

# Report from HEP 2016 COV

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Dec 1, 2016

# Charge to COV

- Assess the **efficacy and quality of the processes** used to solicit, review, recommend, monitor, and document application and proposal actions
- **Assess the quality of the resulting portfolio**, including its breadth and depth of portfolio elements, its national and international standing, and the progress HEP has made toward its long-term program goals since the last review of these milestones by HEPAP

## Charge, continued

- The COV should assess progress in addressing the recommendations of the previous (2013) COV
- The COV should comment on the effectiveness of DOE implementation of the long-term goals and priorities recommended by P5. Are the recommendations of P5 and other recent HEPAP subpanels being reasonably followed?
- It should also identify any significant issues that the COV is not able to appropriately consider within the limited timespan of this review but which deserve subsequent consideration.

## Charge, continued

- Are the actions of HEP maintaining the capabilities needed for healthy laboratory and university programs?
- Comments and suggestions for improving HEP processes and their implementation and on the observed strengths or weaknesses in any component or sub-component of the HEP portfolio would be appreciated.

# Very Large Committee

- Attempt to cover many areas of expertise
- Cross groups to cover areas that cross subpanel boundaries
- Excellent committee members with broad vision and expertise....smaller committee could be effective
- (Recommendation 15: Consider a change to the COV organization to amalgamate the review of the three experimental frontiers into one subcommittee)
  - A smaller committee could do the job.

# Sub-committees

- **Energy Frontier Experiment** (Baden, Han, Hinchliffe, McBride, Parsons)
- **Intensity Frontier Experiment** (Ritchie, Aihara, de Gouvea, Harris, Soldner-Rembold)
- **Cosmic Frontier Experiment** (Bean, Calaprice, Flaughner, McKinsey, Trodden)
- **Theory** (Dixon, Kronfeld, Lawrence, Reina, Tait)
- **Accelerator R&D** (Henderson, Katsouleas, Pilat, Rosenzweig, Syphers)
- **Facility Operations** (O'Brien, Erickson, Oide, Vigdor)
- **Projects** (Sanders, Kerby, Lung, Tuts)

# Cross-groups

- Cross group leaders did outstanding job with somewhat vague mandate
- Committee members assigned to cross groups
  - Comparative Reviews (Grannis)
  - P5 Implementation (Van Kooten)
  - Detectors (Trischuk)
  - Computing (Bauerdick)
- Having general cross sub-group discussions extremely useful (change to future agendas)

# Organization of Report

- Executive summary meant to stand alone
- Body of report has global issues
  - Comparative reviews
  - P5 implementation
  - Detectors and Computing
- Subgroup reports in series of Appendices
  - Many of the subgroup comments are global



# Executive Summary

- In general, the proposal review process appears to be effective and fair
- In general, the decisions of HEP support the priorities outlined in the P5 proposal
- The HEP science is outstanding and is world leading in several areas
  - Specific areas of excellence called out in report

## Executive Summary

- **Recommendation 1:** Continue the comparative reviews of university and laboratory research proposals and activities.
  - The review process, with its comparative nature, is an effective tool towards achieving optimal research programs within tightly constrained budgets.

## Executive summary

- **Recommendation 2:** Adopt, in consultation with HEPAP, an annual mechanism to determine the best plan of action to implement the P5 vision.
  - Intent is not to micromanage budgets, etc, but to discuss the big picture.... Are there changes in the science or technology landscapes that would require tweaks to P5 implementation?
  - Intent is to have progress report on how the P5 science program and implementation is going
  - Although the level of funding to execute the P5 program is currently reasonable, it relies on consistent budget increases in following years. If funding does not increase at least with inflation over many years, or other such scenarios falling below Scenario A in later years, there are questions as to how the P5 program can be effectively implemented.

## Executive Summary, continued

- **Recommendation 3:** Work closely with the Laboratories and with Project Management and Program Management teams to develop **a comprehensive strategic plan, consistent with P5 guidance**, that anticipates the needs for future operating funds that will arise from improvement, upgrade and MIE projects. **The plan should account for the funding needs not only of accelerator and experimental operations, but also of software, computing, and technical support for the new experimental programs.** Develop a similar comprehensive plan **for future research program needs**, once again taking into account the need for research efforts to maximize the scientific return on improved, upgraded, and new facilities and experiments

## P5 alignment

- In general, HEP is doing a very good job following the recommendations of P5 and the accelerator R&D panel **with the exception of:**
- **Setting aside funding for small projects**
- **HEPAP Accelerator R&D Panel recommended support for accelerator R&D**
  - However, accelerator R&D funding reduced ~10% over COV period
- **Approving FACET2 although it was recommended only for Scenario C by Accelerator R&D panel**

