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**DOE High Energy Physics
Program
Report to the AAAC
10 June 2014**

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Energy**

Outline

Concentrating on updates since the last meeting:

- **Budget**
- **Strategic Planning: HEP response to P5 report**
- **Grants process & results**

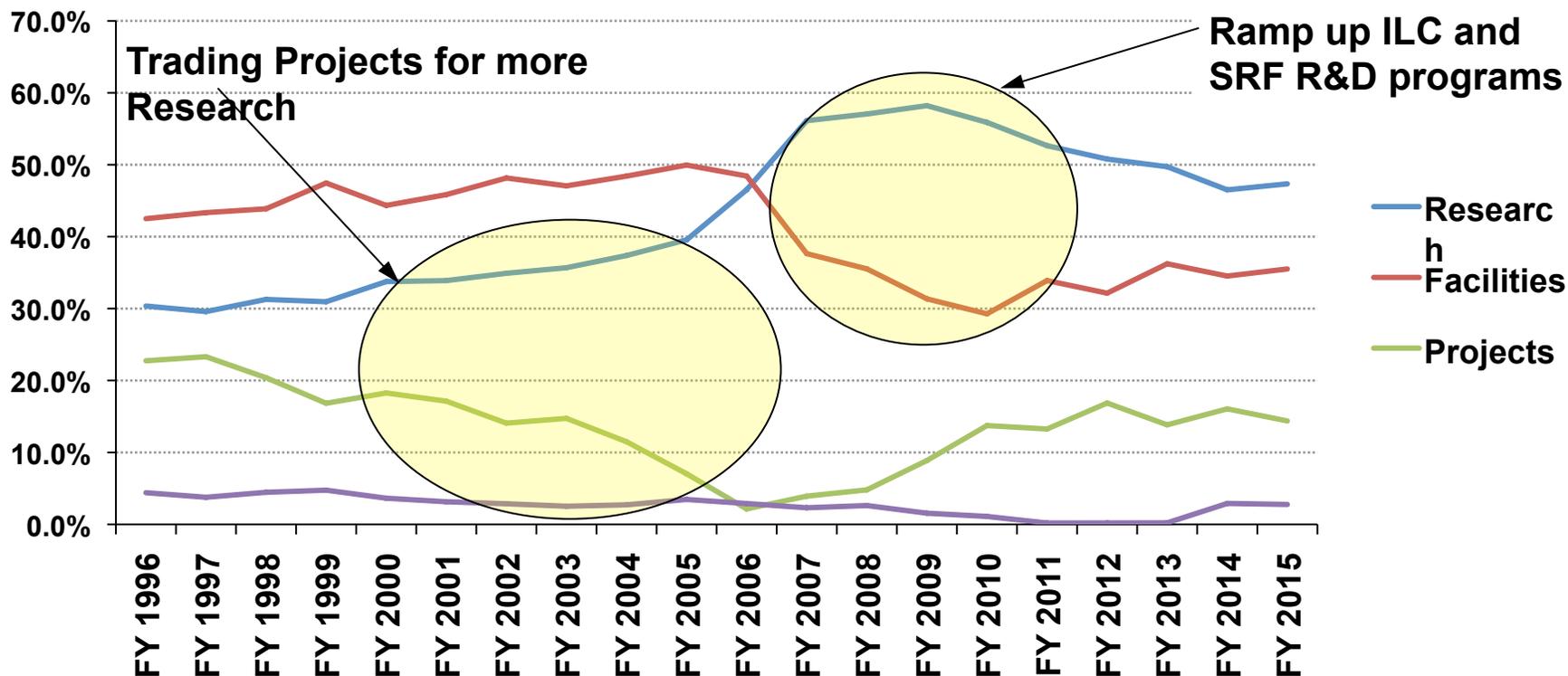
HEP BUDGET AND ISSUES



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HEP - Recent Funding Trends



- In the late 90's the fraction of the budget devoted to projects was about 20%
- Many projects started since 2006 are coming to completion
- New investments are needed to continue US leadership in well defined research areas

