

## IceCube Project Monthly Report January 2006

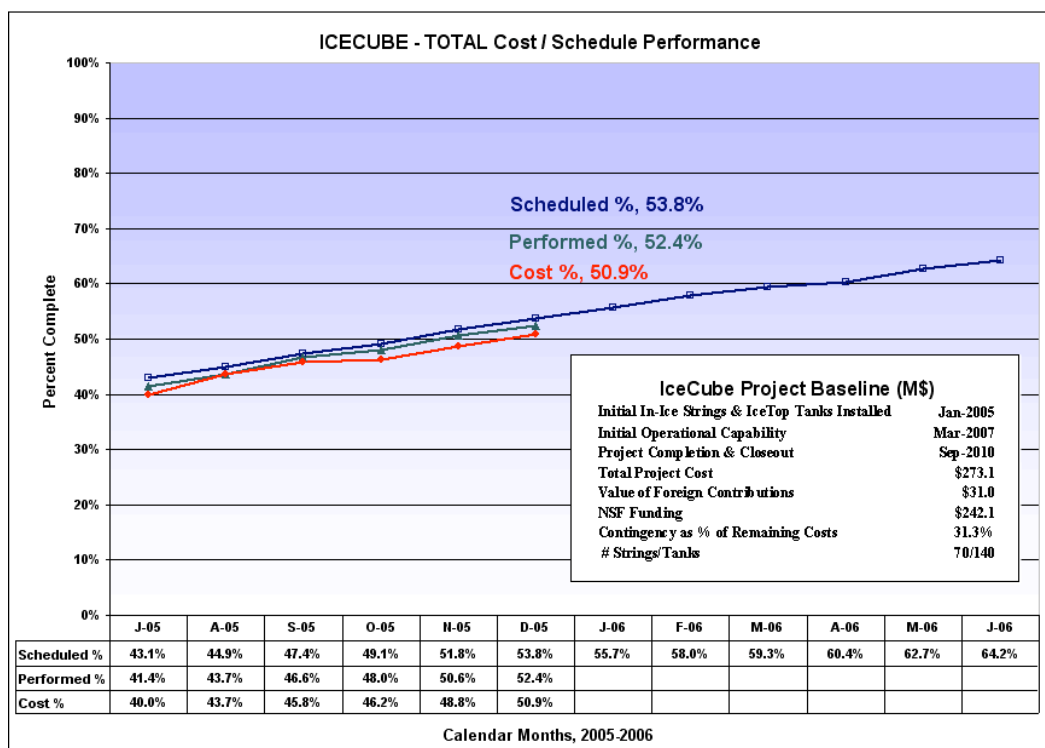
### Accomplishments

Drilling and installation for the current season at the South Pole is complete. A total of eight strings and twenty-four surface tanks were installed, a major accomplishment for the year.

Drilling rates for the 2.5km deep ice holes improved dramatically during the course of the season. The last two holes of the season were drilled within a one-week period.

About 300 DOMs that were shipped to the South Pole and passed acceptance testing were moved from the testing area in front of the Temporary Counting House to the Science Laboratory in the new station. These DOMs will be stored over the winter and used next season.

