



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Status of the DOE High Energy Physics Program

*HEPAP Meeting
August 12, 2016*

Jim Siegrist
Associate Director for High Energy Physics
Office of Science, U.S. Department of Energy

A Global Vision for Particle Physics

- The global vision presented in the May 2014 P5 report addresses the five Science Drivers with a balanced program that deeply intertwines U.S. efforts with international partners
 - “The United States and major players in other regions can together address the full breadth of the field’s most urgent scientific questions if each hosts a unique world-class facility at home and partners in high-priority facilities hosted elsewhere.”
- DOE execution of the P5 strategy requires navigating many factors, including:
 - Balancing scope of HEP program: projects, operations, research
 - U.S. budget formulation and execution
 - Coordination among U.S. and international partners

A Deeply Intertwined Vision

- The P5 strategy is a **balanced** global vision
 - Addresses all five Science Drivers
 - Large, medium, and small projects
 - Time-phasing with continuous science output
 - Investments in projects domestic and abroad
- Realizing the P5 vision requires coordination and cooperation among:
 - Scientists
 - Execute projects, operate experiments, produce research results
 - DOE/Agencies
 - Implement in cooperation with U.S. and international partners
 - Decision Makers
 - Understand and support balanced vision through Government support



FY 2017 HEP Budget Strategy

- The FY 2017 HEP budget request reflects the way that implementing the P5 strategy has evolved as the U.S. and international community has adopted and responded to it
 - LHC (including upgrades) remains the highest-priority large project in the near-term
 - LBNF/DUNE, the highest-priority large project in its time frame, has been reconfigured and is gaining international support much more rapidly than anticipated in the P5 strategy
 - **U.S. Administration and Congress strongly support establishing LBNF/DUNE as the first U.S.-hosted international science facility**
- This presents an opportunity to advance the P5 strategy on a shorter time scale through additional funding: “Scenario B+”
 - HL-LHC accelerator and detector upgrades per CERN schedule
 - Support all other projects in P5’s Scenario B
 - Maintain balance between Research, Operations, and Projects
 - **Additional funding *beyond* the above priorities would support accelerating the implementation of LBNF/DUNE**
- Next slides will concentrate on elements of the research program that involve large numbers of researchers
 - LHC, Neutrinos, Cosmic Visions and CMB-S4



Messages for the U.S. LHC Community

- The lion's share of DOE HEP investment remains the LHC program and will be for many more years
- Our traditional partnership with CERN has been strong and we look forward to continuing it through the U.S.-CERN Agreement and Protocols signed in 2015
- We realize that with the initial (Phase-1) and HL-LHC upgrades, as well as ongoing LHC Operations, resources are quite stretched
 - We are actively taking steps to address this in FY17-18 as the HL-LHC upgrade projects ramp-up and Phase-1 projects ramp-down
 - As a first step, we have added resources to the HL-LHC upgrade projects, for the accelerator, ATLAS R&D, and CMS R&D
 - DOE is leveraging its expertise in high-field magnets and silicon-based detectors to help enable the strong scientific and technological performance of the LHC
- P5 recognized that a compelling and comprehensive LHC program is a core part of U.S. particle physics, and DOE intends to support key leadership roles in all areas of the ATLAS and CMS experiments
 - **U.S. participation is enabled by leveraging U.S. expertise in accelerator science and technology to exploit future opportunities at the LHC**



Messages for U.S. Neutrino Community

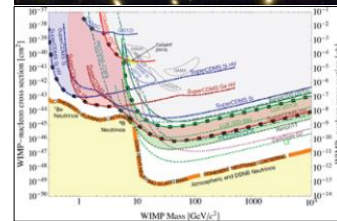
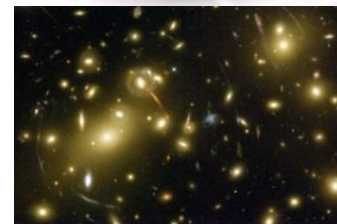
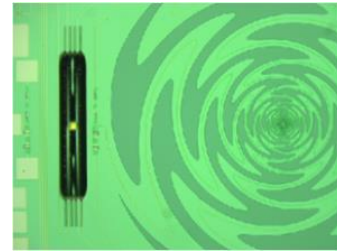
- As part of the P5 global vision, DOE is working to establish a U.S.-hosted world-leading neutrino physics program with LBNF as its centerpiece
 - This major U.S. initiative in the global program must succeed to balance U.S. participation in science facilities hosted elsewhere, including the LHC
 - Given the compelling scientific discovery potential of LBNF/DUNE, Fermilab is working closely with its global partners to establish a truly international “mega-science” facility with first physics in mid-2020s
 - International partners are beginning to come aboard with contributions; more are expected...
 - CERN will be a major partner through the agreements signed last year
- “Scenario B+” strategy aims to accelerate LBNF/DUNE using additional funding while maintaining program balance and supporting priorities of Scenario B
 - CD-3A investments in early far-site construction necessary to enable interested international partners to make “in-kind” contributions on schedule
- Completion of ProtoDUNE is an important R&D step towards timely realization of LBNF/DUNE