HEP Budget

In the last few years --

- **Budget philosophy is to enable new world-leading HEP capabilities in the U.S. through investments on all three frontiers:** Accomplished through ramp-down of existing project operations and Research (~ -6%)
- **Impact of these actions:** Workforce reductions at universities and labs; Several new efforts were delayed
- **Program planning has been very difficult due to unstable budget environment.**

FY 2013 Budget:

We were not able to start new Major Item of Equipment (MIE) projects, including LSST-camera or Belle-II.

FY 2014 Budget enacted:

- MIE-fabrication start approved for LSST-camera, Belle-II, Muon g-2
- Project Engineering & Design (PED) & Construction funds approved for Muon to Electron conversion (Mu2e) experiment
- Specific guidance in approved Budget for the additional \$21M provided over the Request:
 - Long Baseline Neutrino Experiment (LBNE) – \$26M in R&D & PED funds (\$16M in PED over Request)
 - Homestake Mine Operations - \$15M provided (specific guidance was \$5M over Request)

FY 2015 Budget Request – request supports:

- Full operation of existing HEP facilities and experiments
- Continue planned funding profiles of existing projects: LSST-camera, muon g-2, Belle-II, Mu2e
- New MIE-fabrication start requests: ATLAS and CMS detector upgrades
- Accelerator Stewardship subprogram initiated in FY2014
- Continue design studies for Long Baseline Neutrino Experiment (LBNE), DM-G2 and DESI projects

Notes:

The FY15 Request was developed before P5 Strategic Plan announced

- **FY15 Request is below P5 Scenario A; FY14 Appropriation above Scenario B; We are working to make adjustments to align to P5 recommendations and argue for Scenario B funding.**



FY 13-15 High Energy Physics Budget

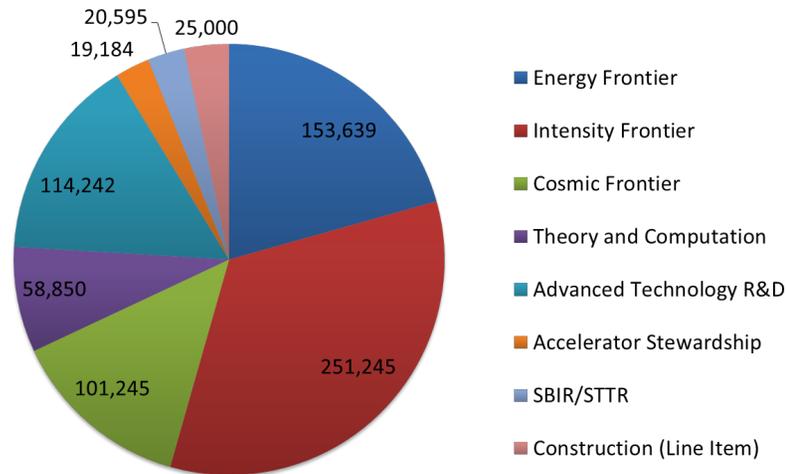
(dollars in thousands)

Description	FY 2013 Actual	FY 2014 Enacted	FY2015 Request
Energy Frontier	149,446	154,687	153,639
Intensity Frontier	274,412	275,043	251,245
Cosmic Frontier	80,063	99,080	101,245
Theory and Computation	66,398	62,870	58,850
Advanced Technology R&D	142,291	122,291	114,242
Accelerator Stewardship	3,132	9,931	19,184
SBIR/STTR	0	21,619	20,595
Construction (Line Item)	11,781	51,000	25,000
Total, High Energy Physics	727,523*	796,521	744,000
Office of Science	4,681,195	5,066,372	5,111,155
SBIR/STTR.			

