

## IceCube Project Monthly Report January 2005

### Accomplishments

The first IceCube string and the first eight IceTop tanks were successfully deployed. This is a tremendous achievement, providing a solid foundation for next year.

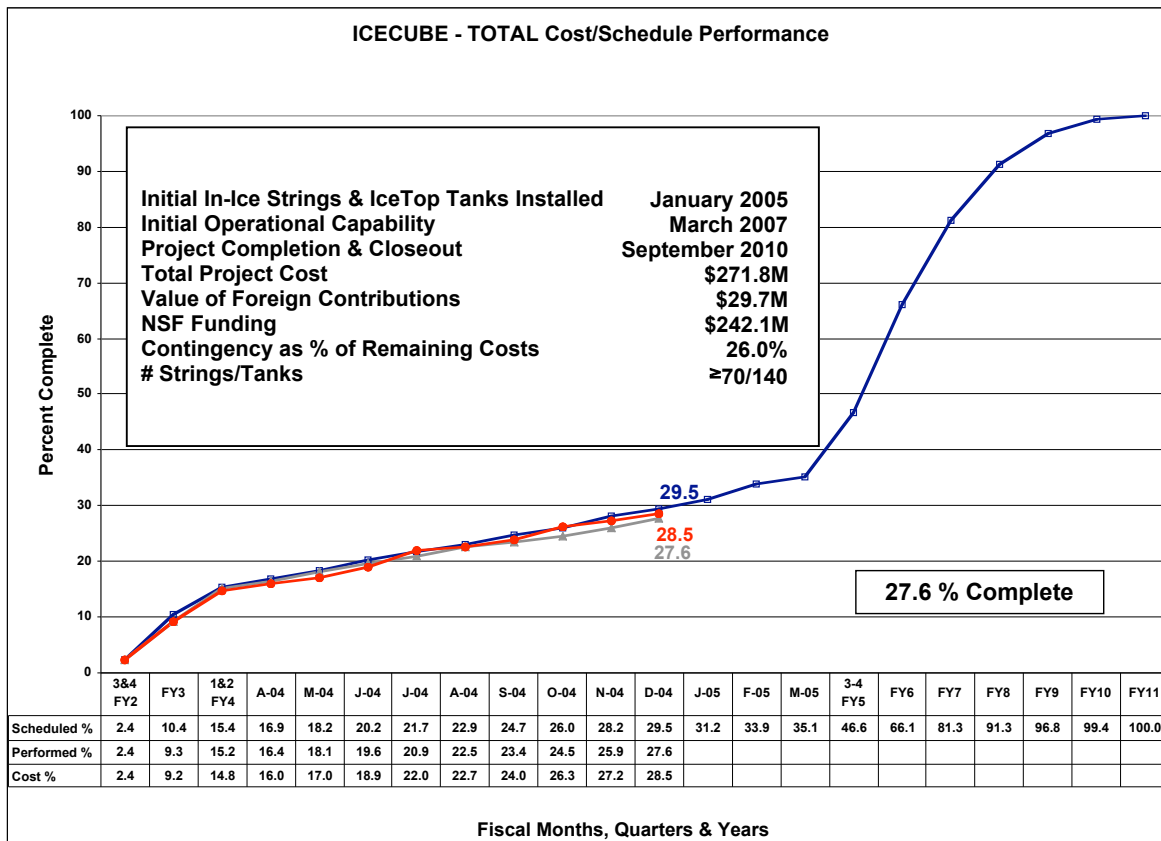
A total of 76 Digital Optical Modules (DOMs) are now frozen in ice (16 DOMs in the IceTop surface tanks and 60 DOMs in the deep ice). Communication was established with every DOM and commissioning activities are proceeding well.

The South Pole station is closed for the winter. The drill seasonal equipment site was broken down and the drill equipment placed behind a protective berm near the new station.

Instrumentation for the equivalent of three strings is safely stored at the station for the winter and will be used at the start of next season when the goal will be to install ten or more strings.

