

## IceCube Project Monthly Report January 2004

### Accomplishments

- Completed shipment to the South Pole and final assembly of the Drill Supply Hose Reel for the Enhanced Hot Water Drill (EHWD).
- Finalized a revised test plan for the EHWD that completes final acceptance in May 2004. Follow on activities include training for the EHWD operators.
- Successfully operated prototype Digital Optical Modules (DOM) in IceTop tanks at the South Pole.
- Transferred data from a DOM at the UW Physical Sciences Laboratory to data collection software, remotely set DOM parameters, and recorded data for analysis using software developed at LBNL, UW, and Penn State University.
- Approved a final production plan for DOMs that supports the installation of four strings in January 2005 and completes production in early 2008.
- Completed final preparations of the IceCube construction baseline to be presented at the NSF Review on February 10-12, 2004.

### Issues

***IceCube Total Project Baseline*** – The IceCube Project completed the development of a final construction baseline for the project. The initial In-Ice strings and IceTop tanks will be installed at the South Pole during the next season (January 2005). The plan includes a contingency year to allow the final installation of strings and tanks in January 2011. This baseline can be compared to the proposed construction baseline presented at the Hartill II review in October 2001.

### **IceCube Project Schedule Baseline Comparison**

	<b>October 2001</b>	<b>February 2004</b>
Initial In-Ice Strings & IceTop Tanks Installed	January 2004	January 2005
Early Operations & Data Analysis	Not Planned	March 2007
Full Operations	~ March 2009	March 2011
Project Completion & Closeout	September 2010	September 2011

### **IceCube Total Project Cost Baseline Comparison**

	<b>October 2001</b>	<b>February 2004</b>
U.S. Cost	\$211M	\$266.7M
Non-U.S. Cost	up to \$40M	\$30.2M
Total Project Cost	\$251M	\$296.9M

The Total Project Cost is approximately 18% higher than the previous estimate. The U.S. cost is approximately 27% higher than the previous estimate (assuming the maximum of \$40M for Non-U.S. contributions in October 2001). The new construction baseline is based on a complete “bottoms-up” estimate of the costs and schedules and includes the current value estimate of cash, hardware, and labor contributions from Non-U.S. collaborators.

**Cost Increase** – A comparison of the cost increase from October 2001 (Hartill II) to February 2004 (Hartill III) will be presented at the review. Major factors contributing to the cost increase include: changes to planning assumptions; scope changes; more accurate understanding of the requirements; and, the general benefits from over two years of additional experience.

- Changes to the Construction Baseline
  - Schedule of first year deployments – revised from Jan. 2004 to Jan. 2005.
  - Project completion date – revised from Sept. 2010 to Sept. 2011.
  - Funding profile – revised to reflect the actual funding in FY02 and FY03 and the new funding requirements.
  - Scope - revised to capture the additional scope, e.g., in EHWD and DOM main board testing, and the full requirements of the IceTop array.
  - Estimated value of Non-U.S. contributions – revised to include a value estimate that is roughly 25% less than previous estimates.
  
- Comments on the Quality of the Current Estimates
  - The project organization is nearly fully staffed and the managers and engineers that will complete the work prepared the estimates.
  - The estimates are based on a much better understanding of the requirements.
  - There is a general increase in the engineering and management effort.
  - Actual component prices and labor productivity rates are included.

**Contributions by Non-U.S. Collaborators** - The current estimated value of Non-U.S. (mainly European) contributions to the construction baseline is less than the amount previously considered possible (\$30.2M vs. \$40M). Contributions of cash and capital equipment are roughly the same while the value of the labor contribution is considerably less. The primary reason for the reduction is that a substantial fraction of the Full Time Equivalent labor estimates that had been assumed as contributions to construction are now recognized as contributions to operations and data analysis. This results in an increase in the U.S. cost of \$9.8M. The collaboration and the project intend to take steps to increase the non-U.S. contributions to construction in keeping with the Non-U.S. role in the collaboration.

**Operations and Data Analysis** – The new baseline plan calls for initial operations and data analysis beginning in March 2007, immediately after the third season of string and tank installation. At that time we expect to have deployed 32 In-Ice strings and 64 IceTop tanks making IceCube the world's largest neutrino detector. Previous planning assumptions assumed that operations and data analysis would only begin after the completion of the complete array of 80 strings and 160 tanks. It is expected that there will be a single proposal for operations funding and that UW will administer the NSF operations funding in the same manner as the construction funding. The collaboration will coordinate planning for data analysis with each collaborating institutions applying for research support directly to their funding agencies. There is much work do be done to define the scope of work and the precise funding requirements.

***Near Term Plans*** – Preparations for the Hartill III has been a dominant activity for the project during the last four months. The focus must shift back toward meeting schedules, in particular the critical path activities for this year, which includes the supply of parts for the production of Digital Optical Modules at the UW Physical Sciences Laboratory, DESY, and Sweden. Lawrence Berkeley National Laboratory is producing the most critical component, the DOM main circuit boards, and recent testing of the third revision of these boards was encouraging. While the schedule remains aggressive, there is reasonable confidence that the schedule will be met. Completion of the EHWD testing and training at PSL is no longer on the critical path.