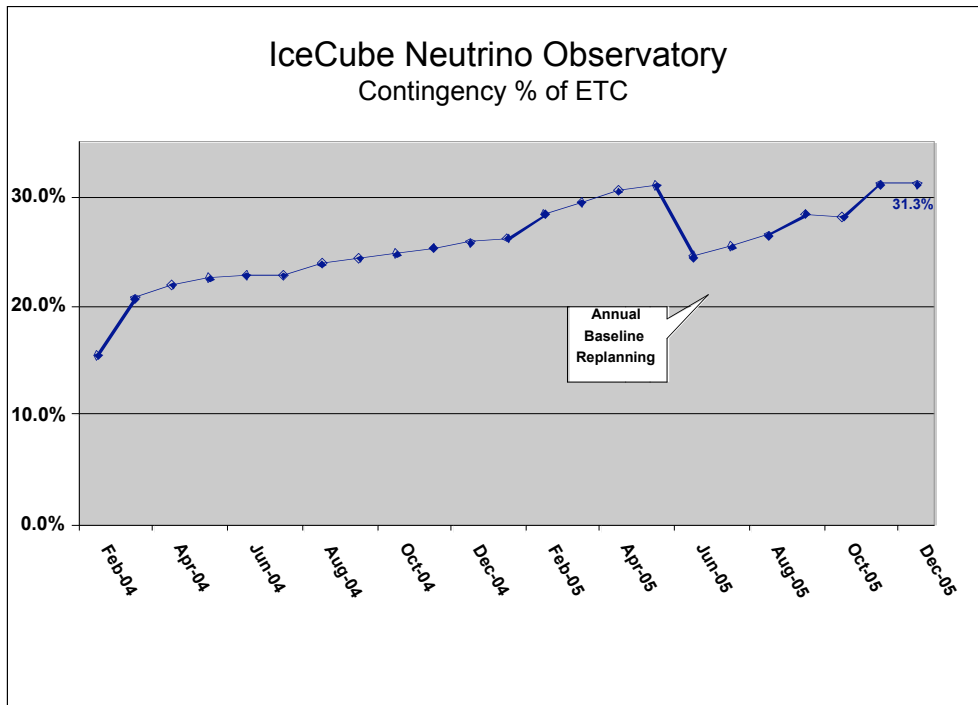
String verification runs and lower level commissioning were done with the test data acquisition system. The production DAQ was deployed and is now collecting data from multiple strings.



**Cost and Schedule Performance** – The project is roughly 52.4% complete versus the planned performance of 53.8% complete as measured using earned value techniques. The earned value measurement includes all tasks completed to date including design, development, procured materials, and the construction of the infrastructure that supports the current seasonal installation plan, e.g., the hot water drill, cargo shipments, etc. The cost and schedule status report and total contingency percentage (contingency/cost-to-complete) as a function of time, currently roughly 31%, is shown in the following tables.

IceCube Neutrino Observatory Cost Schedule Status Report Reporting Period Ending 12/31/2005 <sup>1</sup>											
OBS Structure L2	Cumulative To Date (AY K\$)					At Completion (AY K\$)			Complete (%)		
	Budgeted Cost of Work		Actual Cost of Work Performed	Variance		Budgeted AY \$s	Latest Revised Estimate	Variance	Scheduled	Performed	Actual
	Scheduled	Performed		Schedule	Cost						
PROJECT SUPPORT	16336.0	16336.4	16656.1	0.4	-319.8	29904.8	30224.6	-319.8	54.6%	54.6%	55.7%
IMPLEMENTATION	20463.1	20166.2	20198.8	-296.9	-32.7	32388.6	32421.3	-32.7	63.2%	62.3%	62.4%
INSTRUMENTATION	35707.7	35785.4	35500.5	77.8	284.9	65432.7	65147.8	284.9	54.6%	54.7%	54.3%
DATA ACQUISITION	21414.2	21377.0	21439.7	-37.2	-62.6	32864.6	32927.2	-62.6	65.2%	65.0%	65.2%
DATA SYSTEMS	11540.4	10640.7	10896.8	-899.7	-256.1	25017.6	25273.7	-256.1	46.1%	42.5%	43.6%
DETECTOR COMM. & VERIFICATION	8518.7	8151.2	7954.4	-367.5	196.8	18825.0	18628.2	196.8	45.3%	43.3%	42.3%
RPSC SUPPORT	13339.8	11587.5	7821.2	-1752.3	3766.3	31997.8	28231.6	3766.3	41.7%	36.2%	24.4%
NSF	523.7	523.7	523.7	0.0	0.0	1263.0	1263.0	0.0	41.5%	41.5%	41.5%
Sub Total	127843.6	124568.1	120991.2	-3275.5	3576.9	237694.2	234117.3	3576.9	53.8%	52.4%	50.9%
Management Reserve											
Total Contingency						35,359.1	38,936.0	3,576.9			
Items Outside of Approved Baseline											
IceCube Neutrino Observatory <sup>2</sup>	127,843.6	124,568.1	120,991.2	-3,275.5	3,576.9	273,053.3	273,053.3	0.0	53.8%	52.4%	50.9%

Notes: 1 Incorporates approved and currently pending baseline changes.  
2 Total Budget at Completion includes non-US contributions \$1,283K over the amount in the post Hartill III baseline.  
3 The budgeted contingency is: 31.3% of the Budgeted cost of work remaining.



