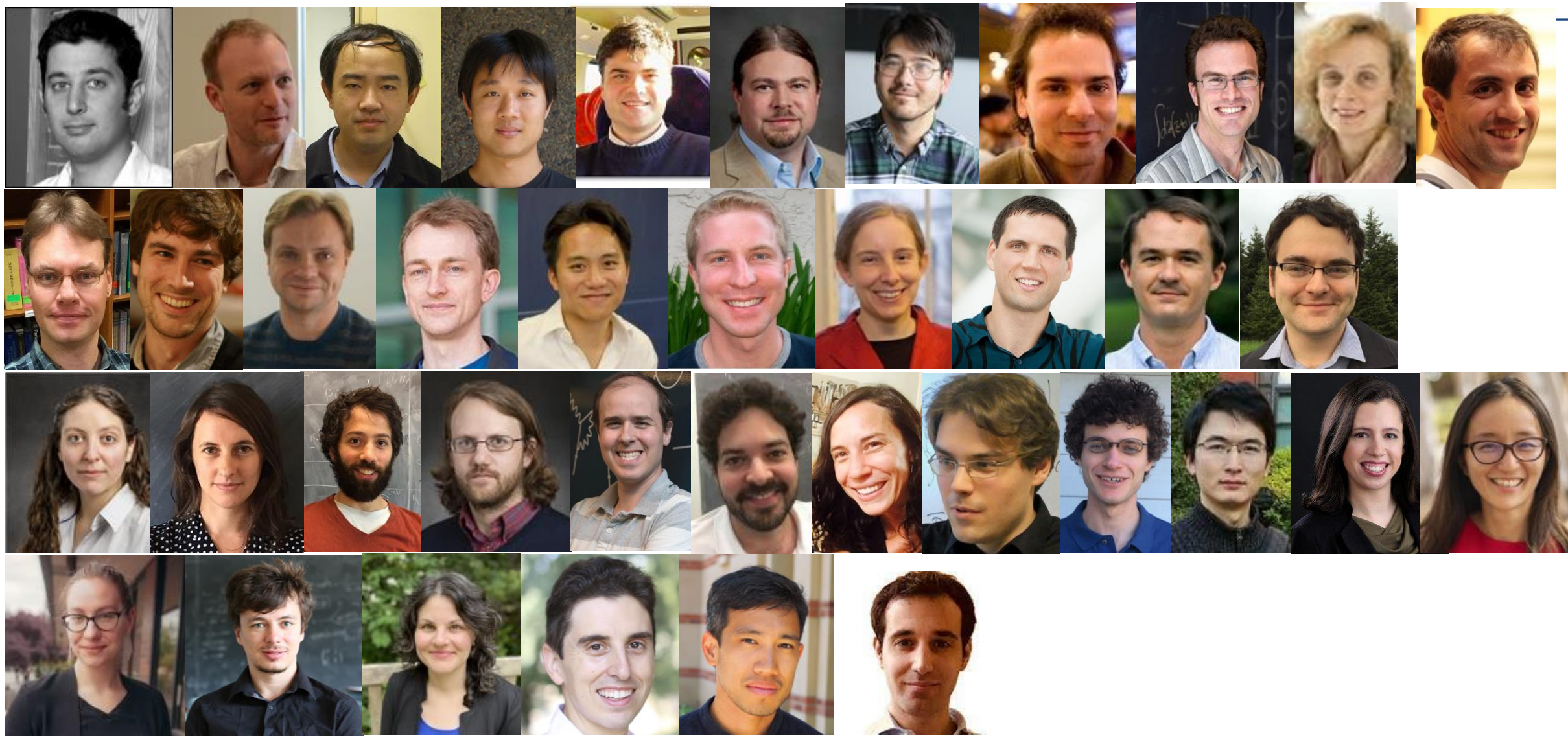
- **The Early Career program for HEP theory is extremely competitive**
- **Successful proposals must be outstanding:**
  - Clear and well-written
  - Timely, Exciting, and Innovative
  - The PI must clearly "own" the proposed research.
  - Must have intellectual depth for the in-program part of the review and a bold vision that appeals to panelists from across HEP.
- **There should be a clear 5-year plan:**
  - If the topic is important enough to merit an Early Career Award, there should be five years worth of work and you should have a clear plan about how you will execute it
- **All of that may not be enough!**

HEP Theory Early Career Awardees



The HEP Theory Program produced 39 awardees through 2023 in the Office of Science Early Career Research Program.