Cosmic Visions Groups and CMB-S4 CDT

HEP Labs & Community are redirecting programs to align with P5 priorities

- HEP has started “Cosmic Visions (CV)” groups in several areas
 - Allows interactions with small HEP community groups (~ monthly) as a 2-way line of communication for HEP-funded efforts
 - Any HEP-funded R&D/technology plans need to be in the context of the larger non-HEP and global community
- CV-CMB
 - Coordinate HEP technology R&D and other efforts for future CMB-S4 planning
- CV-DE
 - Investigate future directions following the end of construction of DESI and LSST
 - Complement, build on, or extend these experiments in investigating the physics of dark energy
- CV-DM (Dark Matter Direct Detection)
 - Coordinate and investigate HEP technology R&D to optimize science from DM-G2 experiments and for future DM-G3 planning
- DOE/HEP and NSF (PHY, AST, Polar) recently sent a call out to the community to apply to be a member of the CMB-S4 Concept Definition Team (CDT)
 - CDT will be a small team to help develop concepts and options for a CMB-S4 project
 - The call was sent to the CMB-S4 Collaboration and HEP Lab management and the CDT will be put together in the next few weeks
 - This is not a commitment by DOE or NSF to do the project or provide funding



Close Cooperation Among Particle Physics Communities


P5's vision for the U.S. particle physics program requires all parts of our domestic and international program to succeed

- **Do:**
 - Share your feedback about the P5 strategy implementation to the DOE
 - We are constantly in contact and are monitoring views of the community
 - Understand the elements of the P5 strategy that are outside of your specific research efforts
 - Your efforts are an important part of a global vision, and you should promote your work in the context of the full vision, not just your area (*see Steve's messages*)
- **Don't:**
 - Attack areas of our field in favor of your preferred area
 - Decision Makers notice: “bickering scientists get nothing”
 - Misinterpret Administration and Congressional support of the P5 plan to be entitlements
 - DOE implementation requires flawless project execution by *entire* community!



Community Material

- Steve Ritz has led a community effort to produce material to help maintain the visibility of the P5 report and update the status of P5 implementation to audiences
 - Initial materials are available at: <http://www.usparticlephysics.org/>
 - Steve plans to continue working with the community to update the material as needed
- U.S. particle physicists – including community members and their representative bodies – should adopt these carefully considered messages as part of their public interactions
 - *Steve is willing to help!*



Building for Discovery
Strategic Plan for U.S. Particle Physics in the Global Context

U.S. Particle Physics Strategy Education and Outreach Site

Particle physics is a dynamic, successful, and global field. The U.S. particle physics community has come together to develop a clear vision for the future. These carefully chosen investments will enable discovery and maintain U.S. leadership in key areas.

The Science Drivers

- Discover Higgs boson
- Pursue the physics associated with neutrino mass.

Building for Discovery
The P5 Report provides a strategy and the priorities for U.S. investments in particle physics for the coming decade.

The top four priorities in particle physics for the coming decade.

- **Start the High-Luminosity LHC (HL-LHC) accelerator and detector upgrade projects** so the U.S. can deliver its critical contributions on time. This is its highest priority near-term large project.
- **Solidify international partnerships** to establish the Long-Baseline Neutrino Facility (LBNF) and Deep Underground Neutrino Experiment (DUNE), and move forward with the engineering design, construction site preparation, and long lead procurement. This is the highest priority large project in its time frame.
- **Complete the existing construction projects** in particle physics, including the ATLAS and CMS upgrades, LSS1, DUNE, Mu2e, Muon g-2, LZ, ADMX-G2, and SuperCDMS-SNO+.
- **Balance scientific research** with facility operations and the carefully selected portfolio of small, medium, and large projects that together facilitate the success of the community's strategic vision.

