



# **NOvA Update**

**MINOS Collaboration Meeting**  
**Fermilab**  
**2 April 2006**

**Gary Feldman**



# NuSAG Report

- **NuSAG reported to HEPAP last month and endorsed NOvA:**
  - **“The NOvA experiment would give the U.S. a leading role in the program of neutrino oscillations. It is a natural extension of the existing NuMI program at Fermilab and provides a pathway towards more ambitious experiments in the future.”**



# NuSAG Report

- **“There are scenarios that would delay or skip NOvA, waiting for ILC siting and approval to be resolved. Though such an approach would save money in the short term and might have more information on  $\sin^2 2\theta_{13}$  prior to further investment, it would cede leadership of the field to Japan and direct U.S. physicists to pursue their interest elsewhere. If the time came to revive the program in the U.S., the buy-in cost in an era where megawatt beams would be a prerequisite would be multiplied by a large factor. Further, there would be years with no U.S.-accelerator-based high energy physics, including the time between a decision to return to accelerator-based neutrino physics and the approval of any construction project. The U.S. infrastructure of accelerators and accelerator expertise would degrade during this period, and it is not clear when, where, or by whom a competitive U.S. accelerator neutrino program would develop. “**



# New NuSAG Charge

- **“...address the APS Study’s recommendation for a next-generation neutrino beam and detector configurations. Assuming a megawatt class proton accelerator as a neutrino source, please answer the following questions...including those needed for a multi-phase off-axis program and a very-long-baseline broad-band program.”**
- **The charge calls for a preliminary draft report by June 2006 and a final report by August 2006.**
- **NuSAG will get input from the joint BNL-Fermilab workshop, which met for the first time last month.**



## P5

- **Charge: “...to propose a detailed roadmap for the U.S. high energy physics program for the period of roughly the next ten years.”**
- **“...while all routes on the roadmap should be interesting, not all will be taken. [Your] prioritization should therefore recommend ... the relative priority and time ordering of projects.”**
- **Final report is due September 2006.**
- **P5 meets at Fermilab on April 18-19 to consider neutrino and dark energy proposals.**



# Money!

- **As part of the “American Competitiveness Initiative,” the President’s FY2007 budget contained 10.3 M\$ of PED (project engineering and design) funds for NOvA.**
- **These funds can be used to advance our critical path item, the Far Detector building, by issuing a “design-build” contract.**



## CD-1 Review

- **NOvA will have a CD-1 review here starting next Tuesday. (You are all welcome and encouraged to attend.)**
- **John Cooper and Ron Ray have written an excellent Conceptual Design Report which meets every DoE requirement to the letter (including details such as setting risk-based contingencies through a Monte Carlo calculation.)**



# Increasing Cost

- **The estimated cost of NOvA rose from 165 M FY2004 \$ in March 2005 to 249 M FY2006 \$ in February 2006, and increase of \$ 84 M in less than a year.**
- **Reasons included**
  - **Addition of R&D funds (\$12 M).**
  - **Cost of oil (\$32 M).**
  - **Changes in design, e.g., overburden (\$10 M) and thicker vertical PVC extrusions (\$6 M).**
  - **Maturity of estimate, e.g., costs based on actual bids (cost of WLS fiber increased \$9 M for no apparent reason).**



# Descope

- **On advice of the DoE and lab management, we have decided to descope the NOvA Far Detector from 30 kT to 25 kT to get the costs closer to \$200 M.**
- **The CDR has a cost of \$226 M in FY 2006 \$, corresponding to \$247 M in AY \$.**
- **However, this will not cause a decrease in performance since Fermilab plans to upgrade the NuMI beam to 1 MW immediately after the Tevatron stops operation.**



# Plan for 1 MW Operation (McGinnis)

- **3 to 4 Booster batches momentum stacked into the Accumulator**
- **6 Accumulator batches boxcar stacked into the Recycler**
- **Recycler transferred to the MI in 1 shot**
- **Rapid MI cycle, 1.33 s for 18 bunches, 1.6 s for 24 bunches**
- **⇒ 1.0 or 1.1 MW**



# Proton Plan

- **FY2010: Full year down time for**
  - Conversion of the Recycler to a proton stacker
  - Construction of the Booster to Accumulator transfer line
  - Construction of the Accumulator to Recycler transfer line
  - Conversion of the Accumulator to a proton momentum stacker
  - Main Injector rf upgrade
  - NuMI target upgrade, including any tritium remediation
- **FY2011**
  - 5 kT ready for data Nov 2010
  - 44 weeks of running, ramp 400 kW to 700 kW (only Recycler needed)