Detailed plans for producing additional instrumentation for deployment next year are in place and a final readiness review will be held on March 7-8, 2005, in Madison. This year the plan is to produce enough instrumentation for twelve strings and a similar number of surface stations.

The IceCube Project Advisory Panel will meet on March 9-10, 2005, to discuss the results of this season and plans for the next season.



<b>Initial In-Ice Strings &amp; IceTop Tanks Installed</b> <b>Initial Operational Capability</b> <b>Project Completion &amp; Closeout</b> <b>Total Project Cost</b> <b>Value of Foreign Contributions</b> <b>NSF Funding</b> <b>Contingency as % of Remaining Costs</b> <b># Strings/Tanks</b>	<b>January 2005</b> <b>March 2007</b> <b>September 2010</b> <b>\$271.8M</b> <b>\$29.7M</b> <b>\$242.1M</b> <b>26.0%</b> <b>≈70/140</b>
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**27.6 % Complete**

***Cost and Schedule Performance*** – The total cumulative schedule and cost variances at the end of December were less than a few percent. A report of cumulative variances at a lower level of the work breakdown is provided as the first attachment to this report.

***Drill Construction and Operation*** – The IceCube drilling team commissioned the enhanced hot water drill and drilled a test hole to a depth of approximately 1 kilometer. There were difficulties encountered as the drilling speed was increased and drill sensor data indicated that the drill head and weight stack were damaged. A decision was made to abandon the test hole and move to a new location within ten meters of the test hole. The drill head was repaired, weight stack modified and the team successfully drilled the first hole to a depth of 2.5 kilometers. Drilling speeds were slower than planned. A tremendous amount of data was taken during drilling and this data, along with the observations of the drillers, will be used to define improvements to the drill for next season. The first week in February was devoted to proper storage of the drill for the winter including moving all the modular drilling structures a protected berm near the South Pole Station.

***Deployment*** – Deployment of the first string of sixty DOMs went extremely well. The total deployment time was slightly better than expectations.

***String Commissioning*** – The freeze-in of the DOMs is nearly complete. The hole freezes from top to the bottom of the hole where the ice temperatures are warmest. There is high confidence that this string will meet IceCube performance requirements. Communications were established with all sixty DOMs. A picture showing a muon first detected in the IceTop detector (blue dot) and later by the string is attached to this report. The picture illustrates that the DOMs, cables, data acquisition, and software are working, at least to a rough approximation.

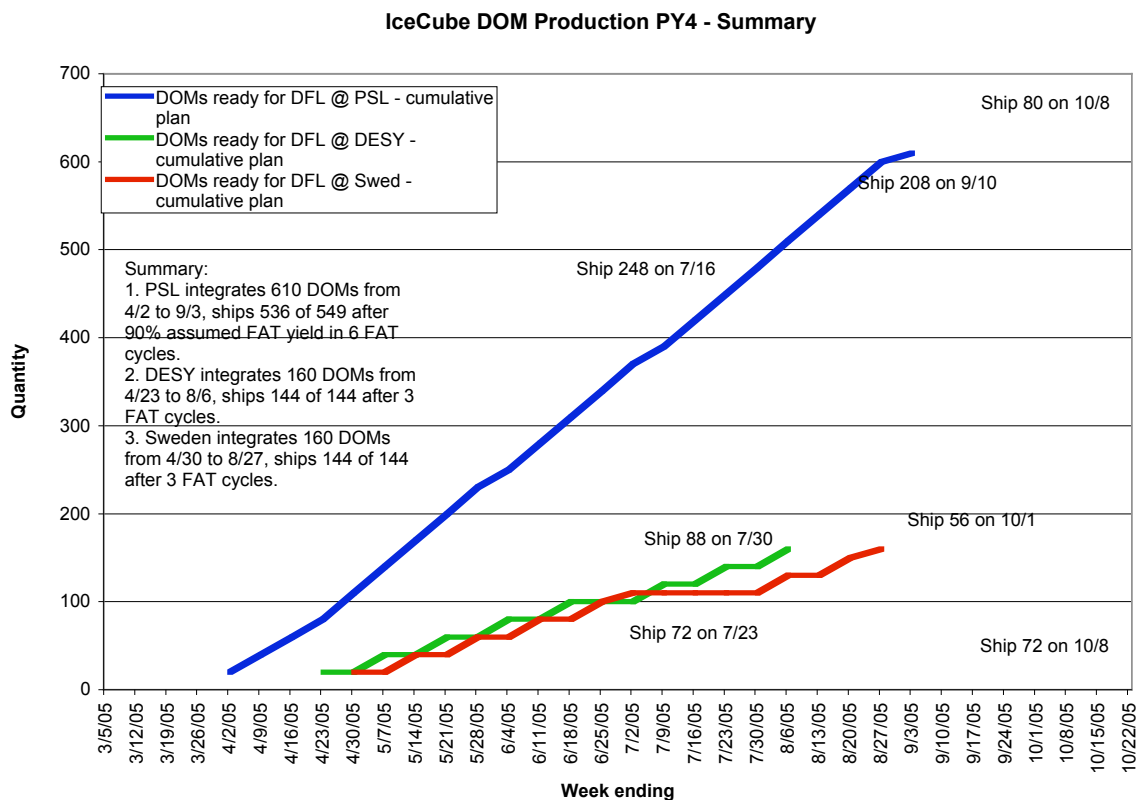
***IceTop Installation*** – The installation of eight IceTop surface tanks, instrumentation, and cabling is complete. The controlled freeze-in of the tanks is nearly complete and all instrumentation is functioning properly.

***Instrumentation System Test Status*** – The South Pole Test System located at the Physical Sciences Laboratory was expanded to support high fidelity demonstrations of communications, data taking, timing, and other critical functions. The engineering and instrumentation team demonstrated reliable communications to all devices, the ability to load new software to deployed DOMs over the full cable path, basic local coincidence functionality, and normal functionality of the IceTop power and freeze control system. Further, they have demonstrated that all of these devices can operate simultaneously over the common communications cable set with no adverse effects.

***Data Systems*** – The data handling system was installed in the temporary counting house (future optical module laboratory) and the software is operational. The permanent counting house (former elevated dormitory) was moved to the center of the IceCube array in preparation for beneficial occupancy next year. Due to cargo shipment limitations NSF and Raytheon decided to postpone build out of the interior of the counting house until next year. It is now anticipated that the IceCube Counting House will not be available until the third season of installation.

**Detector Verification and Commissioning** – Simulations of the first string plus AMANDA is well underway and the complete commissioning of the deployed hardware and software is in progress. The DOMs at the lowest elevations are still not fully frozen in. The three IceCube/AMANDA staff persons that will spend the winter at the station will participate in commissioning and trouble-shoot problems that are diagnosed remotely or at the pole.

**Instrumentation Production & Testing** – The project produced 400 DOMs in calendar year 2004 and shipped 280 to the South Pole, enough DOMs for four strings, eight tanks, plus spares. The project also shipped the full complement instrumentation cables. The production plan for year two is for at least the equivalent instrumentation for twelve strings. If the project is successful with these production plans we will have an inventory of instrumentation that is equivalent to fifteen strings, with three strings already at the pole. The IceCube production plan for DOMs in 2005 is shown in the following graph.



**Safety, Quality Assurance, and Project Documentation** – An IceCube driller was injured during drilling operations. The drilling site was placed in stand down condition and drilling equipment secured in a safe standby mode until accident investigations were completed and the conditions that potentially contributed to the accident could be reviewed. The resumption of drilling was coordinated with NSF and the stand down officially ended one week after the accident. There is an ongoing effort to more fully understand the lessons-learned from the accident along with the rest of the considerable experience gained from the first year of IceCube drilling.

Recent progress on completing a rather long list of project documentation is very good and is tracked by the Quality Assurance Manager and Project Manager.