## P5 Alignment

- Three P5 program-wide recommendations related to the fraction of budget allocated to research programs. Over the COV period and up to now, the % to project construction had a steady increase to 25%, the % to the research program had a steady decrease to the current 40% level; **within P5 target range, now being at the maximum of the project fraction range and at the minimum of the research fraction range**

## P5 Alignment

- **Recommendation 4:** Augment discussion with HEPAP of budgets by annually presenting the disposition of reserves and explaining how the final HEP allocations to the research programs of the frontiers are consistent with P5 recommendations
  - Intent is to have a year end discussion about how the budget was actually divided between various projects and research programs
  - This could be part of P5 status report

## Review Process

- Comparative review process has gone through a complete cycle and is working well
  - Appropriate reviewers chosen and review process is fair
- **Recommendation 5:** HEP should work to enable migration of researchers from one frontier to another
  - This was concern of 2013 COV
- **Recommendation 6:** Deliver laboratory comparative review reports no later than six months after the review is held



# Review Process

- Reviews of lab and university researchers are quite different
- **Recommendation 7:** Appoint members of recent university panels to the laboratory comparative review panels in each program area in order to help gauge the uniformity of quality between laboratory and university research.

## Review Process

- The comparative reviews of experimentalists at the labs is not at the same level of detail as theorists at the labs and experimentalists at universities.
- This is a complex and difficult issue, and the metrics for evaluating lab scientists must be developed in a way that recognizes their operational and service responsibilities, in addition to their research.
- **Recommendation 8:** Charge HEPAP to convene the subpanel envisioned in the 2013 COV report to evaluate roles and responsibilities in university and laboratory research, and the ways in which this research is evaluated.
  - Are there ways the review process could be improved?

## Review Process

- **Recommendation 9:** Ensure an adequate number (at least 3) of reviewers for each PI.
  - Mostly a concern for formal theory and the cosmic frontier
  - This was also a recommendation of 2013 COV
- **Recommendation 10:** Inform review panels about special information obtained by DOE program managers concerning project operational or infrastructure responsibilities and experiment leadership roles.
  - Of course, a good proposal would include this information
  - PI meetings can emphasize this

# Review Process

- **Recommendation 11:** Include more information about why proposals were declined in both the declination letters and the folders.
  - Feedback to PIs was also a concern of 2013 COV along with documentation of declination decisions
- **Recommendation 12:** Seek ways to mitigate the load arising from repeated submissions of rejected proposals.

## Early Career

- Early Career Awards are a very important part of the HEP program, funding the top young PIs.
- It is important to assure that they are properly and carefully reviewed, which can be challenging since the program comprises all frontiers. It is often difficult to form a single “super panel” with all the necessary expertise.
  - Concern that some good proposals failed because they didn’t have an advocate on the panel
- **Recommendation 13:** Form mini-panels to review Early Career proposals in related fields. At least one member from each mini-panel should be a member of the larger super-panel deciding Early Career Awards

## Review Process

- Proposals submitted by undergraduate research institutions are at a disadvantage when directly competing with proposals submitted by research-intensive institutions. There is a case for support of such proposals, which would also benefit diversity and outreach.
- **Recommendation 14:** Develop a mechanism to ensure that opportunities to seek funding are open to qualified applicants at a wide range of institutions.

## Detector R&D

- Generic detector R&D underpins all future HEP experiments. P5 recommendation #27 called for a return to a more balanced mix of long-term detector R&D and short-term R&D when the technical challenges of current high-priority projects are met. This return has not yet begun.
- **Recommendation 16:** Restore a balanced generic detector R&D program as soon as possible after the technical challenges of current high-priority P5 projects are met.
- **Recommendation 17:** Work with the high energy physics community to generate a roadmap for investments in detector R&D based on future research needs of the field.

# Computing

- Computing and software are a large cost factor – easily approaching 50% of operations cost in some experiment areas
- New projects & upgrades come with increased computing needs
- HEP needs to continue to encourage the particle physics community to develop a clear technical vision of how to address technology issues, such as how to make effective use of new hardware, scale the data management capabilities, etc
- **Recommendation 18:** Include planning for computing and software development into the planning for projects and new initiatives.
  - This is implicit in recommendation 3



# Diversity

HEP has worked hard to improve the balance on its review panels, but inadequate demographic information is available to assess the success rate of different populations that apply for funding by HEP.

**Recommendation 19:** Develop a plan for increasing diversity in the programs HEP supports.

# Communication

- HEP recognizes that communication with active researchers is essential for the success of the program and has worked hard to communicate with the community about program priorities as outlined by P5, and the requirements of proposal submissions.
  - Universal praise for HEP PI meetings
- **Recommendation 20:** Continue and enlarge the effort by HEP staff to make presentations about program priorities and to have PI meetings at major conferences.

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# Energy Frontier

- Funding to the Energy Frontier research program has declined from \$86.2M to \$77.3M over the period of this review, the biggest absolute drop among HEP programs.
- The requirement of an appendix in proposals describing the work of each university research scientist has resulted in more information being available to the mail-in reviewers and to the review panels than previously.
- **Recommendation 21:** Continue to require appendices describing the work of each university research scientists in proposals.

## Cosmic Frontier

- The balance between research & operations and construction has been appropriate in 2013-15. It has supported world-leading results from current projects and significant MIE funding for new projects under construction. DOE has devoted substantial Cosmic Frontier MIE project funds to the construction of major international dark energy and direct detection dark matter experiments.
- **Recommendation 22:** Consider for support, through research and operations funding, research scientists making clear and critical contributions to cosmic frontier experiments and construction projects.

# Intensity Frontier

There has not been a full-time Program Manager for the Intensity Frontier for approximately two years. The duties have been covered by a combination of people who have other important responsibilities.

**Recommendation 23:** HEP should fill the Program Manager position for the Intensity Frontier as soon as possible.

# Theory

- A thriving theory program is essential for identifying new directions and opportunities in high energy physics, in addition to supporting the current program (P5)
  - **The theory program in its current state cannot be described as thriving.**
- Cuts during FY2013-2015 have significantly impacted breadth & depth
  - Total theory budget \$51.19M ->\$ 49.32, including early career (FY13-15)
  - The number of funded PIs was reduced by 25, slightly more than 10%.
- **Recommendation 24:** The budget for theory should not be cut further, in order that scientists with tier 3 rankings remain funded, and that the research of scientists with tier 1 and tier 2 rankings not be further compromised by reduced funding.

# Theory

- Formal theorists typically under-represented on panels

**Recommendation 25:** The proportion of panelists should better reflect the balance of thrusts among the PIs being reviewed in order to provide more informed discussion and rankings

- 2013 COV recommended hiring an IPA for theory from a university.

**Recommendation 26:** We reiterate this recommendation. Such a hire will assist with the heavy peak workload and should help provide a balanced perspective to program



## Accelerator R&D

- The overall level and quality of GARD monitoring is good, and the COV encourages similar mechanisms be put in place for the Accelerator Stewardship program as it matures, in order that the two programs can be optimally coordinated and synergies explored.
- **Recommendation 27:** Develop the tools and capability within the reporting process to gather and collate field-appropriate metrics (e.g. publications, citations, patents, etc.) that would be useful to evaluate the productivity and impact of the GARD research programs.
- **Funding for the GARD program declined by approximately 30% from FY2013 to FY2015.**
- The COV is deeply concerned by the decline in GARD-funded research. The decline in funding for university PI's is particularly concerning

## Accelerator R&D

- Following the publication of the HEPAP Accelerator R&D report, the GARD program manager initiated two “road-mapping” activities. The first was organized to encourage the formulation of a community-based R&D roadmap for advanced accelerator (wakefield) concepts. A second was initiated to focus on integrated superconducting magnet R&D priorities.

**Recommendation 28:** Consider creating and implementing roadmaps to define research priorities for the GARD research thrusts not yet mapped.

**Recommendation 29:** Work to address the P5 recommendation to maintain a healthy basic accelerator R&D portfolio.

# Accelerator Stewardship

The CoV finds great potential value in the Accelerator Stewardship program. It offers the possibility of transformative advances for societal needs

# Facilities

- The operation of the HEP facilities Fermilab, FACET, and ATF, as well as experimental support for US-ATLAS, US-CMS and SURF, has gone very well despite continuous budget and resource pressure. The success of the facility operations is due in good part to close communication and coordination between HEP, the laboratories and the experiments, or facility users.
- In the absence of funding increases, the committee sees significant challenges ahead to ensure a healthy operations program while allowing the major new initiatives to proceed on the anticipated schedules and maintaining 40% of the budget for research.
  - See recommendation 3

# Projects

- The DOE processes used to manage projects are well established and are effectively used by HEP.
- The portfolio is of very high quality and is developing rapidly into the recommended P5 portfolio which defines the target breadth, depth and international standing of the portfolio.
- The steps taken by HEP since the release of the P5 report are essentially consistent with the P5 recommendations.
- **Recommendation 30:** Re-evaluate the staffing needed to successfully support the multiple larger projects on the horizon.
  - See recommendation 3