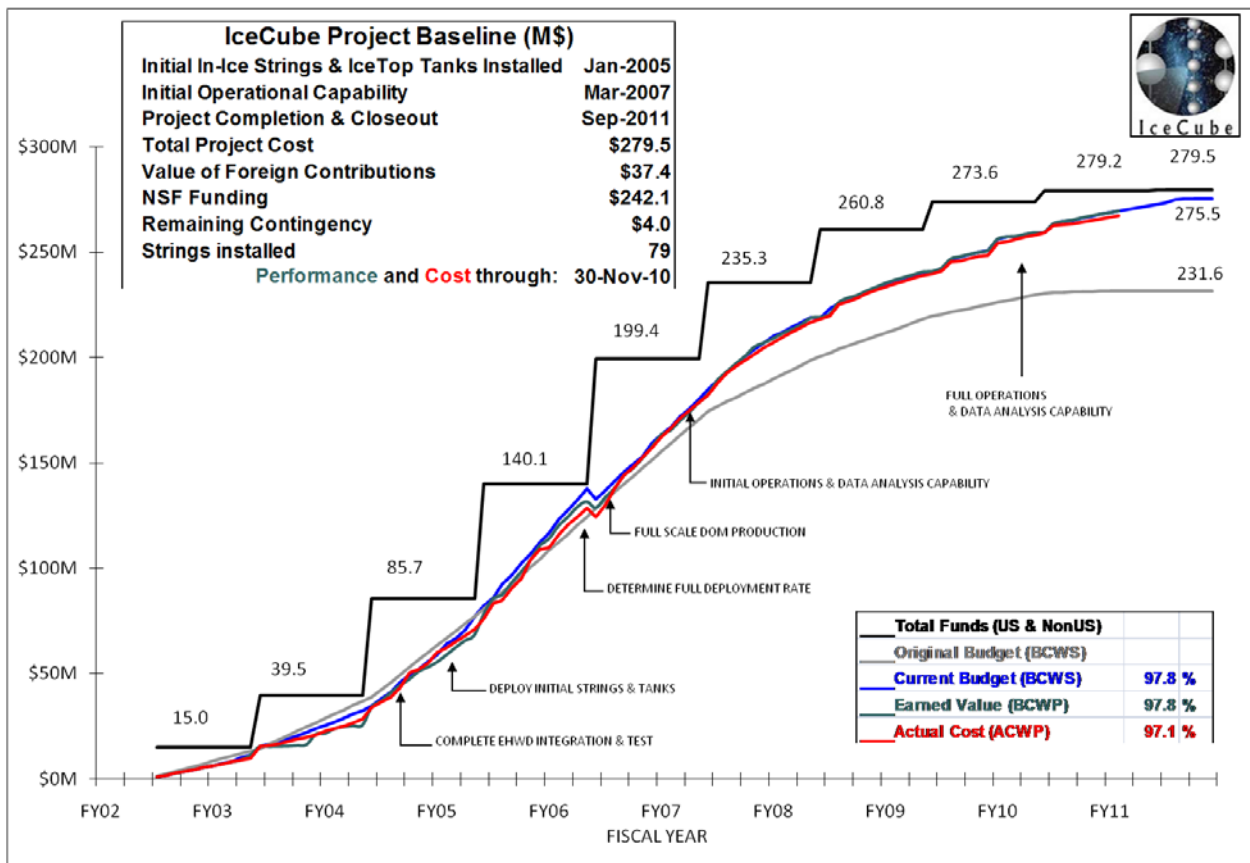


# IceCube Project Monthly Report – December 2010

## Accomplishments

- Drilling and string installation commenced as planned on December 3, 2010 and concluded ahead of schedule on December 18<sup>th</sup>. IceCube string installation is now complete with a total of 86 strings and 5,160 Digital Optical Modules successfully installed.
- IceTop installation completed in December. The IceTop array consists of 162 surface tanks and 324 Digital Optical Modules.
- Press releases from the NSF, UW Madison, and LBNL on the completion of IceCube were picked up by many news services around the world.
- Upgrades to the computing systems located within the IceCube Laboratory were completed successfully in late December and the new systems are operating consistent with expectations.