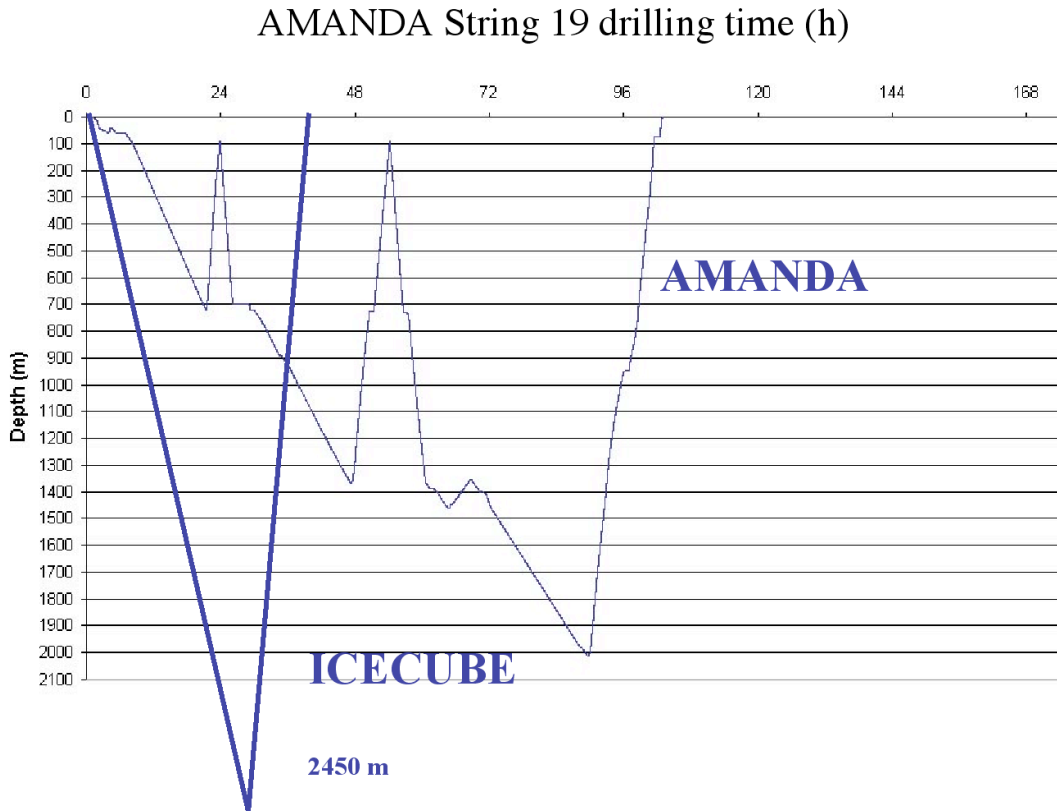
The project is preparing the annual baseline plan for the next project year, PY05, covering the period from April 1, 2006 – March 31, 2007. Contingency budgets will be evaluated at that time.

**Drill Construction and Operation** – Drilling and string installation for this season is complete. On the fifth hole of this season, hole #40, a 0.739” nozzle was used with a 12” extension. A target hole lifetime of 37 hours (time until hole diameter is less than required for string installation) was achieved. Drill speeds reached in excess of 2 meters/minute were achieved without encountering oscillations. A 0.739” nozzle with a 24” extension was used on the next hole, #50. A lifetime of 37 hours for was achieved in a similar amount of time and there was no significant difference between the 12” and 24” extensions. The drill speed limit problem is solved.