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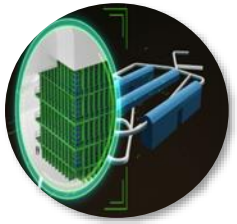
HEP Comparative Review






HEP University Comparative Reviews

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- **Since FY 2012, DOE/HEP uses a process with comparative merit review panels for university research grants – those scheduled for renewal and any new proposals**
  - **FY 2025 will mark the 14th round in the process**
- **This 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."*
    - In 2012, HEP began to 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
    - Communicate about program priorities at DOE-HEP PI meetings, provide improved 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

FY 2025: HEP Comparative Review in the Open Call

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- **In FY 2025, we will continue to prioritize support for the university research program through Comparative Review and use the same edition of the Open Call.**

From DE-FOA-0003177

> **Applications submitted for the annual HEP comparative review process:**
>
> …
>
> 2. FY 2025 HEP Comparative Review: HEP expects to convene merit review panels in November 2024 for research areas **(a)** through **(g)** below. Research applications, as described above, that are aligned with one or more of those research areas and are received **before** September 5, 2024, will be considered for merit review by those panels. Applicants are strongly encouraged to submit pre-applications prior to August 1, 2024.

- **Moving the proposal due date to early September allows us to change the timeline. We anticipate completing reviews by December 2024.**
- **The Computational HEP program will participate in the FY 2025 Comparative Review**

Moving Comparative Review to the Open Call

- **Fitting into the Open Call necessitated many changes to the structure of comparative review applications, which I will summarize in later slides.**
- **The Open Call is a general-purpose vehicle for applications to all programs in the Office of Science.**
- **HEP has limited ability to tailor the parameters of the FOA to our uses, but it also allows flexibility. The main changes to past procedure are:**
  - Proposal Deadlines;
  - Page Limits;
  - Additional Budget Requirements for Multi-task (Umbrella) proposals;
  - Shifting the timeline;
  - Pre-proposals instead of Letters of Intent.
- **The HEP Program description in Section I of the FOA will contain HEP-specific instructions for research proposals, that augment the general instructions found, as usual, in Section IV of the FOA.**

Changes: Proposal Deadlines

- HEP has set a deadline for accepting proposals to Merit Review Panels (Comparative Review). The Open Call, however, is always open and proposals will be accepted by grants.gov after the deadline.
- Proposals that arrive after the deadline will be reviewed but might be declared ineligible for the Merit Review Panels. This arrangement permits (but does not compel!) greater flexibility in accommodating emergencies that prevent the timely submission of proposals. Contact HEP as early as possible if you face an unavoidable delay to improve the likelihood that we will exercise this flexibility.

Changes: Page Limits, Research Scientists

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- **The nature of the Open Call is not amenable to the complicated definition of "Senior Investigators" used in past Comparative Reviews. Instead, we will permit 9 pages of research narrative for each Senior/Key Person. (The limit is on the total narrative length, not the length of any individual's contribution.)**
  - Research Scientists are considered Senior/Key Personnel and are therefore allotted an equal number of pages in the research narratives. Since Research Scientist Biosketches and Current and Pending are attached to their Senior/Key Person Profiles, there is no longer any need for an appendix dedicated to Research Scientist activities.
  - Warning: Do NOT enlist phantom research scientists to take advantage of the new rules to enhance your narrative page count. Including Senior/Key Persons whose narratives do not indicate key roles are an invitation to Declination Without Review!

Changes: Additional Budget Requirements

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- **If support is requested from two or more HEP research subprograms, you must provide a supplemental Title Page identifying each research thrust, the Senior/Key Persons involved in each subprogram, and the budget request for each year.**
  - This requirement does not apply to applications that request support from only a single research thrust, e.g., Accelerator Science and Technology R&D, Theory, CMS, ATLAS, LSST, DESI, DUNE, etc.
- **The nature of the Open Call does not allow us to assign a special appendix for this information.**
- **We require use of the Research & Related Subaward Budget Attachment(s) Form, available in the grants.gov package. Mark the Budget Type as "Project" and complete a budget form for each task.**
  - These budget pages have the same format as the main budget pages and have attachment points for the justifications.
- **If individual investigators request support from two or more HEP research subprograms and/or thrusts (including two or more thrusts in the same research subprogram), they must provide information on the distribution of their full-time effort (FTE) in a table included in the subprogram justifications.**
- **Refer to the FOA for full details.**

