Office of High Energy Physics: Neutrinos

NNN 09

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The Office of Nuclear Physics

- NSAC and HEPAP formed the Neutrino Scientific Assessment Group (NuSAG) in 2005
  - Resulted in three reports on different aspects of neutrino science
  - [http://www.sc.doe.gov/np/nsac/nsac.html](http://www.sc.doe.gov/np/nsac/nsac.html)

  - Neutrino-less Double Beta Decay (DBD) Experiment, Approved Mission Need (CD-0), joint with HEP in November 2005
  - NP has supported DUSEL R&D with NSF and HEP since 2007
    - Effort supported by NP has been directed toward a Ge-based DBD experiment at a deep underground site
  - NP is supporting planning and R&D on DBD in the base program at universities and laboratories
  - NP is planning a review of the Majorana Demonstrator R&D project in the Fall 2009
    - A successful demonstration of DBD technology with $^{76}$Ge may lead to a forefront international experiment at DUSEL, dependent on funding
The OHEP Mission and the Neutrino Campaign

• The Mission
  • The mission of the High Energy Physics program is to understand how our universe works at its most fundamental level. We do this by discovering the most elementary constituents of matter and energy, exploring the basic nature of space and time itself, and probing the interactions between them.

• Community Input
  • HEPAP and its subpanels: NUSAG, P5

• In Operation
  – MiniBoone
  – MINOS

• In Construction
  – Double Chooz
  – Daya Bay
  – MINERvA
  – MicroBoone
  – NOvA
  – T2K

• The next step (as recommended by HEPAP/ P5/ NUSAG)
  – LBNE
The Energy Frontier, powerful accelerators are used to create new particles, reveal their interactions, and investigate fundamental forces;

The Intensity Frontier, intense particle beams and highly sensitive detectors are used to pursue alternate pathways to investigate fundamental forces and particle interactions by studying events that occur rarely in nature; and

The Cosmic Frontier, ground and space-based experiments and telescopes are used to make measurements that will offer new insight and information about the nature of dark matter and dark energy, to understand fundamental particle properties and discover new phenomena.
Planning Investments at All Three Frontiers

- **Energy Frontier ($16M)**
  - LHC accelerator upgrades ($16M)
  - LHC detector upgrades

- **Intensity Frontier ($70.8M)**
  - Daya Bay ($11M)
  - MINERvA ($0.8M)
  - NOvA ($59M)
  - MicroBoone
  - Long Baseline Neutrino Experiment
  - Mu2e
  - Project X

- **Cosmic Frontier ($10.1M)**
  - DES ($8.6M)
  - Dark matter experiments ($1.5M)
  - JDEM/LSST
Critical Decision 0:
- Approve Mission Need A determination is made that there is a scientific case to pursue the project. Some of the possible alternative means of delivering the science are presented as well as a coarse estimate of the cost. (Develop CDR)

Critical Decision 1:
- Approve Alternative Selection and Cost Range One of the alternatives proposed in the CD-0 is selected and a credible cost range is established.

Critical Decision 2:
- Approve Performance Baseline The technical scope of work, the cost estimate, and the construction schedule is sufficiently well known that the project can be completed on time and within budget.

Critical Decision 3:
- Approve Start of Construction Engineering and design are sufficiently complete that construction, procurement, and/or fabrication can begin.

Critical Decision 4:
- Approve Start of Operations The project is ready to be turned over to the organization that will operate and maintain it. The criteria for this stage are defined in the Performance Baseline.
Intensity Frontier Plans

- MINOS and MiniBoone are running
- Daya Bay, NOνA, MINERνA are under construction
- OHEP is pursuing CD-0s for MicroBoone, LBNE, and Mu2e.
  - The larger the project the higher up in DOE it goes for approval.
  - More preparation required.
  - LBNE requires coordination with NSF.
- Project X is still in the R&D phase.
OHEP is seeking approval from the Department for approval of Mission Need (CD-0) for the LBNE project.

Mission need is a world-class neutrino oscillation experiment that includes the neutrino beam, near and far detector and needed infrastructure.

OHEP has identified FNAL, working with BNL as lead on the water Cherenkov detector, to take responsibility for performing the work needed for approval of CD-1 (Exploration of Alternatives). This includes conceptual design, alternatives analysis, etc.

We have received a “work plan” to reach CD-1 from FNAL/BNL.
- Will take 12-18 months to carry the work.
- Will cost $25-30 million.
- With the approval of CD-0, DOE R&D funds will be made available to support this work, which is expected to involve participants from laboratories and universities.
  - There are $15 million of ARRA funds available to support this.

As recommended by P5 we are working with NSF to coordinate LBNE and DUSEL efforts.
New Leadership

DEPARTMENT OF ENERGY

Dr. Steven Chu, Secretary
Daniel Poneman, Deputy Secretary

Dr. Kristina Johnson
Dr. Steve Koonin

(Dr. William Brinkman)

Office of the Under Secretary
Dr. Kristina Johnson
Under Secretary

Office of the Under Secretary
Dr. Steve Koonin
Under Secretary for Science

Office of Science

Federal Energy Regulatory Commission

Approving Official

Had to wait for new senior management to be confirmed

Reviewing Office
- Both agencies are following their individual requirements for aspects of the DUSEL/LBNE combined project
  - NSF is supporting the conceptual design of the DUSEL facility and a suite of experiments.
  - DOE HEP is seeking Mission Need (CD-0) approval for the Long Baseline Neutrino Experiment (LBNE) that includes the neutrino beam and a large underground detector.

- DOE and NSF have had discussions with OMB and OSTP on how to coordinate planning
  - DOE and NSF are working to coordinate their efforts, avoid duplication, and optimize their investments.
    » JOG exists and MOU is anticipated when the separate projects are better defined ~ at the time of the CD-1
A word from your sponsor: OHEP Positions

- **Research and Technology Division**
  - Theory Program Manager
  - Non-Accelerator Program Manager
  - Interdisciplinary Computer Scientist/Physicist ( Computational HEP)

- **Facilities Division**
  - Interdisciplinary General Engineer/Physicist
    - (Instrumentation and Major Systems)
  - FNAL Program Manager