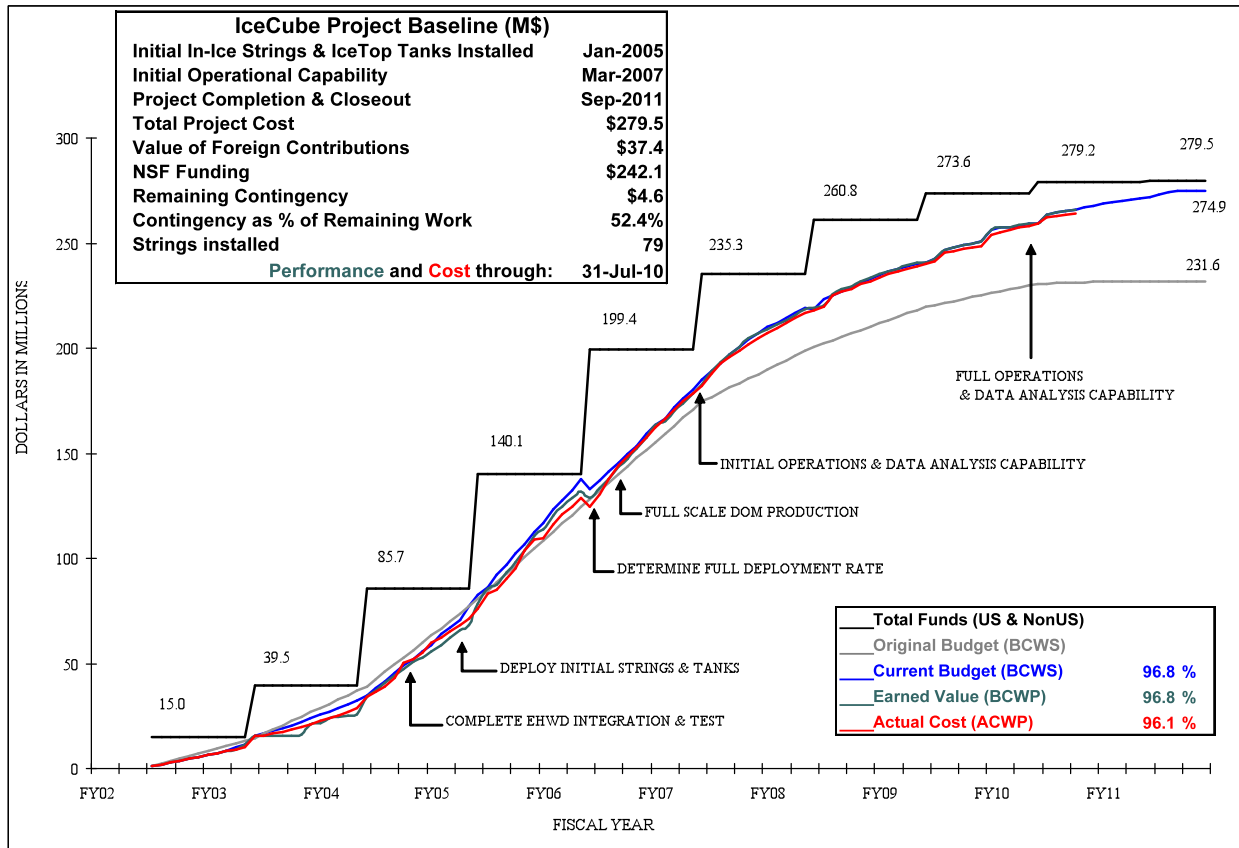


# IceCube Project Monthly Report - August 2010

## Accomplishments

- Shipping commenced for equipment destined for the South Pole this season.
- IceCube maintained a high up-time of 98.52% in August as maintenance teams attended to IceTop Digital Optical Modules after a spell of extremely low temperatures.
- The simulation teams produced several benchmark datasets that will be used for systematic checks.
- A new Data Acquisition software release was deployed on the South Pole System, addressing two major issues: a reduction in the number of detector configuration files and an increase in the data buffer memory allocation.
- A new IceCube poster series is being designed, with three separate posters focusing on Neutrino Science, Digital Optical Modules, and Life at the South Pole.
- The IceCube Collaboration meeting will be in Brussels from September 20-23, followed by the International Oversight and Finance Group meeting on September 24.



**Cost and Schedule Performance** – The project is 96.8% complete. Remaining contingency is \$4.6 million. The NSF IceCube MREFC funding of \$242.1 million remains unchanged since the project baseline was established in early 2004.

IceCube Neutrino Observatory Cost Schedule Status Report Reporting Period Ending: 7/31/2010										
							Note 1			
Cumulative (AY K\$)							At Completion Note 4	Complete (%)		
OBS Structure L2	Budgeted Cost <sup>2</sup>		Actual Cost of Work Performed	Variance Cost	Risk Contingency <sup>Note5</sup>		Budgeted AY \$s	Sched	Perf	Actl Cost
	Work Scheduled	Work Performed			Assigned	% Remain Work				
Project Support	26,315	26,315	26,264	50.9	125	13.8%	27,223	96.7%	96.7%	96.5%
Implementation	43,389	43,389	43,178	210.6	560	16.7%	46,732	92.8%	92.8%	92.4%
Instrumentation	76,657	76,657	76,526	131.0	30	12.6%	76,895	99.7%	99.7%	99.5%
Data Acquisition	33,855	33,855	33,855	-0.3	0	0.0%	33,855	100.0%	100.0%	100.0%
Data Systems	26,380	26,380	26,434	-53.5	50	8.9%	26,940	97.9%	97.9%	98.1%
Detector Comm. & Verification	20,533	20,533	20,516	17.5	25	21.6%	20,649	99.4%	99.4%	99.4%
Pre Operations	4,192	4,192	3,954	238.6	50	6.2%	4,999	83.9%	83.9%	79.1%
Subtotal	231,321	231,321	230,726	594.8	840	14.1%	237,293	97.5%	97.5%	97.2%
RPSC SUPPORT	33,639	33,639	32,406	1,233.1	300	11.2%	36,323	92.6%	92.6%	89.2%
NSF	1,163	1,163	1,163	0.0	15	15.0%	1,263	92.1%	92.1%	92.1%
Total	266,124	266,124	264,296	1,827.9	1,155	13.2%	274,880	96.8%	96.8%	96.1%
CONTINGENCY <sup>Note 3</sup>							4,593			
IceCube Total <sup>Note 2</sup>	266,124	266,124	264,296	1,827.9	1,155		279,472	96.8%	96.8%	96.1%

Notes: 1 Incorporates approved baseline changes.  
2 Total Budget at Completion includes \$37.4 M  
3 Budgeted contingency is: 52.4% of the Budgeted cost of work remaining.  
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 July 2010 was \$1,828k. This favorable cost variance is primarily due to Raytheon and NY Air National Guard FY10 on-ice fuel and labor cost savings and lower than planned travel and labor cost of the training, WBS 1.2. The favorable Cost Variance under WBS 1.9, Pre Operations, is mostly due to lagging invoices for computing hardware purchases.

7/31/10

No.	Description	Approval Date	Total Baseline	Allocated Budget	Allocated Budget Change	Contingency Budget	Budgeted Cost of Work Remaining
NA	Status as of April 2010		279,472	274,420	0	5,052	11,012
NA	Status as of May 2010		279,472	274,420	0	5,052	9,963
CR165	Additional PY9 Simulation & Calibration effort	08/03/10	279,472	274,513	93	4,959	8,756
NA	Status as of June 2010		279,472	274,513	0	4,959	9,443
CR166	Pre-Operations Budget Plan through Sep.2010 -2nd phase	07/12/10	279,472	274,880	367	4,593	8,756
NA	Status as of July 2010		279,472	274,880	0	4,593	8,756

**Contingency Status and Plans** – One change request was implemented during the past month, change request IC0166 on the amount of \$367k to support remaining labor needed to meet core pre-operational requirements through September 2010.

The IceCube project is conducting reviews of the various MREFC subsystems to ensure completeness and readiness for reliable operations. The action item lists resulting from these reviews typically generates the need for additional resources, e.g., programming support, computing hardware purchases, documentation effort, etc. The cost is considered in the risk assessment process and will be addressed within the available contingency.

If the final drilling season is successful the remaining contingency will be adequate to complete the approved scope. A no-cost extension will be requested for the project 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. In January 2011 the EHWD will be prepared for shipment from South Pole. Only a limited amount the drill equipment can be shipped out of South Pole in January and February 2011 due to retro cargo limitations. The current plan is to ship the majority of drill equipment out of South Pole during the 2011-12 summer.