Changes: Pre-Applications

- **The Open Call permits Pre-Applications instead of Letters of Intent. This is largely a distinction without a difference.**
- **Though not required, we request those who plan to submit applications for Comparative Review to submit a Pre-Application to let us know who will be applying and permit us to arrange an appropriate slate of reviewers. The pre-application submission allows you to attach additional documents. We ask that you attach a copy of the Collaborator Template to your pre-application.**
  - Please attach the Collaborator Template as an Excel Document.

Comparative Merit Review Criteria

[A set of criteria elements listed in Section V of FOA: for both Investigators and Merit Reviewers to evaluate proposals]

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MERIT REVIEW CRITERIA	REVIEW CRITERIA SUB-QUESTIONS FOR MERIT REVIEWER'S EVALUATIONS
SCIENTIFIC AND/OR TECHNICAL MERIT OF THE PROJECT	• What is the scientific innovation of the proposed research? • What is the likelihood of achieving valuable results? • How might the results of the proposed work impact the direction, progress, and thinking in relevant scientific fields of research? • How does the proposed work compare with other efforts in its field, both in terms of scientific and/or technical merit and originality? • Is the Data Management Plan (DMP) suitable for the proposed research? To what extent does it support the validation of research results? To what extent will research products, including data, be made available and reusable to advance the field of research? • For renewal applications only: Is the proposed work an appropriate outgrowth of, continuation to, or successor of the currently supported research?
APPROPRIATENESS OF THE PROPOSED METHOD OR APPROACH	• How logical and feasible are the research approaches? • Does the proposed research employ innovative concepts or methods? • Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions? • Does the applicant recognize significant potential problems and consider alternative strategies? • Is the proposed research aligned with the published priorities identified or incorporated by reference in Section I of the FOA such as program strategic plans? *I.e.,* for HEP, the 2023 P5 strategic plan.
COMPETENCY OF APPLICANT'S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES	• What is the past performance and potential of the research team? • How well qualified is the research team to carry out the proposed research? • Are the research environment and facilities adequate for performing the research? • Does the proposed work take advantage of unique facilities and capabilities?
REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET	• Are the proposed budget and staffing levels adequate to carry out the proposed research? • Is the budget reasonable and appropriate for the scope?
QUALITY AND EFFICACY OF THE PROMOTING INCLUSIVE AND EQUITABLE (PIER) RESEARCH PLAN	• Is the proposed 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?

PIER: Promoting Inclusive and Equitable Research

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- **DOE Office of Science (SC) is deeply committed to supporting diverse, equitable, inclusive, and accessible (DEI&A) work, research, and funding environments that value mutual respect and personal integrity**
- **PIER Plans:** since FY 2023, all DOE SC Funding Opportunity Announcements (FOAs) and DOE National Lab Announcements and other funding solicitations require applicants to submit a PIER plan as an appendix to their proposal narrative.
  - Additional information about the PIER Plan, including 1) FAQs for applicants and reviewers and 2) link to the DOE's public webinar, available at: *https://science.osti.gov/grants/Applicant-and-Awardee-Resources/PIER-Plans*

- **At-a-glance, PIER Plans:**
  - Should describe the activities and strategies proposed by the PI/project team to promote equity and inclusion integral to the research project
  - Should be included as an Appendix to the proposal narrative not exceeding 3 pages
  - Are to be evaluated as part of the merit review process that is used to inform funding decisions by DOE

- **General guidance language for applicants is provided in Section IV of the FOA:**
  - Plans may include, but are not limited to, strategies of your institution (and collaborating institutions, if applicable) for enhanced recruitment of undergraduate students, graduate students, and early-stage investigators (postdoctoral researchers and others), including individuals from diverse backgrounds and historically underrepresented groups
  - Strategies for creating and sustaining a positive, inclusive, safe, and professional research and training environment that fosters a sense of belong among all researchers
  - Plans may incorporate or build upon existing DEI&A efforts but should not re-state the standard institutional and broad principles. The complexity and detail of a PIER Plan is expected to increase with size of research team and the # of personnel supported

PIER Plans and HEP Research Proposals

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- Most applicants and almost all reviewers took this assignment seriously. The quality of the responses was generally good, but there was large variance.
- Individual reviewer comments on the PIER plans are included in the redacted anonymous reviews provided to PIs.
- Some subprograms are now including panel summary statements on the PIER plan itself, as well as scientific merit and strength of research proposal.

- PIER is not meant to be a general-purpose exercise in Diversity, Equity, and Inclusion (DEI), nor does it ask for participation in unrelated outreach efforts. PIER is Promoting Inclusive and Equitable Research, and a PIER Plan should describe how inclusivity and equity are to be expressed in the research being proposed, and how senior investigators on the proposal are involved in the effort. A PIER Plan can leverage institutional DEI plans and resources, but it is not enough to simply describe those programs and resources; the PIER Plan must discuss how they are to be implemented in the proposed research. Please look at the information available at: https://science.osti.gov/grants/Applicant-and-Awardee-Resources/PIER-Plans.

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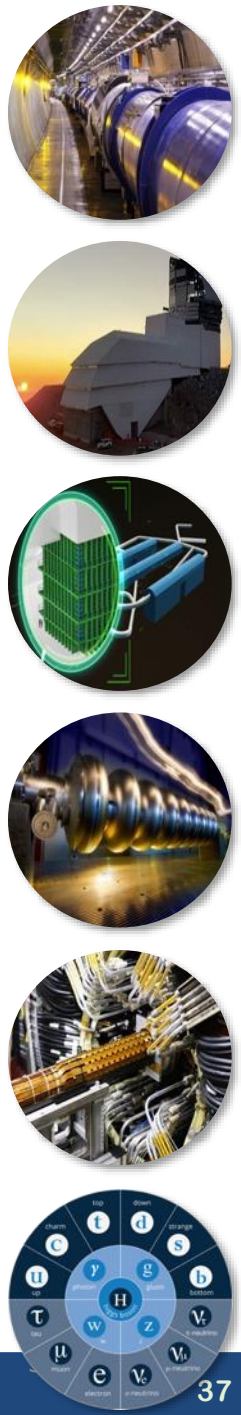
Guidance for Proposal Writing



Proposal Project Narrative

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- **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
- **Must not exceed 9 pages per Senior/Key Person when printed on standard 8 ½" x 11" paper with 1-inch margins (top, bottom, left, and right). Font must not be smaller than 11 point*.**
  - Faculty members at collaborating institutions listed on the proposal (if any) are not included in the count.
- **PIs are encouraged to refer to Section IV and the HEP subsection of Section I of the FOA**
  - 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, …

*** No one will measure your fonts or margins unless the violations are obvious.**

Key Items to Keep in Mind

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- Proposed research will review best if closely aligned with the DOE/HEP mission, its program, and the 2023 P5 strategy
- Investigators in experimental HEP research frontiers (Energy, Intensity, Cosmic) will review best if they are closely integrated into HEP experiment 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 HEP Theory or Detector R&D programs, as appropriate.
- Read the FOA carefully and follow the requirements on content, length, etc.
  - Some FOA requirements 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 have been declined without review. The most often missed or overlooked requirements include: Page limits, separate budget sheets (if needed) for each research subprogram or thrust, Data management plans, missing Collaborator Lists
  - Most declinations occur for "new" proposals. Ask a mentor or experienced PI for help.
- During and prior to submission, work with your university sponsored research office to make sure all FOA requirements are met.
- DOE uses Adobe software tools to combine the documents you submit into the packages that are sent for review. Make sure your documents are Adobe compatible; submit early and review your submission to see if corrections are needed.

HEP Research Activities Supported

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- **What DOE/HEP supports**
  - Efforts that are in direct support of DOE/HEP programs
    - support depends on merit review process, programmatic factors, and available funds
  - Research efforts (mainly scientists) on R&D, exp. design, data-taking, analysis-related activities
  - Some engineering support may be provided through the DOE/HEP 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 should be 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.:*
    - Experimental research on gravity waves (LIGO); heavy-ion (RHIC *or* at the LHC).
    - Theoretical research on non-HEP topics (CM-QFT, heavy ions, …) should clearly state how such research benefits the HEP program.

