Progress on Concept for
National Scientific Program Advisory Subpanel

HEPAP

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NSPAsP Concept

Goal: **Effective and transparent mechanism for HEPAP to advise DOE on the selection of particle physics projects for the national HEP portfolio.**

Context:

- **P5 process performed strategic planning.**
  - **P5 set the overall goals and priorities of the national program.**
  - **For large/medium project concepts, P5 recommendations can provide a basis for "mission need", CD-0 approval**

- **DOE CD process performs technical review of projects that are part of national portfolio.**

- **Project concepts often require additional evaluation of scientific & technical issues before being added to national portfolio.**

A sample case:

- **How does a concept for a small project, too small to be considered individually by P5, gain approval to become a project?**

Concept:

- **A HEPAP subpanel provides scientific advice regarding project concepts, following scientific & technical review and evaluation of whether concept is aligned with the P5 strategic plan and considering P5 selection criteria.**

NSPAsP Concept – Connections with P5 Report

Three subjects of connection:

- **Small Projects Portfolio**
- **Short Baseline Portfolio**
- **Project Reassessment (if costs and/or capabilities change substantively)**

NSPAsP Concept – Connections with P5 Report

Small Projects Portfolio:

- **P5 recommended a program that included small-scale projects.**
  - *Recommendation 4: Maintain a program of projects of all scales, from the largest international projects to mid- and small-scale projects.*
- **Important small projects, whose costs were typically less that $20M, were not individually large enough to under direct P5 review.**
- **Small projects can also include:**
  - **Small investments in large, multi-disciplinary projects**
  - **Early R&D for some project concepts**
  - **Funding for participation in experiments hosted by other agencies and other countries**
    - *Recommendation 9: Funding for participation of U.S. particle physicists in experiments hosted by other agencies and other countries is appropriate and important but should be evaluated in the context of the Drivers and the P5 Criteria and should not compromise the success of prioritized and approved particle physics experiments.*

Short Baseline Portfolio

Project Reassessment (if costs and/or capabilities change substantively)

NSPAsP Concept – Connections with P5 Report

Small Projects Portfolio

Short Baseline Portfolio

- **P5 recommended:**
  - **Selection of a set of small-scale short-baseline experiments**
  - **Some of the experiments should use liquid argon**
  - **(implicitly) Some of these experiments be hosted at Fermilab**
- **P5 did not want to preclude either some of these experiments not using LAr or some of these experiments being sited elsewhere than Fermilab.**
  - **It enunciated possibilities for experiments with neutrinos from radioactive sources, beams, or nuclear reactors.**
- **Short-baseline experiments need selection as part of a coherent national program**
- Pertinent recommendations:
  - *Recommendation 12: In collaboration with international partners, develop a coherent short- and long-baseline neutrino program hosted at Fermilab.*
  - *Recommendation 15: Select and perform in the short term a set of small-scale short-baseline experiments that can conclusively address experimental hints of physics beyond the three-neutrino paradigm. Some of these experiments should use liquid argon to advance the technology and build the international community for LBNF at FNAL.*

Project Reassessment (if costs and/or capabilities change substantively)

NSPAsP Concept – Connections with P5 Report

Small Projects Portfolio

Short Baseline Portfolio

Project Reassessment

- **P5 recommended reassessment of project priority if costs and/or capabilities change substantively.**
  - **In particular for continuing compatibility with the P5 strategic plan**
  - **P5 did not recommend a specific mechanism.**
    - *Recommendation 3: Develop a mechanism to reassess the project priority at critical decision stages if costs and/or capabilities change substantively.*
- **This issue was also raised by the HEPAP CoV for DOE HEP.**

NSPAsP Concept – Connections with P5 Report

Small Projects Portfolio

Short Baseline Portfolio

Project Reassessment (if costs and/or capabilities change substantively)

HEPAP CoV for also commented on having a more transparent / routine review process for new projects.

NSPAsP Concept & Fermilab PAC

NSPAsP would be somewhat similar to the Fermilab PAC, but at national level.

- **What are the roles of NSPAsP and F-PAC in approving Fermilab-based projects?**
- **How would redundancy and delays in reviews be avoided?**
- **How can NSPAsP and F-PAC will work in concert with one another?**

NSPAsP concept was presented & discussed with F-PAC in July.