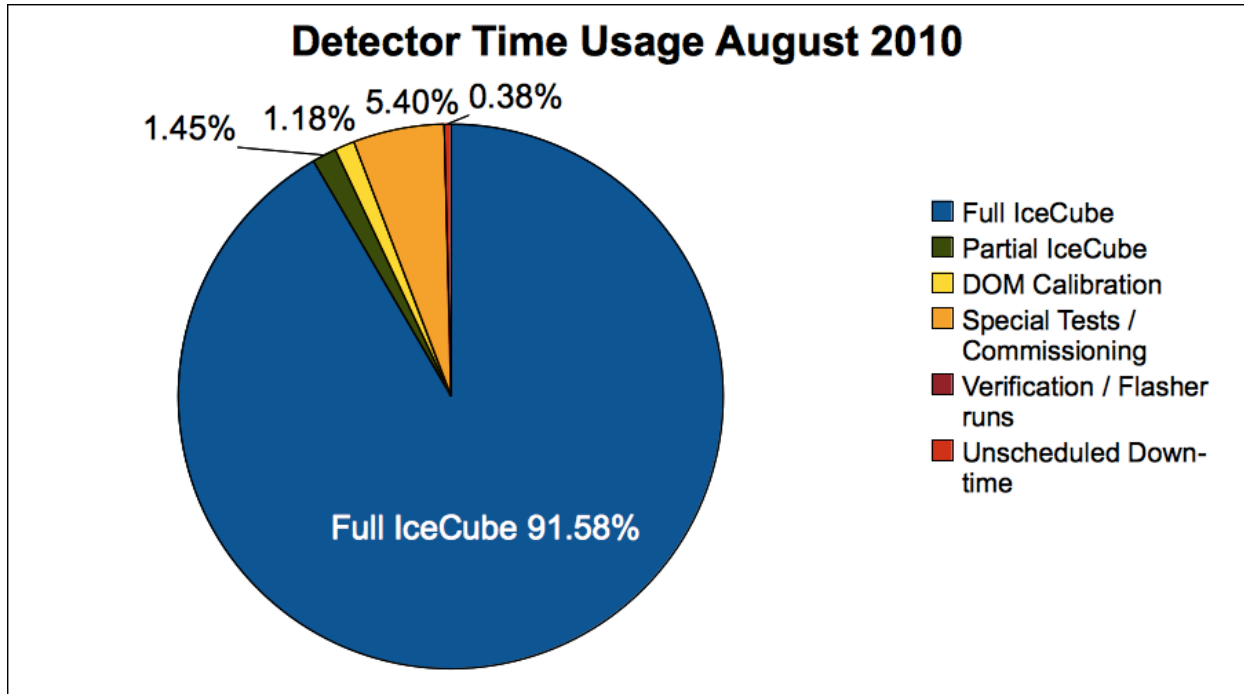
**Risk Assessment & Potential Contingency Adjustments**

Item	Estimate
1. Potential cost exposure for the approved scope of work based on Level 3 technical, cost and schedule risk assessment.	\$1,155K
2. Computing infrastructure and software development.	\$1,560K
3. Estimated cost to retro IceCube equipment/materials from the South Pole at the end of the project.	\$1,050K
4. Potential labor cost to retain experienced personnel in the final year of construction to ensure that the final season will be a success.	\$150K
Total	<b>\$3,915K</b>
<b>Available Contingency as of July 31, 2010</b>	<b>\$4,593K</b>

**Drill Operation and Installation** – As the drilling season nears, off-ice activities are concluding. Equipment spares and replacement procurements, testing of repaired and recalibrated equipment, and preparations for early September shipments are complete. Packing and crating for additional shipments to the South Pole Station are on-going.

Documentation on the EHWD is still underway. All procedures and hazard analysis are uploaded and video editing and embedding is over 50% complete. Drawing and document development continues.

**Detector Time Usage** – IceCube maintained a high up-time of 98.52% in August as maintenance teams attended to IceTop Digital Optical Modules after a spell of extremely low temperatures. Clean up-time was at 89.78% while the team addressed flasher run bugs. Unscheduled downtime was at 0.38%.