Connecting the Narrative to Research Initiatives

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- **Significant HEP funding comes through Initiatives (Congressional, Administration, Agency).**
- **Current Research Initiatives include Quantum Information Science (QIS), Artificial Intelligence and Machine Learning (AI/ML), Advanced Computing, and Microelectronics.**
- **AI/ML has significant impact across the entire HEP research program, QIS has become a common research tool for parts of the Theory and Detector Development programs, while Microelectronics primarily impacts the Detector Development program.**
- **Clearly identify those components of your proposed research that may connect to initiative funding:**
  - If applications and/or development of initiative-related techniques are a part of your research effort, call attention to them so that they can be properly reviewed. Consider adding a dedicated section to your narrative to describe the research group's efforts in these directions and their importance to completing the proposed research, explaining the associated methods to be used and their impact to advance the group's scientific results; highlight particular results which are expected to be significantly improved or enabled by the use of these methods. Identify the personnel (e.g., students, postdoctoral researchers, etc.), their training, and effort level for carrying out such activities in the proposed research plan.
- **Distinguish the initiative-related research scope being proposed from that supported by other Federal research grants (if any) through QuantISED, or dedicated AI/ML or Microelectronics FOAs.**

Cross-cut, Multi-thrust, or Transitional Proposals

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- **Applications where a PI is proposing to conduct research across multiple HEP research subprograms during the project period will be considered**
- **PIs are encouraged to submit only one application, describing:**
  - Overall research activity, including fractional time planned in each subprogram
  - In proposal's Budget Justification material (Appendix 7), include a level-of-effort table for any transitions of effort during project period
- **As part of their overview of the subprogram and review process, DOE PMs will provide the panel with details regarding such research plans across multiple HEP thrusts**
- **Reviewers with appropriate topical expertise in the research area(s) will assess the full scope, relevance, and impact of the proposed research in the merit review process — *e.g.*, merit review questions consider:**
  - Are plans for such cross-cutting efforts reasonably developed and balanced?
  - Does the scope of the full proposed program provide synergy or additional benefits to the HEP mission beyond the individual thrusts?
  - Will PI's overall efforts across multiple thrusts add value to HEP program goals and mission and have impact?

Proposal Budgets and Budget Justifications

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- **Applicants are encouraged to work with their SRO/SPO to develop their budgets and budget justifications with the same care that is devoted to the project narrative.**
  - Reviewers and panelists often express frustration and/or confusion about budget details leading to lengthy panel discussions about what is being requested.
  - Points for consideration:
    - 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!
    - Reviewers will notice and call out:
      - Excessive or inappropriate requests
      - Arithmetic errors
      - Poorly justified expenses
      - Discrepancies between the project narrative and budgeted expenses
  - Worst case: Reviewers will start guessing if items are not adequately explained.

Comparative Review: Subprogram Panels

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- **The Comparative Review process is very competitive and hard choices must be made based on the reviews and our available funding**
  - As this is a comparative process, some proposals/PIs will be ranked at the top while others will be in the middle or at the bottom
- **It is understood that the vast majority of people applying are working hard and their efforts are in support of the HEP program. Due to the rankings & comments by the reviewers and our constrained budgets, some people whose research activities and level of effort who are ranked lower in terms of priority and impact relative to others in the field will not be funded**
  - This does not necessarily mean the person cannot continue working on the experiments; they are not being funded by the grant to do it. It could be that the person has a critical role in the program, but this did not come out in the proposal or review process.
  - This is why it is imperative to respond to the FOA and detail each person's effort.
- **Members of subprogram review panels see all of the proposals and each member provides input and ranks proposals relative to the others. When panel members are faced with comparing efforts, impacts and limited budgets, rather than rank the whole proposal low, they may provide guidance regarding details of the proposals.**
  - e.g., Section A looks good but Section B looks weak and shouldn't be supported at the requested level.