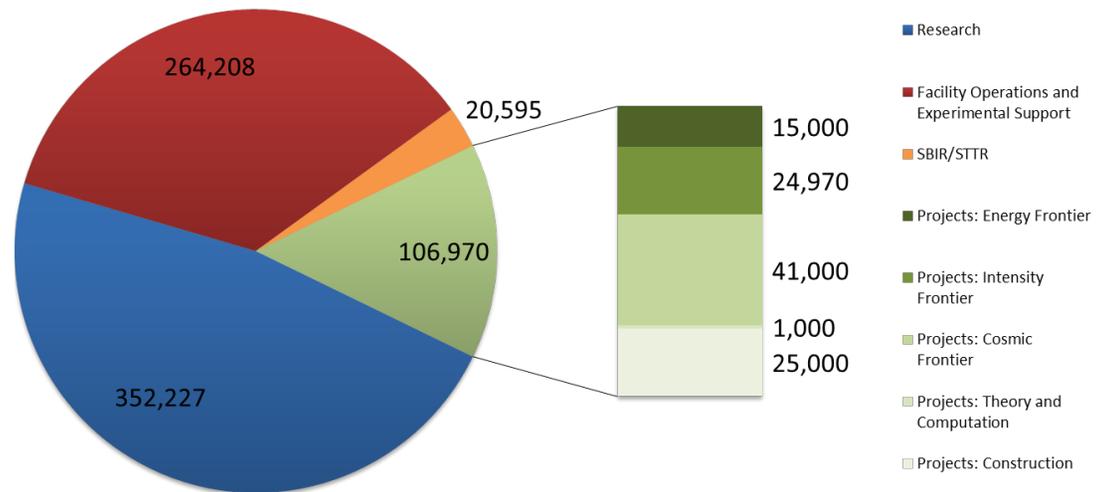
*The FY 2013 Actual is reduced by \$20,791,000 for

FY 2015 High Energy Physics Budget Request (in \$K)

By Area



By Activity



HEP Budget - Cosmic Frontier

Funding (in \$K)	FY			
	2012 Actual	FY 2013 Actual	FY 2014 Enacted	FY2015 Request
Research - univ + lab			46,840	45,435
Research - univ	12,881	12,233		
Research - lab	34,962	36,419		
Facilities - operating	8,505	10,111	7,500	7,238
Projects - MIE - HAWC	1,500	1,500		
Projects - MIE R&D, LSST camera	5,500	8,000		
Projects - MIE fabrication, LSST camera			22,000	35,000
Projects - future R&D, small fabrication	5,891	9,659	14,694	6,000
TOTAL - Cosmic available	69,239	77,922	91,034	93,673



HEP RESPONSE TO P5 REPORT



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HEPAP – Strategic Planning

Strategic Planning Goals:

- **A realistic, coherent, shared plan for US HEP**
 - Enabling world-leading facilities/experiments in the US while recognizing the global context and the priorities of other regions
 - Recognizing the centrality of Fermilab while maintaining a healthy US research ecosystem that has essential roles for both universities and multipurpose labs
 - Articulating both the value of basic research and the broader impacts of HEP
 - Maintaining a balanced and diverse program that can deliver research results consistently

→HEP needs to have a compelling and executable strategic plan, with the community behind it

Process:

- **APS-DPF led community planning process in 2013 (“Snowmass”)**
- **HEPAP P5 Subpanel (Steve Ritz, Chair) used Snowmass and other inputs to develop a strategic plan for the field within different funding scenarios.**
- **P5 report was delivered and approved by HEPAP in the May 22-23, 2014**



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→DOE is extremely grateful to P5 and the community for developing a consensus vision

P5 report

HEPAP is our primary panel for providing advice to us on the status and direction of the field.

→ P5 subpanel guides our strategic plan.

The P5 report “Strategic Plan for US Particle Physics in the Global Context” was presented to HEPAP on May 22, 2014.