The hole production rate improved dramatically by the end of the season. The drill crew was able to produce a new hole in roughly 48 hours per starting with firm drilling and until removal of the drill weight stack. The remaining time is used to relocate hoses, cables and equipment.

Fuel consumption is consistent with estimates and forecast developed prior to the season. The baseline estimates assume 7,200 gallons per hole. The estimates are now calculated using a demand for running the system for the season (20,000 gallons) plus the incremental consumption per hole. Preliminary estimates indicate that slightly less than 20,000 gallons were consumed to run the plant and between 5,000 and 6,000 gallons were consumed on each hole.

The following plot compares the drilling time for the final string in AMANDA and an IceCube string this year.



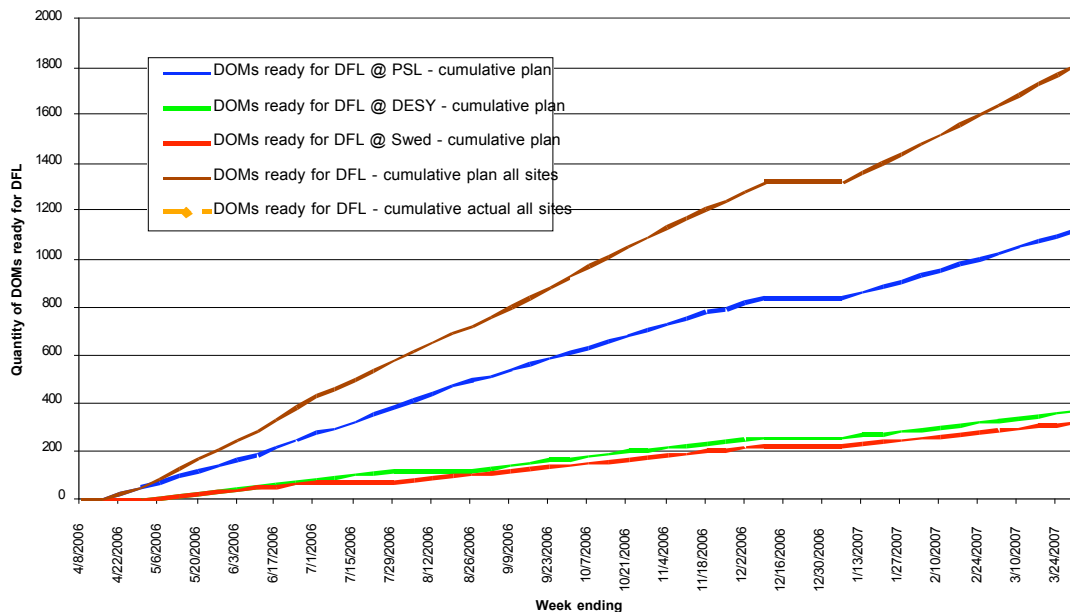
**String Installation** – The following table provides the string installation dates for the current season. Installation times averaged 15 hours from the start of installation until the tie off of the installed cable.

String Installation Dates			
String	Position	Finish Date	Time (days)
1	Hole # 29	12/26/05	16
2	Hole # 39	01/04/06	8
3	Hole # 38	01/09/06	5
4	Hole # 30	01/14/06	5
5	Hole # 40	01/18/06	4
6	Hole # 50	01/22/06	4
7	Hole # 59	01/26/06	4
8	Hole # 49	01/29/06	3.5