**Cost and Schedule Performance** – The project is 97.8% complete. Remaining contingency is \$3.997 million. The NSF IceCube MREFC funding of \$242.1 million remains unchanged since the project baseline was established in early 2004.

| IceCube Neutrino Observatory<br>Cost Schedule Status Report<br>Reporting Period Ending: 11/30/2010 |                            |                |                               |               |                                   |               |                         |              |        | Note 1    |
|--|----------------------------|----------------|-------------------------------|---------------|-----------------------------------|---------------|-------------------------|--------------|--------|-----------|
| Cumulative (AY K\$)  |                            |                |                               |               |                                   |               | At Completion<br>Note 4 | Complete (%) |        |           |
| OBS Structure L2   | Budgeted Cost <sup>2</sup> |                | Actual Cost of Work Performed | Variance Cost | Risk Contingency <sup>Notes</sup> |               | Budgeted AY \$s         | Sched        | Perf   | Actl Cost |
|  | Work Scheduled             | Work Performed |                               |               | Assigned                          | % Remain Work |                         |              |        |           |
| Project Support  | 26,729                     | 26,729         | 26,610                        | 118.3         | 175                               | 23.6%         | 27,471                  | 97.3%        | 97.3%  | 96.9%     |
| Implementation   | 44,783                     | 44,783         | 44,416                        | 366.6         | 95                                | 4.8%          | 46,767                  | 95.8%        | 95.8%  | 95.0%     |
| Instrumentation  | 76,797                     | 76,797         | 76,643                        | 154.5         | 15                                | 15.4%         | 76,895                  | 99.9%        | 99.9%  | 99.7%     |
| Data Acquisition   | 33,855                     | 33,855         | 33,855                        | 0.6           | 0                                 | 0.0%          | 33,855                  | 100.0%       | 100.0% | 100.0%    |
| Data Systems   | 26,603                     | 26,603         | 26,660                        | -56.9         | 75                                | 19.4%         | 26,989                  | 98.6%        | 98.6%  | 98.8%     |
| Detector Comm. & Verification  | 20,580                     | 20,580         | 20,576                        | 4.2           | 15                                | 21.7%         | 20,649                  | 99.7%        | 99.7%  | 99.6%     |
| Pre Operations   | 5,011                      | 5,011          | 4,927                         | 84.0          | 50                                | 19.9%         | 5,263                   | 95.2%        | 95.2%  | 93.6%     |
| Subtotal   | 234,358                    | 234,358        | 233,687                       | 671.2         | 425                               | 12.0%         | 237,889                 | 98.5%        | 98.5%  | 98.2%     |
| RPSC SUPPORT   | 33,879                     | 33,879         | 32,465                        | 1,414.3       | 250                               | 10.2%         | 36,323                  | 93.3%        | 93.3%  | 89.4%     |
| NSF  | 1,213                      | 1,213          | 1,213                         | 0.0           | 15                                | 30.0%         | 1,263                   | 96.0%        | 96.0%  | 96.0%     |
| Total  | 269,450                    | 269,450        | 267,365                       | 2,085.5       | 690                               | 11.5%         | 275,475                 | 97.8%        | 97.8%  | 97.1%     |
| CONTINGENCY <sup>Note 3</sup>  |                            |                |                               |               |                                   |               | 3,997                   |              |        |           |
| <b>IceCube Total</b> <sup>Note 2</sup>   | 269,450                    | 269,450        | 267,365                       | 2,085.5       | 690                               |               | 279,472                 | 97.8%        | 97.8%  | 97.1%     |

Notes: 1 Incorporates approved baseline changes.  
2 Total Budget at Completion includes \$37.4 M  
3 Remaining Contingency is: \$4.0 M  
4 The BAC (Budget At Completion), reflects PY9-10 detailed Baseline Review.  
5 Contingency is assigned based on the remaining Technical, Cost & Schedule risks associated with the approved scope of work.

The cost variance at the end of December 2010 was a favorable \$2.085M, primarily due to Raytheon and NY Air National Guard FY10 on-ice fuel and labor cost savings.