-- The report represents a consensus vision developed by the particle physics to identify the most exciting and productive areas of research and how we pursue them. P5 recommended that we “pursue the most important opportunities wherever they are”, “host unique, world-class facilities that engage scientific community” and “pursue a program to address the 5 science

- Use the Higgs boson as a new tool for discovery
- Pursue the physics associated with neutrino mass
- Identify the new physics of dark matter
- Understand cosmic acceleration: dark energy and inflation
- Explore the unknown: new particles, interactions, and physical principles.



- The report recognizes the reality of a challenging funding landscape, where choices have to be made and resources stewarded carefully, and confronts those challenges head on.
- The promise/potential of high energy physics has never been greater – exciting science on the horizon.
- Plan includes a well-balanced portfolio of small, medium and large-scale projects for the future.



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to provide the required balance of short-term and longer-term science goals

HEP Response – Next Steps



DOE/HEP Management will respond by developing and aligning the program along the P5 recommendations.

- **This will take some time, many discussions and presentations with partners and stakeholders**
 - DOE management, HEP community, DOE Laboratories, Congress, OMB, other US and international Agencies

- **Communications of “P5 plan rollout”**
 - HEP presentation at AAAC Meeting: June 10, 2014
 - HEP presentation at Fermilab Users Meeting: June 11-12, 2014
 - HEP-organized University PI Meeting: June 16-17, 2014
 - DPF is actively organizing several events at Congress and on the Hill.
 - HEPAP/P5 Chairs (Lankford, Ritz) already giving many presentations.

- **Planning meetings**
 - Will eventually have meetings with experiment management, community interested or involved in specific topics, laboratory



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P5 Report – Program & Project Criteria



HEP will use P5 criteria (similar to PASAG) to develop the program and determine which projects to invest in.

- **Program optimization criteria**

- **Science:** based on the Drivers, assess where we want to go and how to get there, with a portfolio of the most promising approaches.
- **International context:** pursue the most important opportunities wherever they are, and host world-leading facilities that attract the worldwide scientific community; duplication should only occur when significant value is added or when competition helps propel the field in important directions.
- **Sustained productivity:** maintain a stream of science results while investing in future capabilities, which implies a balance of project sizes; maintain and develop critical technical and scientific expertise and infrastructure to enable future discoveries.

- **Individual project criteria**

- **Science:** how the project addresses key questions in particle physics, the size and relevance of the discovery reach, how the experiment might change the direction of the field, and the value of null results.
- **Timing:** when the project is needed, and how it fits into the larger picture.
- **Uniqueness:** what the experiment adds that is unique and/or definitive, and where it might lead. Consider the alternatives.
- **Cost vs. value:** the scope should be well defined and match the physics case. For multidisciplinary/agency projects, distribution of support should match the distribution of science.
- **History and dependencies:** previous prioritization, existing commitments, and the impacts of changes in direction.
- **Feasibility:** consider the main technical, cost, and schedule risks of the proposed project.
- **Roles:** U.S. particle physics leadership



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HEP RESPONSE TO P5 REPORT: COSMIC FRONTIER