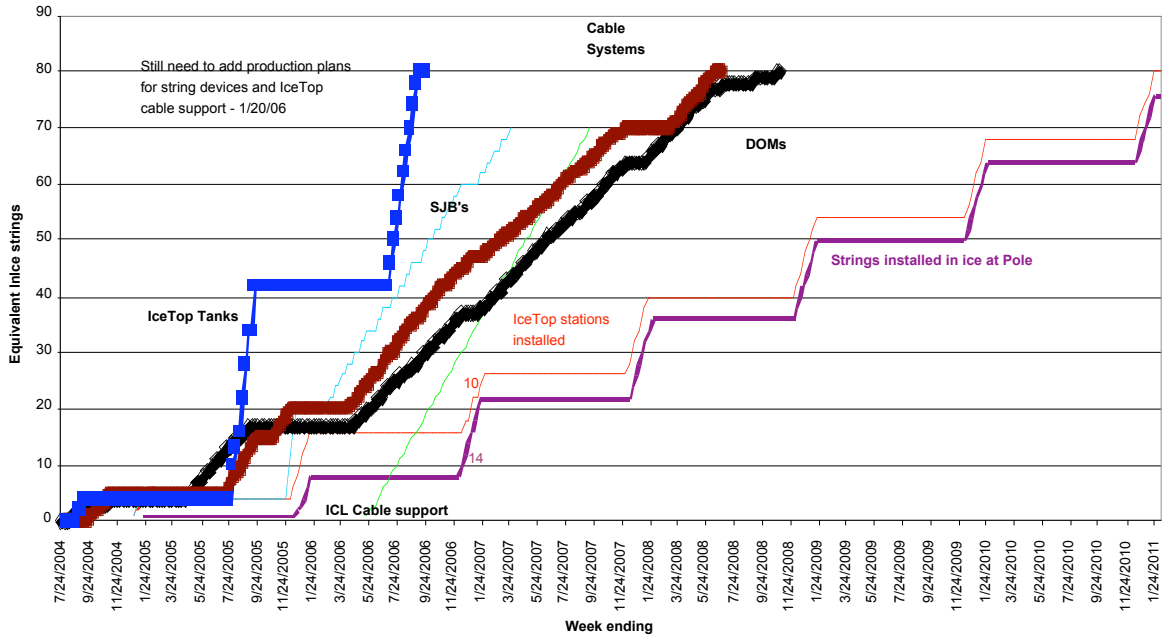
String 50, the sixth of the season, was successfully installed on January 22, 2006. RICE II instrumentation was deployed with this string. The RICE instrumentation was deployed in the uppermost 200 meters of the hole and increased string deployment times by less than 30 minutes. The seventh string of the season, #59, was successfully deployed on January 25 and also included RICE II instrumentation. String 49, the eighth of the season, was deployed on January 29. All new strings (8 in total) are connected to the appropriate surface junction boxes. Preliminary reports show that the strings are working well.

**Digital Optical Module and Cable Production Status and Plans** - The status of DOM production for 2006 is provided in the chart below along with the plan for DOM, cable, and tank production plan for 2004 – 2008. There are no major issues with instrumentation production. The plans provide instrumentation well in advance of the installation need dates and support the use of the least expensive shipping methods.

IceCube DOM Integration PY5 (April, 2006 to March, 2007) - Plan vs. Actual



IceCube DOM, Cable and Tank Production CY2004 - CY2008 for 76 strings installed



**Final Acceptance Testing of DOMs** – Nine DOMs are being sent back to Madison to be reworked and integrated into test systems. All other DOMs that did not pass will be stored at the South Pole and retested next season. Most of the failures on these DOMs were marginal and will most likely be waived after retesting and analysis.

**String and IceTop Commissioning** – All 76 IceCube DOMs installed at the South Pole last season are operating and reading data (60 DOMs on the string and 16 DOMs in eight surface tanks). The basic strategy for string commissioning this season is to conduct detailed verification and commissioning testing on the first few strings and a minimal set of tests on the rest of the strings. It is already clear that a few of the 480 DOMs deployed in the ice this season did not survive the installation procedure including freeze-in of the holes. The general situation is very good and all the strings installed this season are expected to meet project requirements. Early communication tests on the new strings were successful.

**Data Acquisition System** – The DAQ team has been collecting data from multiple strings. Four releases of the DAQ software were created, tested on the South Pole Test System, and deployed to run on South Pole System. Runs were complete on the existing string, #21, plus seven of the new strings. The integration of testing between the DAQ software and Processing and Filtering software is underway. DAQ testing and upgrades will remain an intense activity until for the next few months.