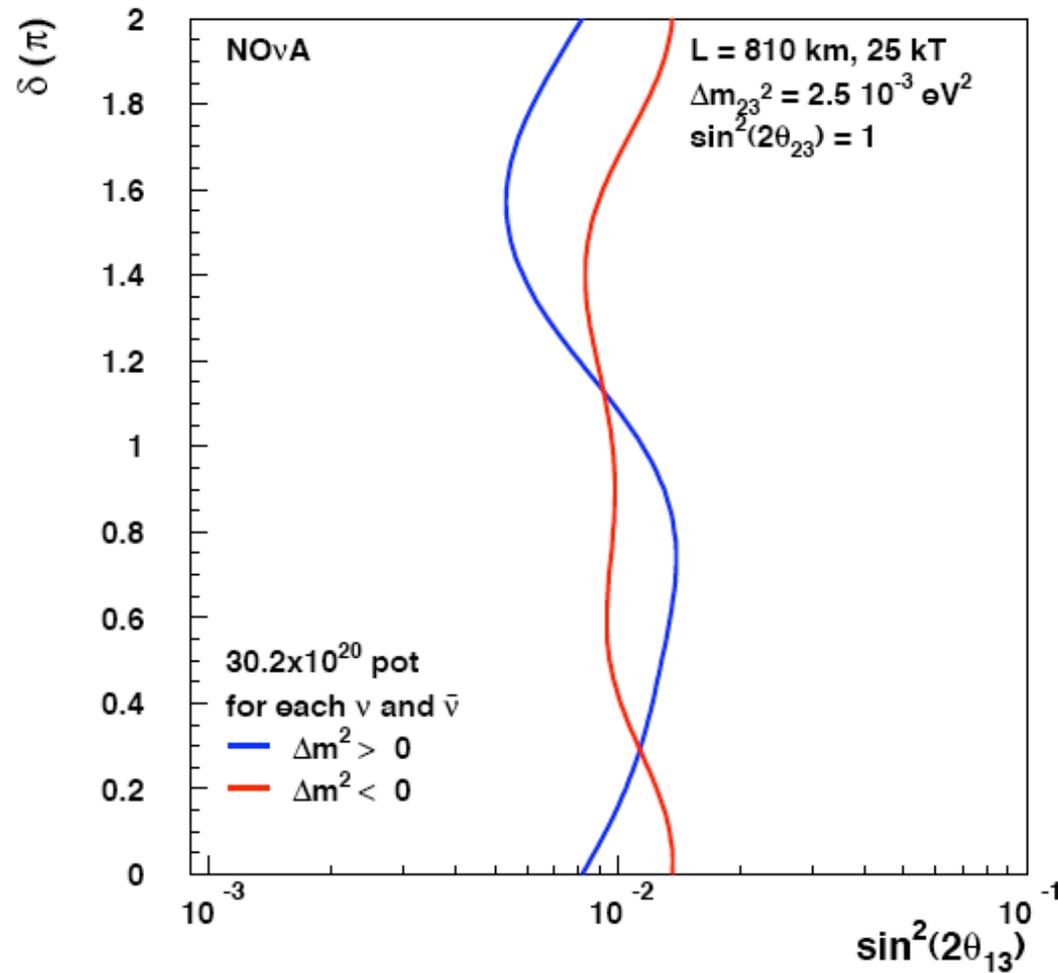


# Proton Plan

- **FY2012**
  - NOvA construction complete Nov 2011
  - 38 weeks of running (to allow for fixing of problems)
  - Ramp 700 kW to 1.0 MW
- **FY2013 and beyond**
  - 44 weeks of running at 1.0 MW
- **⇒ 60.3  $10^{20}$  pot for 6 years of running after NOvA completion**



# $3\sigma$ Sensitivity to $\theta_{13} \neq 0$





# Announcements

- **Mark Messier has been elected spokesperson.**
- **We are currently electing 6 members to the Executive Committee.**
  - **Candidates: Dave Ayres, Bob Bernstein, Carl Bromberg, Debbie Harris, Ken Heller, Marvin Marshak, Bill Miller, Rob Plunkett, Gina Rameika, Peter Shanahan, Rich Talaga**
- **Next meeting: “NOvA in the North,” May 22-25 in International Falls. Register at <http://www.soudan.umn.edu/NN/>**



# Advertisement

- A great deal of work to be done, particularly in online and offline software and simulations.
- The Integration Prototype Near Detector is scheduled to start running in the MINOS surface building by the end of 2007.
- Measurements in the off-axis NuMI beam:

