IceCube Project Monthly Report
October 2005

Accomplishments

All of the IceCube Digital Optical Modules (DOMs) installed at the South Pole continue to produce physics quality data (60 DOMs on the in-ice string and 16 DOMs in surface tanks).

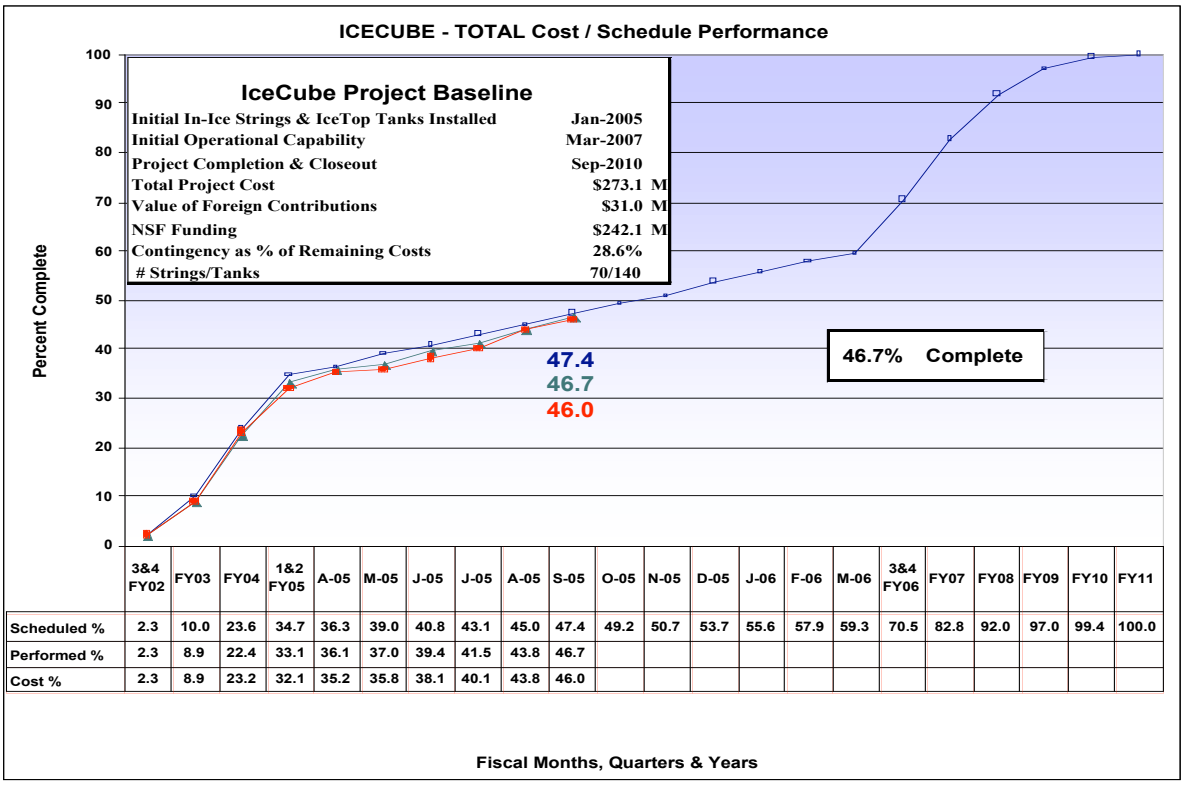
The DOM production requirements were satisfied for 2005/2006. DOM production is complete at all three production sites (Sweden, Germany, and UW–Madison). DOM testing is complete in Sweden and Germany and one additional Final Acceptance Test cycle remains at UW-Madison.

The additional data handling equipment required for the next season of instrumentation installation was built-up and tested in UW-Madison and shipped to the South Pole.

All surface-to-DOM and surface cables that will be shipped to McMurdo station this season were shipped (8 surface-to-DOM and 12 surface). There are three surface-to-DOM cables at the Pole and one at McMurdo from shipment last season.

The deployment of IceCube staff to the South Pole is underway and there is steady progress taking the existing drill equipment out of winter storage and installing the new equipment.

The IceCube International Oversight & Finance Group met on October 21, 2005, at NSF.



	3&4 FY02	FY03	FY04	1&2 FY05	A-05	M-05	J-05	J-05	A-05	S-05	O-05	N-05	D-05	J-06	F-06	M-06	3&4 FY06	FY07	FY08	FY09	FY10	FY11
Scheduled %	2.3	10.0	23.6	34.7	36.3	39.0	40.8	43.1	45.0	47.4	49.2	50.7	53.7	55.6	57.9	59.3	70.5	82.8	92.0	97.0	99.4	100.0
Performed %	2.3	8.9	22.4	33.1	36.1	37.0	39.4	41.5	43.8	46.7												
Cost %	2.3	8.9	23.2	32.1	35.2	35.8	38.1	40.1	43.8	46.0												

IceCube Neutrino Observatory
Cost Schedule Status Report
Reporting Period Ending: 9/30/2005 [1]

WBS Element	Cumulative To Date (AY K$)					At Completion (AY K$)			Complete (%)		
	Budgeted Cost [2]		Actual Cost	Variance							
	Work Scheduled	Work Performed	of Work Performed	Schedule	Cost	Budgeted AY $s	Latest Revised Estimate	Variance	Scheduled	Performed	Actual
1.1 Project Support [3]	15,028.3	15,170.7	15,573.9	142.4	-403.2	29,896.7	30,299.9	-403.2	50.3%	50.7%	52.1%
1.2 Implementation	18,859.8	18,920.5	18,255.1	60.7	665.4	32,217.6	31,552.3	665.4	58.5%	58.7%	56.7%
1.3 Instrumentation	49,384.7	49,037.8	49,264.5	-346.9	-226.7	97,919.8	98,146.5	-226.7	50.4%	50.1%	50.3%
1.4 Data Systems	9,842.5	8,833.9	9,179.5	-1,008.5	-345.6	24,874.3	25,219.9	-345.6	39.6%	35.5%	36.9%
1.5 Detector Commissioning & Verification	6,833.3	6,957.0	6,499.4	123.7	457.6	18,773.7	18,316.1	457.6	36.4%	37.1%	34.6%
1.6 Polar Support Services	11,876.1	11,449.0	9,737.8	-427.1	1,711.3	32,054.5	30,343.2	1,711.3	37.0%	35.7%	30.4%
NSF [3]	491.3	491.3	437.3	0.0	54.0	1,263.0	1,209.0	54.0	38.9%	38.9%	34.6%
Sub Total	112,316.0	110,831.267	108,947.5	-1,455.7	1,912.8	236,999.7	235,115.9	1,883.8	47.4%	46.8%	46.0%
Management Reserve											
Total Contingency						36,053.7	37,937.5	1,883.8			
Items Outside of Approved Baseline											
IceCube Neutrino Observatory [2]	112,316.0	110,831.3	108,947.5	-1,455.7	1,912.8	273,053.3	273,053.3	0.0	47.4%	46.8%	46.0%

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: 28.6% of the Budgeted cost of work remaining.

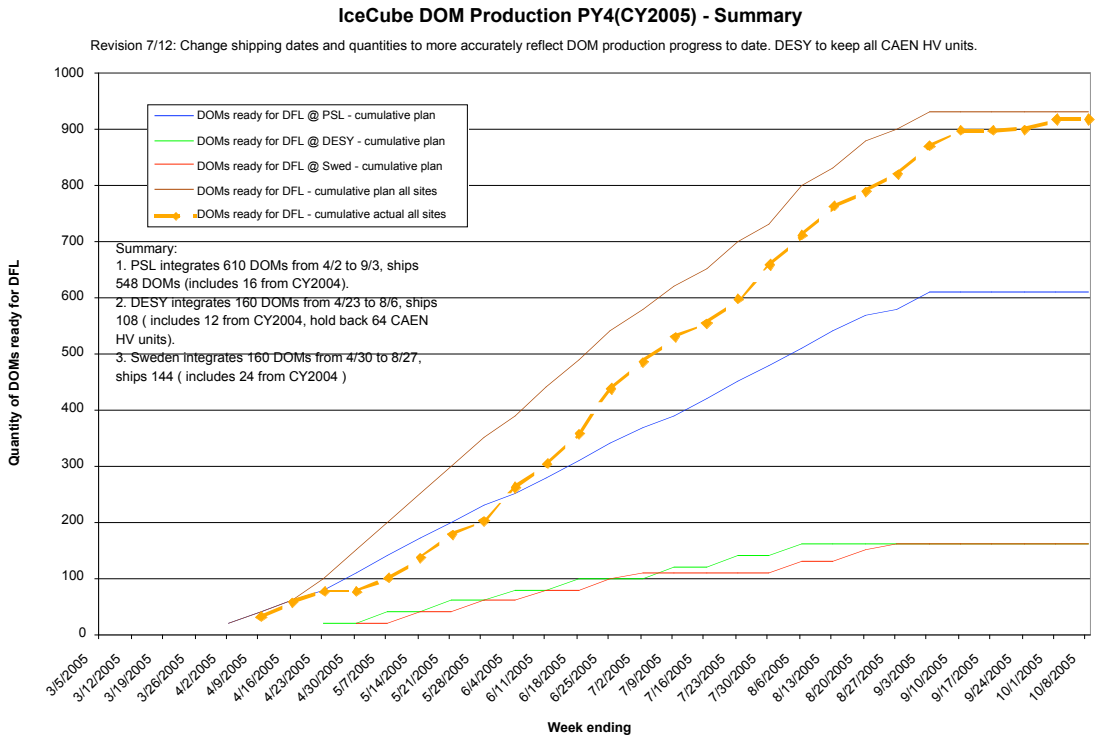
Cost and Schedule Performance – The project is roughly 46.7% complete versus the planned performance of 47.4% complete as measured using earned value techniques. The earned value measurement includes all tasks completed to date including design, development, procured materials, and the construction of the infrastructure that supports the current seasonal installation plan, e.g., the hot water drill, cargo shipments, etc. The total contingency percentage (contingency/cost-to-complete) as a function of time is shown at the end of this report.

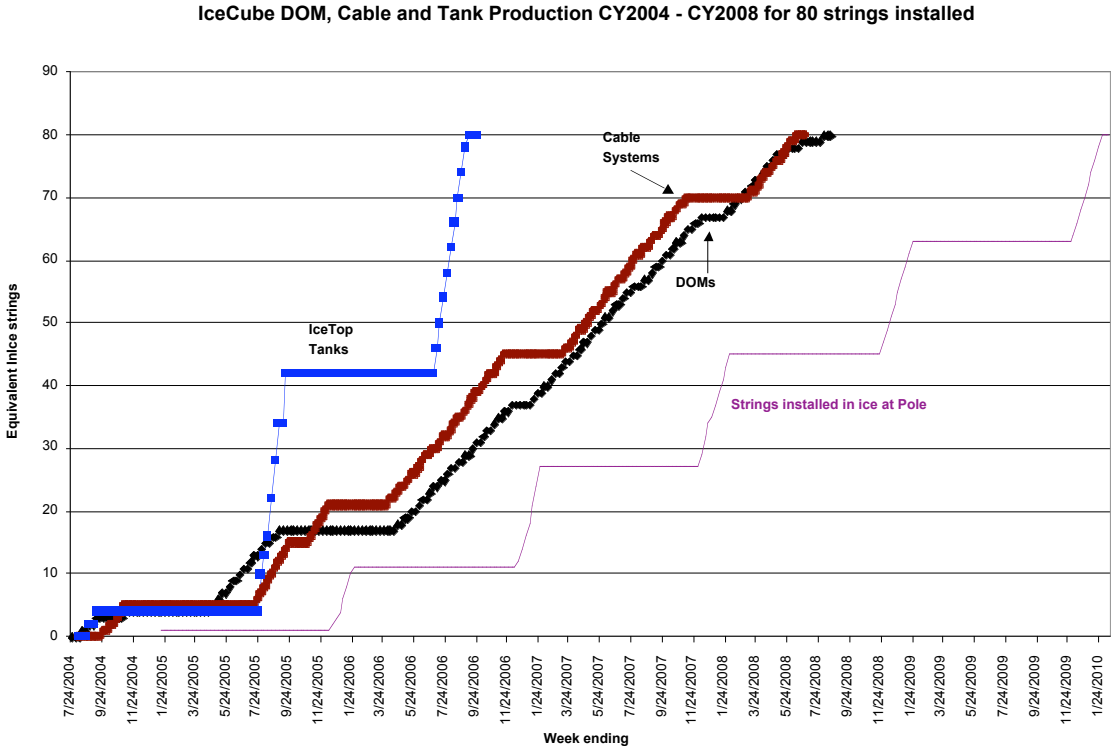
Drill Construction and Operation – The hot water drill was operated for the first time at the South Pole during the 2004/2005 season drilling one hole to a depth of 1,500 meters and another to 2,500 meters, with the latter used for the first IceCube string. Preparation for 2005/2006 is essentially complete and the drill crew is now arriving at the South Pole to ready the drill for operations. The Standard Operating Procedures (SOPs) for the drill and deployment activities are essentially complete with 38 of 40 SOPs approved and the two in draft form. The two draft procedures that are still in draft, tower winterizing and rod well reel stop test, will be approved in a few weeks. The general drilling and string installation plan for 2005/2006 includes:

- Set up the drill camp and check-out systems by December 9th
- Readiness Review on December 10th
- Drill and install strings over seven weeks (December 11th – January 28th)
  - Drill one hole demonstrating stable operations
  - Improve the drilling speed to the original design goals
  - Install two strings per week
- Winterize the drill equipment in preparation for the 2006/2007 season

The initial draft of the IceCube On Ice Drill Operations Plan for 2005/2006 was completed in September and continues to be revised in response to further review and discussion. The general plan is to establish stable drilling operations and then to increase the drilling speed at an incremental rate. A readiness review will be conducted prior to drilling to ensure that the drill crew is properly rested and ready to start and to ensure that the program of SOPs and readiness checklists are being followed. There is a detailed plan for the first hole and a hole-to-hole plan that provides for investigations into improvements in the drilling speed through additional

modifications, e.g., changes to the drill nozzle diameter, taper, and weight stack.





Instrumentation Production, Testing, and Shipping – The production goals for this calendar year were to produce 16 surface-DOM cables, 16 surface cables, and 930 DOMs. These goals will be met. Roughly 90% of the DOMs planned for shipment this season were shipped. Cable shipments this season to McMurdo via ChristChurch include twelve surface cables and eight surface-to-DOM cables. An additional five surface cables and six surface-to-DOM cables will be sent directly to McMurdo on the annual supply vessel and stored at McMurdo.
Final Acceptance Testing of DOMs – The first pass yield of DOMs passing final acceptance tests in the dark freezer laboratories is routinely approaching 90% on average, a long-term goal for the project. The second pass yield is 95%. An additional FAT cycle is planned at UW to test the DOMs that failed the first pass but are now expected to meet requirements.

String and IceTop Commissioning – All 76 IceCube DOMs at the South Pole are operating and reading data (60 DOMs on the string and 16 DOMs in eight surface tanks). Overall, the quality of the data from the first string and the eight IceTop tanks is very good. The IceCube scientific collaboration is evaluating data from AMANDA and the initial IceCube instrumentation. Plans are in place for verification and commissioning the strings and surface tanks that will be installed during the 2005/2006 season. The basic strategy for string commissioning is to conduct detailing performance testing on only a few strings and a minimal set of tests on the rest of the strings.

Data from the existing IceCube string is currently extracted using a test version of the data acquisition software. The "final" data acquisition software will be uploaded onto the first string and surface hardware in early December, following the installation of the South Pole System (SPS) for 2005/2006. A technical review of the DAQ is planned for early March 2006. The review will respond to the results from this coming season.

System Testing – The South Pole Test System, a mirror image of the SPS, continues to provide a critical test bed for the data acquisition and data handling software. The DOM-Cable Test System at PSL is includes a full-length surface-DOM cable plus IceTop hardware. This system provides a test environment for data acquisition software, general system performance testing, and the ability to troubleshoot problems without impacting the instrumentation installed at the South Pole.

Data Systems – The data handling systems required for the 2005/2006 was shipped after buildup and testing at UW. The system will be installation in the temporary counting house (future optical module laboratory). The IceCube Laboratory or permanent counting house will be available on December 15, 2006. The schedule variance in data systems due to muon delays in purchases and some underestimates of progress by earned value techniques.

Quality Assurance & Safety – There are no significant quality assurance issues to report. The project submitted a detailed response to the NSF Safety Review of the IceCube Program that was conducted in early August. Response to NSF Review of the IceCube Safety Program

International Oversight & Finance Group (IOFG) - The IceCube International Oversight and Finance Group (IOFG) met on October 21, 2005, at the National Science Foundation. The agenda for the meeting included a review of the status and plans on the construction project and preliminary plans for the formal start of IceCube operations and analysis in 2007. In addition to

NSF, countries represented on the IOFG included Germany, Sweden, and Belgium. The participants were pleased with the progress on construction activities. The preliminary plans for operations and analysis were discussed for the first time with the IOFG and there is commitment to prepare more detailed plans prior to the next meeting scheduled for April 7, 2006. The major challenge is to find ways for constructive cost sharing among the collaborating institutions given the centralized nature of the management, technical support, and data handling efforts.

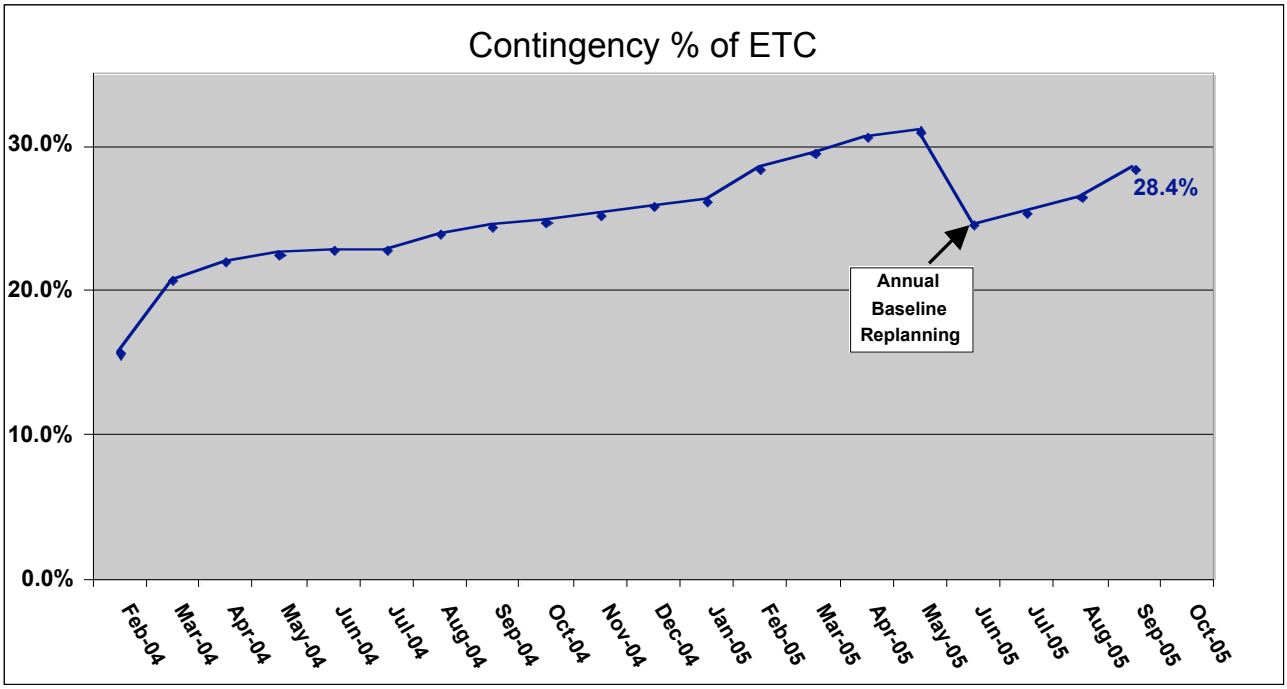
South Pole Activities - Work at the South Pole has started in earnest. The 2005/2006 season is extremely important as the project will attempt to safely drill a large number of deep ice holes in a stable mode. The drillers are arriving at the South Pole Station and work to prepare the drill equipment is now underway. Cargo and people are arriving as planned. IceTop tanks were successfully drift unloaded making use of early season flights. Morale is high. A few pictures are provided at the end of this report.

Meetings and Events

IceCube Reconstruction Workshop	December 15-16, 2005
Drill Advisory Panel Meeting	March 27-28, 2006
Panel Advisory Panel Meeting	March 29-30, 2006
Science Advisory Committee Meeting	March 30-31, 2006
NSF Annual Review	May 30-June 1, 2006

Education & Outreach - IceCube scientists and engineers were invited to participate in the live webcast on December 1, 2005, to celebrate Einstein and look beyond the World Year of Physics 2005. CERN, the sponsor of the webcast, asked IceCube scientists to contribute their comments from the South Pole Station as the webcast makes its way around the globe.

The monthly reports are posted at IceCube Monthly Reports.



2004-2005 Rodwell hole uncovered and inspected. Photo courtesy of Tom Hutchings.

Temporary IceCube Lab (TICL), OMLs in service with IceCube Lab in background. Photo courtesy of Tom Hutchings.