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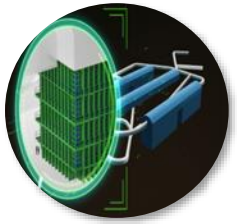
Final Remarks






Closing Remarks

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- **HEP continues to maintain the core of its DOE science mission**
  - We continue to deliver exciting discoveries, important scientific knowledge, and technological advances
  - Now transitioning from 20214 P5 to 2023 P5 to begin advancing the next long-range program for particle physics

- **DOE/HEP funding opportunities**
  - Issued FOAs are available at: *Grants.gov* or *https://science.osti.gov/hep/Funding-Opportunities*
  - Your research proposals should provide a plan for activities to be undertaken; and prepare the accompanying budget material, **including any description in the budget justifications, with the same care as the narrative**

- **FY 2025 President's Budget Request released earlier this year**
  - Now awaiting FY 2025 House and Senate Marks, which generally are 'budget indicators' in the overall process
  - Fiscal budget is only known when Congress passes an appropriation, and the President signs the bill
  - DOE continues to work within the process to emphasize the importance of the P5-recommended projects as well as the core research and operations programs

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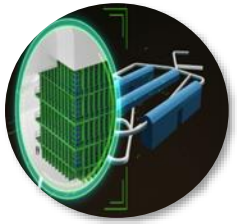
Extra Slides






Proposals: What To Do

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Do Follow Instructions

- Read the current FOA thoroughly, as well as any supporting materials, e.g. FAQ
- 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 review of the proposal.

  There are resources at most institutions

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 or sponsored research office

Do follow through on 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

Do follow proper English grammar and composition

- Careless editing will annoy or confuse reviewers
- Hire someone to proof-read your proposal

Do ask for what you reasonably need

- Standard research requests
  - Salary and travel
  - Other Personnel including post-docs, students, Engineer, etc.
  - Equipment, M&S, Tuition remission
- Realistic funding expectations
  - Early Career >$150k Univ & >$500k Lab
  - 50% FTE to proposal
  - Stagger personnel

Proposals: What Not To Do

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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. Include your mentoring.

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 dwell on the past

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

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

Majority of proposal narrative should be forward looking

Do Not submit a sloppy budget

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

Do Not be discouraged

Competition is strong.

Some very good proposals are declined due to limited resources.

That first feedback is so valuable.

ECRP: Develop a Personal Roadmap

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- **Timescales for HEP projects from conception to first data will only get longer in the continued pursuit of discovery science due to cost, size and complexity**
- **HEP academic research track (Univ. or Lab) will benefit from developing a near-, mid- and long-term research plan**
  - Balance research between ongoing experiment, upgrades and R&D with future experiment
- **A new university tenured-track faculty or lab scientist is likely to "hit the ground running" by continuing the research conducted during the most recent post-doc position**
  - This is perfectly normal. Most people are hired with this consideration.
  - A rising trajectory, clear leadership positions, track record of accomplishments, mentoring, etc.

- **Before preparing that first proposal, map out your long-term strategic goals (10+ years)**
- Will you be working on that same experiment in 5 years? How about 10 years? In 20 years?!
- Optimize your start-up or LDRD funds by expanding your research portfolio and seeding a future-looking project/experiment
- With your strong participation, major projects like Mu2e, LBNF/DUNE, Vera Rubin Observatory, and HL-LHC CMS and ATLAS will complete on time and be poised to reap the physics data on Day 1
- **Can you envision yourself (and your colleagues) shepherding the next set of P5 projects?**

ECRP Final Word: Engagement

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- **Review criteria for HEP Comparative Review and Early Career includes "Potential for leadership within the scientific community."**
  - Important to seek out and/or volunteer for roles and responsibilities which increase visibility and provide career advancement opportunities
  - Editorial Boards, Sub-detector systems, Physics Working Groups, Run Coordinator, Analysis Coordinator, etc.
  - Service work for community is also valued, e.g. co-chairing a conference committee or serving on a DOE or NSF review panel
- **When asked to review, co-chair, attend, speak, etc. try NOT to say no!**
  - You need the experience
  - Ask for feedback (if possible)
  - Respond promptly to all communication

- Talk to your community representatives
- HEPAP: High Energy Physics Advisory Panel
  - http://science.osti.gov/hep/hepap/
- AAAC: Astronomy and Astrophysics Advisory Committee
  - https://www.nsf.gov/mps/ast/aaac.jsp
- APS Division of Particles and Fields
  - https://www.aps.org/units/dpf/
- HEP Organization
  - Introduce yourself to the DOE Program Managers
- Ask questions

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