- **It was presented that interplay with F-PAC needs better definition and discussion was invited.**

F-PAC reported: "*The PAC is very concerned that, in the case of "normal-course" review of experiments hosted at Fermilab, the relationship between a NSPAsP and the Fermilab PAC is not clear and could be potentially redundant and damaging, adding another hurdle to the timely and efficient approval of worthwhile projects.*"

NSPAsP Concept & Fermilab PAC

Without intending to make subject a major topic of HEPAP discussion today, let's look at some of the similarities and differences between NSPAsP & F-PAC.

A major similarity:

- **Both bodies perform scientific review:**
  - **Usual merit review criteria, including *e.g.*:**
    - **significance of scientific objectives**
    - **capability to achieve scientific objectives**
    - **potential to impact particle physics**
  - **Quality of the team**
  - **Technical approach**
  - **Cost range**

NSPAsP Concept & Fermilab PAC

A major similarity: Both bodies perform scientific review

Some differences:

F-PAC:

- **Provides ongoing review. Nurtures projects from concept to success.**
- **Meets regularly (currently 2/yr)**
- **Standing committee w/ multi-year appointments & rotating membership**
- **Advises on Fermilab program,**
  - **Including impact proposed expts would have on Fermilab**
- **Advises Fermilab Director**

NSPAsP:

- **Provides review of projects proposed as ready to join US HEP portfolio. Does not provide ongoing review.**
- **Convened as needed.**
- **Subcommittee of HEPAP with add'l experts as appropriate**
- **Advises on national HEP program**
  - **Including alignment with P5 plan & considering P5 selection criteria**
- **Advises DOE**
- **FACA-compliant**

F-PAC plays an irreplaceable role in nurturing development of experiments, and it can provide invaluable input on the subjects of scientific review for proposed experiments.

NSPAsP Concept – Moving Forward

Concept needs further refinement:

- **Interplay & interactions of NSPAsP & Fermilab PAC**
- **Also:**
  - **Role in interagency projects or initiatives**
  - **Possible role in review of projects previously recommended by P5 that experience significant changes in cost or schedule**

Formal charge needs to be developed.

Meanwhile, national short-baseline program needs initial definition.

Undertake initial definition of national short-baseline program as "pilot project" by HEPAP subpanel constituted of subcommittees of PAC and HEPAP.

Note: Fermilab PAC has been discussing short-baseline neutrino program since early 2014. It targets proposal(s) for Jan. 2015. Fermilab-based experiments should not be unnecessarily delayed.

Short-Baseline, Short-term Neutrino Program
Possible Way Forward

- **Convene an international workshop on the neutrino program that will be intermediate in time between current experiments and LBNF.**
  - **Emphasis on steriles, short baseline oscillations (incl reactors), R&D opportunities**
  - **Opportunity to accrete participation in experiments & in program**
  - **Opportunity to trigger (or, a prelude to) proposals**
  - **Workshop agency sponsored**
  - **Hosted by BNL with scientific advisory and local organizing committees**
  - **Timescale under discussion**
- **Working groups such as short-baseline expts, reactor expts, R&D platforms, non-accelerator neutrinos**
  - **Working groups should converge on a short "white paper" for each project or experiment outlining:**
    - **physics and/or technical goal(s)**
    - **timeline/next steps,**

    and should try to tie together the experiments/platforms in a portfolio with overarching theme(s).

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- Convene an international workshop on the neutrino program that will be intermediate in time between current experiments and LBNF.
- Working groups such as short-baseline expts, reactor expts, R&D platforms, non-accelerator neutrinos
  - Working groups should converge on a short "white paper" for each project or experiment outlining physics goal(s), technical goal(s), and timeline/next steps, and should try to tie together the experiments/platforms in a portfolio with overarching theme(s).
    - **Fermilab-based program could be brought for discussion to workshop either as an ensemble or as separate experiments.**

Agencies use white papers to inform subsequent steps

Possible DOE call for proposals (NSF open to proposals)

Advice to DOE on initial program definition by HEPAP subpanel composed of members of Fermilab PAC, members of HEPAP, and other experts.

Summary - 1

A National Scientific Program Advisory sub-Panel of HEPAP can:

- **Provide an effective and transparent mechanism for HEPAP to advise DOE on the selection of particle physics projects for the national HEP portfolio.**
  - **Following scientific and technical review and evaluation of whether project concept is aligned w/ P5 strategic plan and considering P5 selection criteria.**
- **Address the recommendations of P5 regarding:**
  - **Small project portfolio**
  - **Short-baseline portfolio**
  - **Project reassessment** (if costs and/or capabilities change substantively)
- **Give guidance to DOE *wrt* appropriateness of CD-0 approval of projects.**

NSPAsP would be <u>somewhat</u> similar to Fermilab PAC, but at national level.