**System Testing** – The South Pole Test System, a mirror image of the South Pole System located at the UW-Madison Physics Department, continues to provide a critical test bed for the data acquisition and data handling software. There is an additional test facility located at the UW-Madison Physical Sciences Laboratory that includes a full-length surface-to-DOM cable and DOMs in portable freezers. This facility is used for more experimental system testing.

**Data Systems** – The temporary counting house is fully operational. The IceCube Laboratory or permanent counting house is expected to be available by December 6, 2006.

**Quality Assurance & Safety** – There have been no significant quality assurance or safety issues to report this season including no injuries resulting in lost work time. Michael Zernick served as quality assurance and safety manager on the ice for the second half of the season.

**Congressional Delegation** – A delegation visited the South Pole and the IceCube site, witnessing drilling operations. They also asked questions regarding the IceCube science program. The visit was considered successful.

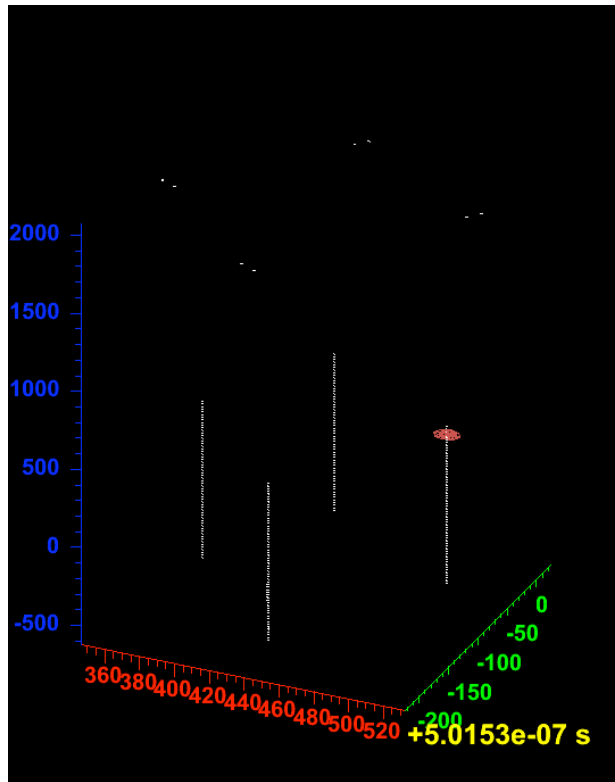
**High Level Summary** – The transition from AMANDA to IceCube is in place:

- AMANDA accumulating data for the 7th year and will continue to deliver results
- One year of experience with the first IceCube string
- IceCube string deployment meets expectations
- Nine IceCube strings have more PMT-cathode area than entire AMANDA array
- Installed IceCube strings already larger than AMANDA
- IceCube on track towards completing a 1 km<sup>3</sup> neutrino telescope

The monthly reports are posted at [IceCube Monthly Reports](#). The IceCube 2005-2006 Weekly Construction Reports are posted at [IceCube 2005-2006 Weekly Construction Reports](#).

**Meetings and Events**

Project Year 5 Planning Workshop – Madison	February 21-22, 2006
NSF Site Visit – Madison	February 23-24, 2006
Season Review Meeting w/ UW/RPSC/NSF – Madison	March 16-17, 2006
Drill Advisory Panel Meeting – Madison	March 27-28, 2006
Panel Advisory Panel Meeting – Madison	March 29-30, 2006
Science Advisory Committee Meeting – Madison	March 30-31, 2006
International Oversight & Finance Group – NSF	April 7, 2006
Collaboration Meeting - Baton Rouge, LA	April 9-14, 2006
DAQ/On-line Review – Lawrence Berkeley National Laboratory	April 25-27, 2006
NSF Annual Review – Madison	May 23-25, 2006



**4-String Event Animation**