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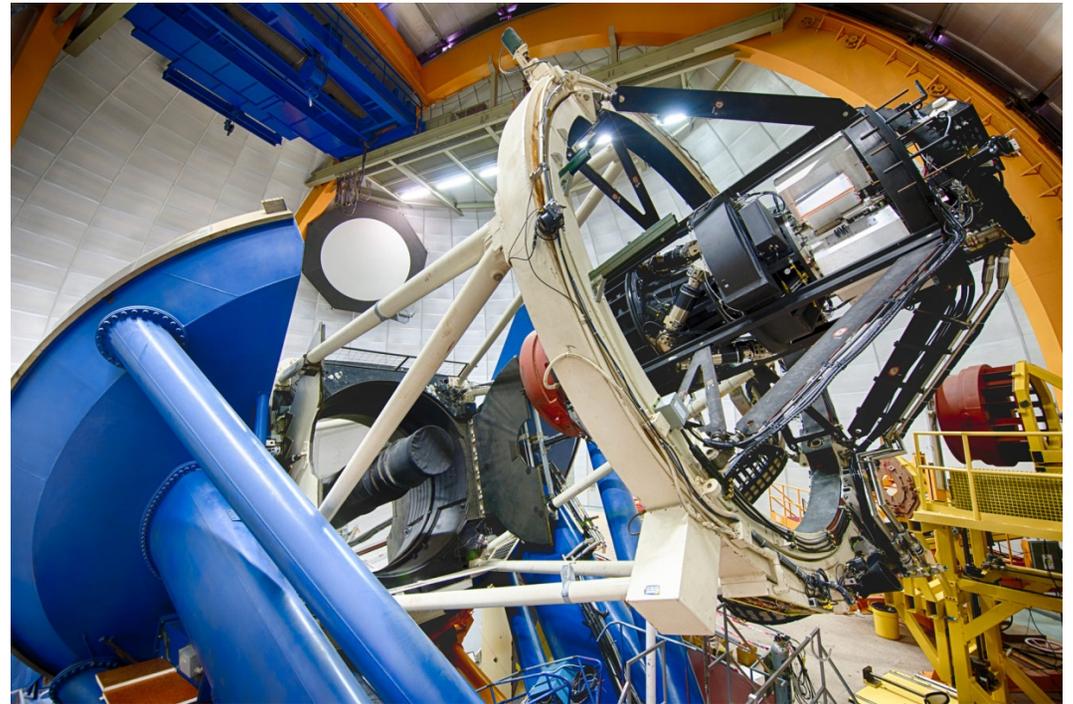
Cosmic Frontier

Program thrusts:

- Study the nature of **Dark Energy**
- Direct Detection searches for **Dark Matter** particles
- **Cosmic-ray & Gamma-ray studies** – particle properties, high energy acceleration mechanisms, indirect searches for dark matter particles
- **Other:** small efforts in **CMB**, computational cosmology, etc.

Future program:

- **Consider other possibilities and further develop/optimize program following the P5 report**



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Cosmic Frontier – Dark Energy, CMB (P5 Recommendations, OHEP Response)



P5 #16: Build DESI as a major step forward in dark energy science, if funding permits

- DESI should be the last project cut if budgets move from Scenario B to Scenario A (lowest)

- The P5 recommendation will be used to highlight the importance of the DESI and argue for the additional funds needed to implement it as a high priority.
- A successful Independent Project Review (IPR) will be used to show that DESI is ready to receive funding if it becomes available. The IPR is scheduled for Sept 9-10, 2014 to evaluate DESI's readiness for CD-1. (Fabrication funding is not in the FY15 Request)
- HEP will move forward in planning DESI in coordination with NSF.

P5 #17: Complete LSST as planned.

- Detailed plans by both DOE and NSF to carry out LSST exist. We will continue to execute the project according to the DOE-NSF agreement. Start of fabrication funding approved in FY14.

P5 #18: Support CMB experiments as part of the core particle physics program. The multidisciplinary nature of the science warrants continued multi-agency support.

- HEP will use this recommendation to open discussions with traditional CMB research support agencies (NSF, NASA) to come to agreement on DOE's role.

-  Going forward, these meetings would be followed by community planning meetings. Welcome AAVSO's input on this P5 recommendation.

Cosmic Frontier – Dark Matter

(P5 Recommendations, OHEP Response)



P5 #19: Proceed immediately with a broad second-generation (G2) dark matter direct detection program with capabilities described in the text. Invest in this program at a level significantly above that called for in the 2012 joint agency announcement of opportunity.

- Coordinated HEP/NSF US Portfolio for Direct Detection Dark Matter (DDDM) is being planned
- The overall DDDM program will need to include DM-G2 project(s), operations of current experiments, background and material studies, and future R&D efforts.
- Selection of DM-G2 concept(s) will be announced soon (~ end of June).
- HEP is moving forward with our process. The P5 recommendation will be used to highlight the importance of an expanded DDDM program and argue for the additional funds needed to implement it as a high priority.

P5 #20: Support one or more third-generation (G3) direct detection experiments, guided by the results of the preceding searches. Seek a globally complementary program and increased international partnership in G3 experiments.

- HEP will concentrate on getting the DM-G2 experiment(s) successfully started. Actions for DM-G3 will take place later on.



Cosmic Frontier – Cherenkov Telescope Array (CTA) (P5 Recommendations, OHEP Response)



P5 #21: Invest in CTA as part of the small projects portfolio if the critical NSF Astronomy funding can be obtained.

P5 Comments:

- CTA has a broad science reach that transcends fields, with the dark matter detection capabilities of direct importance to particle physics
- Using P5 Criteria, a de-scoped US component should be shared by NSF-AST, NSF-PHY and DOE.

NSF-AST has said publicly that its budget is unable to accommodate this project as a strategic initiative; Only possibility is the competed mid-scale program.

→HEP doesn't plan to continue support of research or R&D efforts on CTA.

- This could be re-considered if NSF moves forward on the project and requests a partnership with DOE, based on priorities, funding etc.



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Cosmic Frontier – notes, plans, comments



Projects:

The Cosmic Frontier has high priority projects ready to go in the near term (DESI and DM-G2) and HEP is working towards getting the additional funds (over the lowest funding scenario) to do DESI and an expanded dark matter program.

Operating experiments:

To review the status of the operating experiments and ensure alignment with the P5 vision, we are planning a review of Cosmic Frontier operating experiments later in 2014 (last review was end of FY12).

Priorities for funding:

- Following the P5 criteria, it will be a priority to support projects in which HEP has a major/visible role and in which there are significant leaps in capabilities and/or science.
- The priority for research funding will be to sufficiently support the science collaborations to carryout the project fabrication + operations and to deliver the science.
 - Ensure some room in the research program for development of ideas for new projects that are aligned with the science drivers.
- Research efforts on projects that are aligned with P5 science drivers, but which don't have HEP participation, will also be considered, taking into account the above and based on funding availability.

P5 #4: Maintain a program of projects at all scales (recommendation 4)

- The suite of projects recommended by P5 fulfills this recommendation & HEP will work to bring these projects to successful completion.
- As these projects complete, HEP will use a new project evaluation mechanism (e.g. the National Program Advisory Committee being considered by HEPAP) to select the next round of projects. We expect that the program will have a variety of project sizes as needed to address the science drivers.



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GRANTS – PROCESS & RESULTS



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FY14 Comparative Review Data — by Proposal

	HEP Subprogram						HEP Total
	Energy	Intensity	Cosmic	Theory	Acc. R&D	Det. R&D	
Received	20	26	29	33	31	16	129
Declined Without Review	0	0	1	0	2	2	5
Reviewed	20 (7)	26 (11)	28 (14)	33 (17)	29 (20)	14 (4)	124 (71)
Funded	16 (4)	17 (3)	19 (5)	16 (1)	11 (4)	7 (0)	60 ^(a) (17)
Declined	4 (3)	9 (8)	9 (9)	17 (16)	18 (16)	7 (4)	62 (54)
“Success Rate” (%) (Previous/New)	80	65	68	48	38	50	48 (81/24)

- Single proposals with multiple research thrusts are counted multiple times [1 /thrust]
- () indicates number of proposals from research PI/groups that did not receive DOE HEP funding in FY13.
- “Success Rate” is = # Funded/ # Reviewed.
- Most proposals are not fully funded at the “requested” level.
- About 43% of the proposals reviewed were from research groups that received DOE HEP funding in FY13.
- Overall success rate of reviewed proposals for previously (newly) funded groups was 81% (24%).
- *For Ref:* FY13 Comp. Review proposal success rate was 62%; previously (newly) funded was 78% (34%).

^(a) Total does not include 2 proposals currently ‘on-hold’ pending funding decisions from separate federal funding agency.



HEP Early Career FY10-14 Demographics

Subprogram Awards	FY10 (L/U)	FY11 (L/U)	FY12 (L/U)	FY13 (L/U)	FY14 (L/U)	Total (L/U)
Energy	3 (1/2)	3 (1/2)	1 (0/1)	2 (0/2)	2 (1/1)	11 (3/8)
Intensity	2 (1/1)	1 (0/1)	3 (2/1)	1 (0/1*)	1 (1/0)	8 (4/4)
Cosmic	2 (0/2)	3 (2/1)	3 (1/2)	2 (1/1)	1 (0/1)	11 (5/6)
HEP Theory	6 (1/5)	4 (0/4*)	3 (0/3)	3 (1/2)	1 (0/1)	17 (2/15)
Accelerator	1 (1/0)	2 (2/0)	2 (1/1)	1 (0/1)	1 (1/0)	7 (5/2)
HEP Awards	14 (4/10)	13 (5/8)	12 (4/8)	9 (2/7)	6 (3/3)	54 (18/36)
Proposals	154 (46/108)	128 (43/85)	89 (34/55)	78 (29/49)	75 (35/40)	524 (187/337)

- Lab or University (L/U)
- Early Career Research Program has become even more competitive
 - Congress enacted legislation requiring Office of Science grants of less than \$1,000K to be fully funded in the year the award is issued.
 - This requires university Early Career grants awarded this year to be fully funded from the FY14 budget.
 - Award rate across Office of Science is now ~5%.



FY15: Funding Opportunity Announcements

- **During FY2015, DOE/HEP will continue the large-scale comparative review of research proposals submitted by US academic institutions.**
 - This will be the 4th year of such reviews conducted within the HEP research program.
- **DOE/HEP is currently preparing the FY2015 Funding Opportunity Announcement (FOA) for these comparative reviews**
 - Expect it to be issued in next couple of weeks (~ mid-June 2014).
 - FOA will address suggestions & recommendations raised by the 2013 HEP Committee of Visitors (COV)
- **Deadlines for applicants:**
 - Letter of Intent (strongly encouraged) on overview of research proposals: planned for mid-July 2014
 - Final Application: planned for early-September 2014
 - Exact dates will be provided in the FOA, once issued
- **Independently, an Accelerator Stewardship FOA is planned to be issued synchronously**
 - Specifically for accelerator R&D which predominantly impacts non-HEP applications
 - A letter of intent is required, which will result in an encourage/discourage response
 - Eligibility will include academia, national labs, and industry



Announcement: DOE/HEP PI Meeting

- Geared towards University Faculty PI's
- Meeting of all HEP Principal Investigators (PIs) including any co-PIs on an existing DOE HEP grant as well as those new [to DOE] PIs interested in applying
 - Junior Investigators are particularly encouraged to attend
- Meeting will address the following topics
 - Overview of the HEP program, the P5 strategic plan in HEP
 - DOE/HEP's initial plan for implementation of the P5 plan
 - Presentations on science and funding opportunities:
 - FY 2015 HEP Comparative Review FOA and Accelerator Stewardship FOA
 - Presentations on major HEP projects and R&D opportunities
 - Presentations by individual DOE Program Managers (PMs) on subprograms, priorities, budgetary factors, and guidance on preparing university grant applications
 - Topical discussions with HEP management
 - Opportunities for scheduled one-to-one and/or small group meetings with PMs
- Date: **Monday – Tuesday, June 16 – 17, 2014**
- Venue: **Hilton Rockville Hotel, Rockville, Maryland** (~20 mi. North of Washington, DC)
- Registration: No fee, but registration encouraged to assist in logistical planning
- Additional information (agenda, registration, etc.):
<http://www.orau.gov/heppi2014/>

SUMMARY

- **An exciting time for HEP and the field**
- **P5 developed compelling, realistic strategic plan with a consensus vision for US HEP**
- **HEP will be moving forward to implement it.**