These carefully chosen investments will enable a steady stream of exciting new results for many years to come and will maintain U.S. leadership in key areas.

Particle Physics is both global and local. Scientists throughout the world are working together to advance the field. It is important to build high-level research and innovation networks across the globe and to ensure the next generation of U.S. scientists is well-positioned to lead the world.



Best Practices in Media Communication

- A “Best Practices in Media Communication” meeting was held for spokespersons of HEP experiments on January 19, 2016
- Recently followed up with spokespersons, including:
 - Outcome of collaboration’s review of their media plan
 - Request to provide DOE Program Manager and Michael Cooke with contact information for collaboration’s media coordinator
 - Encourage community to host & attend communications training talks
- Further areas that collaborations can assist with announcements :
 - Reach out to DOE to help amplify big press releases/results
 - Work with laboratories to generate Science Highlights for DOE SC (not necessarily press-release level results!)
 - DOE will amplify University press releases/articles through “University Research” highlights if they mention DOE as source of funding

FY 2017 HEP Funding by Activity

HEP Funding Category (\$ in K)	FY 2015 Current	FY 2016 Enacted	FY 2017 Request	Explanation of Changes (FY17 vs. FY16)
Research	334,225	327,389	331,123	Sustain support for research program
Facilities	264,634	254,979	252,037	Overall operations support reductions due to scheduled completion of projects
Projects	109,373	125,635	123,736	<i>*Other Project Costs (OPC) includes CDR, project-specific R&D, prototyping and testing, installation and commissioning/pre-operations before CD-4</i>
<i>Energy Frontier Projects</i>	<i>15,000</i>	<i>19,000</i>	<i>18,967</i>	<i>Initial ATLAS/CMS upgrades complete in FY17; OPC* begins for HL-LHC detector upgrades</i>
<i>Intensity Frontier Projects</i>	<i>46,970</i>	<i>35,700</i>	<i>24,569</i>	<i>Reduction from ramp down of g-2 & end of LBNF/DUNE OPC*; SBN Program increases</i>
<i>Cosmic Frontier Projects</i>	<i>46,403</i>	<i>66,835</i>	<i>70,200</i>	<i>Planned ramp up supports fabrication of LSSTcam, DESI, SuperCDMS-SNOlab, LZ</i>
<i>Other Projects</i>	<i>1,000</i>	<i>4,100</i>	<i>10,000</i>	<i>Increase to support the FACET-II project</i>
Construction (Line Item)	37,000	66,100	88,521	Request engineering design, site preparation and long-lead procurement for the LBNF/DUNE; planned profile for Mu2e
SBIR/STTR	20,768*	20,897	22,580	
Total	766,000*	795,000	817,997	House mark \$823M, Senate mark \$833M

* SBIR/STTR added to FY 2015 for comparison to FY 2016/2017

Continuing Resolution

- **If the U.S. Congress and the President have not passed all appropriations bills by September 30, a Continuing Resolution (CR) may be passed to avoid a U.S. Government shutdown**
 - CRs typically extend level of funding from the previous year for a set amount of time
- **A CR may impede the start of new projects**
 - Projects with total cost >\$10M must be line-items approved by Congress in an appropriations bill before funding can begin
 - It is possible, though not typical, for CRs to include “anomalies” that would allow new starts
- **A CR may impact the ramp-up of new projects**
 - DOE is committed to the successful execution of projects that have reached CD-2 and aims to provide the baseline funding profile
 - Projects that have not reached CD-2 are most likely to be impacted under a CR
- **A CR may also impact future-year planning through such effects...**
- **Given the current political climate, we expect a CR for at least part of FY 2017 and are planning accordingly**
 - **DOE has limited flexibility for adjustments under a CR, but will work closely with laboratory and project management to minimize any impacts**



Implementing the P5 Strategy: The Large Projects

- P5 presented a global vision for particle physics, and CERN is an important U.S. partner in realizing that vision
- Important activities that will enable the successful realization of HL-LHC and LBNF/DUNE will occur in FY17-18
 - HL-LHC accelerator and ATLAS/CMS upgrade projects begin in order to meet CERN's LHC schedule
 - Aim to begin LBNF/DUNE site preparation and excavation to enable contributions from international partners on planned schedule
- The P5 vision is both compelling and ambitious:
 - It challenges us (all of us!) to achieve goals we have not attained before
 - We are confident that the global particle physics community is up to the challenge



The image features several stacks of US pennies arranged in a descending staircase pattern from the top-left towards the bottom-right. The coins are copper-colored and show some signs of use. The background is a plain, light-colored surface.