**Contingency Status and Plans** – No change requests were implemented this month.

10/31/2010 **Change Log - IceCube Total Project Budget Baseline (\$K)**

| No.   | Description  | Approval Date | Total Baseline | Allocated Budget | Allocated Budget Change | Contingency Budget |
|-------|--|---------------|----------------|------------------|-------------------------|--------------------|
| CR166 | Pre-Operations Budget Plan through Sep.2010-2nd phase                    | 07/12/10      | 279,472        | 274,880          | 367                     | 4,593              |
| NA    | Status as of July 2010   |               | 279,472        | 274,880          | 0                       | 4,593              |
| NA    | Status as of August 2010   |               | 279,472        | 274,880          | 0                       | 4,593              |
| CR167 | Pre-Operations Plan through March 2011 and Project Support Budget Replan | 10/07/10      | 279,472        | 275,475          | 596                     | 3,997              |
| NA    | Status as of September 2010  |               | 279,472        | 275,475          | 0                       | 3,997              |
| NA    | Status as of October 2010  |               | 279,472        | 275,475          | 0                       | 3,997              |
| NA    | Status as of November 2010   |               | 279,472        | 275,475          | 0                       | 3,997              |

Reviews of MREFC subsystems continue, and any additional resources necessary to ensure successful completion of these systems are considered in the risk assessment process and will be addressed within the available contingency. The remaining contingency will be adequate to complete the approved scope. A no-cost extension was submitted to NSF requesting an extension of the project end date from March 31, 2011 to March 31, 2012 to accommodate activities associated with the final disposition of the IceCube Enhanced Hot Water Drill

(EHWD); the orderly termination of construction activities; and the preparation of a comprehensive completion report on construction.

### **Risk Assessment & Potential Contingency Adjustments**

| <b>Item</b>   | <b>Estimate (\$K)</b> |
|---|-----------------------|
| 1. Potential cost exposure on the remaining scope of work based on an evaluation at a detailed level. The evaluation includes a technical, cost and schedule risk assessment. | \$690K                |
| 2. Additional computing infrastructure and software development required for the completed array to support data taking, simulations, and distributed analysis.               | \$2,100K              |
| 3. Estimated cost to prepare the IceCube EHWD equipment stored at the South Pole for shipment out of Antarctica.  | \$300K                |
| 4. Potential labor cost during the final year of construction and project closeout.   | \$150K                |
| 5. Additional calibration, reconstruction and simulation software tools that were identified during the internal review of IceTop.  | \$200K                |
| Total   | <b>\$3,440K</b>       |
| <b>Available Contingency as of Nov 30, 2010</b>   | <b>\$3,997K</b>       |

***Drill Operation and Installation*** - Drilling commenced as planned on December 3, 2010 (South Pole time). All 7 holes were completed and instrumented ahead of schedule by December 18. A winter-storage area was graded and prepared to relocate the EHWD for storage. EHWD systems were drained and purged and disassembly/preparations are underway to store complete system at South Pole for the winter. Video shots and component procedures were gathered throughout December for input to the EHWD documentation.

***Education and Outreach*** – IceCube began the month’s outreach by participating in the opening celebrations of the Wisconsin Institutes for Discovery on the evening of December 2 and for “ice drilling” on December 4 and December 11. On December 14, Francis Halzen delivered the final lecture in a series of four at the UW Space Place. Dr. Halzen spoke about the discovery of the Southern Hemisphere cosmic-ray anisotropy and the potential for discoveries with IceCube. The IceCube winterovers called from the South Pole and answered questions from the audience during the last 15 minutes of the event.

The big news of the month was the drilling of the last seven holes and deployment of the remaining DOMs. Press releases from the NSF, UW Madison, and LBNL were picked up by many news services around the world. By the end of the month we logged news stories from 30 countries. Bob Paulos interviewed for Discovery News Canada and Albrecht Karle in a live interview for German television, were among the many IceCube staff who were contacted by the media.

Taping of the final deployment was posted on the IceCube website on December 22 and was on YouTube, January 1: <http://www.youtube.com/watch?v=14XsxS25zS0> . By January 11 the video had over 18,500 views.



**The IceCube team in front of the drilling and deployment tower following completion of the IceCube Neutrino Detector.**



**The completion of IceCube is a milestone for science and it reflects the efforts of hundreds to people. Those at the South Pole during the final deployment pose for a photo with the last optical sensor.**

### *Upcoming IceCube Meetings and Events*

IceCube Collaboration Meeting, Madison  
IceCube Detector Completion Event  
IceCube Invites Particle Astrophysics

April 25 – May 2, 2011  
April 28, 2011  
April 29-30, 2011

### *Acronym List*

|       |  |
|-------|--|
| DOM   | Digital Optical Module                               |
| EHWD  | Enhanced Hot Water Drill                             |
| LBNL  | Lawrence Berkley National Laboratory                 |
| MREFC | Major Research Equipment and Facilities Construction |
| NHSG  | The Northern Hemisphere Support Group                |