- **Main similarity is scientific review. Several differences in mission and operation.**
- **Interplay of NSPAsP and F-PAC needs better definition.**

Summary - 2

National short-baseline neutrino program needs initial definition.

- **P5 did not want to preclude either some of these experiments not using LAr or some of these experiments being sited elsewhere than Fermilab.**
- **Fermilab PAC has been developing a short-baseline program.**

Moving forward

- **Convene an int'l workshop on intermediate-term neutrino program**
- **Advice to DOE on initial program definition by HEPAP subpanel composed of members of F-PAC, members of HEPAP, and other experts.**
  - **Consider this a "pilot project" to better understand interplay of future NSPAsP and F-PAC**
  - **Settle on path forward by December HEPAP meeting.**

Spare Slides

NSPAsP Concept - 2

NSPAsP will perform scientific & technical review

- **Role analogous to that performed by PAC for experiments at FNAL**
- **With additional criterion of alignment with objectives of P5 strategic plan and considering P5 selection criteria.**
- **Scope of scientific review:**
  - **Usual merit review criteria, including *e.g.*:**
    - **significance of scientific objectives**
    - **capability to achieve scientific objectives**
  - **Quality of the team**
  - **Technical approach**
  - **Budget review sufficient to set CD0 range.**
  - **Assessment of potential for impact on the particle physics program**
- **Advice on project viability & appropriateness to the portfolio**

Positive outcome may result in CD0

NSPAsP Concept - 3

NSPAsP is planned as a subpanel of HEPAP

- **Convened as needed**
- **Provides initial review of experiments proposed to join the US particle physics portfolio, not ongoing review**
- **Membership adjusted to provide appropriate range of expertise**

NSPAsP & FNAL PAC

- **NSPAsP will review in a manner analogous to FNAL PAC**
- **NSPAsP is a more general mechanism applying to all aspects of the program, and is FACA-compliant.**
- **Where applicable NSPAsP will work in concert with, not duplicating FNAL PAC.**

Possible mode of operation

- **Agencies collect proposals**
  - **Either through solicitation/FOA on a regular basis or for specific areas**
  - **Perform initial screening for appropriateness to call and of cost**
- **Proponents would provide any prior outside reviews, to see if ready for NSPAsP**
  - ***e.g.* FNAL PAC review, LHCC review, lab director's review**
  - **If no outside review, one would be performed prior to NSPAsP**
- **NSPAsP provides scientific evaluation, incl. compatibility with P5 strategic plan and position within global context, and evaluation of technical readiness**
- **In cases of multiple projects, NSPAsP provides prioritization**

Short-Baseline Neutrino Oscillation Program

- Hints from short-baseline experiments suggest possible new non-interacting neutrino types or non-standard interactions of ordinary neutrinos.
- These anomalies can be addressed by proposed experiments with neutrinos from radioactive sources, pion decay-at-rest beams, pion and kaon decay-in-flight beams, muon-decay beams, or nuclear reactors.
- A judiciously selected subset of experiments can definitively address the sterile-neutrino interpretation of the anomalies and potentially provide a platform for detector development & international coordination toward LBNF.
  - The short-term short-baseline science and detector development program and the long-term LBNF program should be made as coherent as possible in an optimized neutrino program.

- **Recommendation 15:**
  - **Select and perform in the short term a set of small-scale short-baseline experiments that can conclusively address experimental hints of physics beyond the three-neutrino paradigm.**
  - **Some of these experiments should use liquid argon to advance the technology and build the international community for LBNF at FNAL.**

P5 and Short-Baseline Neutrino Expts.

Recommendation 15:

Select and perform in the short term a set of small-scale short-baseline experiments that can conclusively address experimental hints of physics beyond the three-neutrino paradigm.

Some of these experiments should use liquid argon to advance the technology and build the international community for LBNF at FNAL.

P5 did not want to preclude either some of these experiments not using LAr or some of these experiments being sited elsewhere than Fermilab.

➡ **Other possible experiments should (must) be considered.**

How to coordinate FNAL portion with possible other experiment(s)?

- **Scientifically complete, no avoidable redundancy, do not slow unnecessarily**
- **Can inside & outside expt planning be synchronized?**
- **Should others come after "simple/obvious" PAC plan?**
- **Questions: What is time scale for development of proposal(s) at FNAL?**
  When might other concepts, proposals come forward?