**Other News**

Michael Shaevitz, chair of the IceCube Science Advisory Committee (SAC) that reports to Francis Halzen, IceCube PI and Co-Spokesperson, will conduct the first organizational meeting of the SAC in March. The meeting will be on the second day of the annual Project Advisory Panel meeting. Topics to be discussed include the charge and plans for membership of the SAC. Current members include Rocky Kolb, U. Chicago/Fermilab, and Jos Engelen, CERN Research Director, and the PAP chair, Jay Marx, LBNL.

**Future Meetings and Events**

Monthly Status Meeting	February 23, 2005
1 <sup>st</sup> Season Assessment/Future Year Planning Meeting w/ NSF & RPSC @ UW	March 3-4, 2005
Instrumentation Readiness Review @ UW	March 7-8, 2005
Project Advisory Panel/Science Advisory Committee Meeting @ UW	March 9-10, 2005
Amanda/IceCube Collaboration Meeting @ Berkeley/LBNL	March 19-23, 2005
International Oversight and Finance Group Meeting @ NSF	March 24, 2005
UW/RPSC Detailed Planning Meeting in Support of SIP @ UW	April 5-6, 2005
Baseline Status Review	

The monthly reports are posted at [IceCube Monthly Reports](#).

IceCube Neutrino Observatory Cost Schedule Status Report Reporting Period Ending: 12/31/2004 <sup>1</sup>											
WBS Element	Cumulative To Date (AY K\$)					At Completion (AY K\$)			Complete (%)		
	Budgeted Cost <sup>2</sup>		Actual Cost of Work Performed	Variance		Budgeted AY \$s	Latest Revised Estimate	Variance	Scheduled	Performed	Actual
	Work Scheduled	Work Performed		Schedule	Cost						
1.1 Project Support <sup>3</sup>	11,165.7	11,000.5	11,358.8	-165.1	-358.3	30,042.0	29,569.1	472.9	37.2%	36.6%	37.8%
1.2 Implementation	12,115.3	12,095.5	13,376.0	-19.9	-1,280.6	27,832.3	30,275.3	-2,443.0	43.5%	43.5%	48.1%
1.3 Instrumentation	26,794.3	26,865.6	29,319.8	71.2	-2,454.2	90,382.3	97,207.9	-6,825.6	29.6%	29.7%	32.4%
1.4 Data Systems	6,278.9	4,998.9	4,698.7	-1,280.0	300.2	26,634.6	27,412.1	-777.5	23.6%	18.8%	17.6%
1.5 Detector Commissioning & Verification	4,342.9	1,733.6	2,232.2	-2,609.2	-498.6	19,861.9	20,692.3	-830.5	21.9%	8.7%	11.2%
1.6 Polar Support Services	6,474.6	6,201.9	3,795.2	-272.7	2,406.7	32,791.0	31,073.7	1,717.3	19.7%	18.9%	11.6%
NSF <sup>3</sup>	394.9	394.9	394.9	0.0	0.0	1,263.0	1,273.6	-10.5	31.3%	31.3%	31.3%
Sub Total	67,566.6	63,290.9	65,175.7	-4,275.7	-1,884.9	228,807.2	237,504.0	-8,696.8	29.5%	27.7%	28.5%
Management Reserve											
Total Contingency						42,963.8	0.0	42,963.8			
Items Outside of Approved Baseline											
<b>IceCube Neutrion Observatory</b>	<b>67,566.6</b>	<b>63,290.9</b>	<b>65,175.7</b>	<b>-4,275.7</b>	<b>-1,884.9</b>	<b>271,771.0</b>	<b>237,504.0</b>	<b>34,267.0</b>	<b>29.5%</b>	<b>27.7%</b>	<b>28.5%</b>

Notes: 1 Incorporates approved and currently pending baseline changes.  
 2 Budgeted contingency includes \$536K of currently undesignated Non-US Contributions.  
 3 Budgeted contingency is 26.0% of the Budgeted cost of work remaining.

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