**HEP FUNDING OPPORTUNITY
ANNOUNCEMENT (FOA):
COMPARATIVE REVIEWS**

Schedule of DOE/HEP-based Solicitations

Ongoing: “FY 2016 Continuation of Solicitation for the Office of Science Financial Assistance Program” [DE-FOA-0001414]

- Also known as the “general or open annual DOE/SC solicitation”
 - SC-wide FOA that invites applications in support of work in any of six SC offices, incl. HEP research
- Published annually, typically at beginning of FY (October), remains open until successive issuance

New: “FY 2017 Research Opportunities in High Energy Physics” [DE-FOA-0001604]

- Issued for *new* or *renewing* grant applications, evaluated through comparative review (CR) process
 - Optional but encouraged Letter of Intent (LOI) due August 23
 - Final applications due September 20

New: “Early Career Research Program” [DE-FOA-0001625]

- SC-wide invitation for junior investigators (within 10-years post PhD) from labs or universities
 - Early career development of outstanding scientist’s research programs in areas supported by DOE/SC
 - Required pre-application due September 8, final applications due November 14

Upcoming: “Research Opportunities in Accelerator Stewardship”

- Specifically for accelerator R&D which predominantly impacts non-HEP applications
 - LOI will be required, resulting in encourage/discourage response
 - Eligibility will include academia, national labs, and industry



Recent FOA Changes

- All FOAs have different eligibility, technical requirements, page limits, etc.
 - As a convenience and courtesy, opening pages of FOA now include a checklist
 - List is not intended to be complete; applicants should review the FOA in detail!
 - Several requirements in the FOA are set from outside the DOE/HEP office, and there is little to no flexibility to modify
 - In recent years, 10-15% of proposals are declined without review, often from:
 - Data management plans, page limits, separate budget sheets (if needed) for each research subprogram or thrust, inclusion of Personally Identifiable Information (PII)
- Data Management Plans (DMPs)
 - All *Research* proposals to DOE/SC must have a data management plan
 - Includes HEP comparative review and Early Career, not conferences/workshops...
 - The requirement for a data management plan will be strictly enforced. Any research thrust in a proposal without a DMP will be declined without review.
- All *Renewal* proposals will need to also submit “proposal products” after the application is submitted
 - We cannot review incoming proposals until this step is completed





OFFICE NEWS AND MISCELLANY

HEP Program Personnel Updates

- **Comings and Goings**
 - Kevin Flood arrived as IPA for Intensity Frontier August 1, 2016
 - Jim Stone (IPA, Energy Frontier) departing at end of August 2016
- **New Assignments and Opportunities**
 - New permanent position for Theory PM (vice Simona) closed
 - Permanent position for Intensity Frontier PM (vice Petros) approved. Advertisement out this fall.
 - New IPA (Stewardship) starting this fall
 - **Interested in new IPA/Detailee for Energy Frontier starting 2017**
 - *Interested parties should contact HEP management!*



HEP Laboratory Optimization

- **HEP is working with the laboratories to improve the long-term sustainability and optimization of the HEP program**
 - Exercise looks ahead 7 years, attempting to account for:
 - Expected modest growth of Research funding
 - Expected costs of Operations
 - Expected participation in Projects
- **Process is ongoing and has not yet reached an outcome, but progress is being made**
 - Some marginal or low priority efforts have been curtailed
 - Laboratory leadership are discussing the HEP program across laboratory boundaries, exploring:
 - Unique capabilities brought by each laboratory to HEP mission
 - Best way to leverage unique capabilities in future program
 - Prioritization of where to invest resources to maintain a healthy, sustainable program in the long term





U.S. DEPARTMENT OF
ENERGY

Office of
Science