Extended tests of the newest DAQ release are underway. It will be deployed in September and hit losses will ultimately improve 1,000 times from the 0.052% loss originally identified. The remaining hit loss is under study.

Definition of the terms:

“**Detector Up-Time**” is the percentage of the time period for which the pDAQ data acquisition was acquiring data and delivering at least 500Hz of event rate. This uptime measure includes periods in which the detector was taking data with a partial detector or with light contamination from calibration sources.

“**Clean run Up-Time(s)**” is the percentage of the time period considered to have pristine data (standard hardware and software configurations) with the full nominal detector enabled, not contaminated with light from calibration sources and for which no serious alerts were generated by the monitoring, verification or other. The criteria applied are not algorithmic but rather represent the Run Coordinator’s overall impression of the quality (including uniformity) of the runs/data.

**Data Management** – A new Data Acquisition release was deployed on the South Pole System, addressing two major issues. The number of detector configuration files was reduced and the data buffer memory allocation was increased. Also this month, firmware on the Digital Optical Modules was upgraded and testing continues on new triggers.

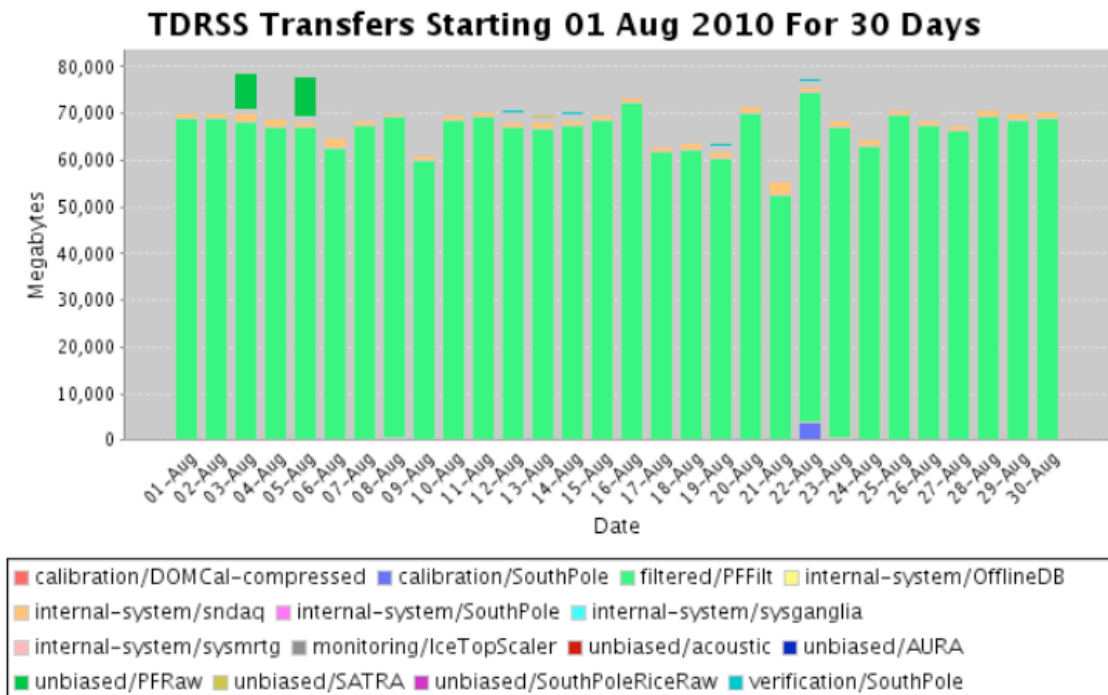
No major problems have been found in the data by verification. Work is underway to integrate monitoring into IceCube Live and improve automatically add flasher IDs to the Northern database.

Level 2 off-line production processing of the 59 string run configuration is complete, and work continues in Level 3 offline processing. Preparations for Level 2 processing of the 79 string run are underway.

There was significant progress in implementing a web browser version of the IceCube event display. This will be used for outreach activities in the near future. There was a planning session for the construction of a prototype 3D desktop event viewer of the IceCube detector.

A future plan for calibration runs with flashers has been posted. Plans include runs to calibrate Deep Core ice properties, 79-string configuration cascade rates, and dust layer properties.

The figure below shows the daily satellite data transfer rates in MBytes/day for this month. The green is for the steady 79-string filtered physics data, which dominates the total bandwidth.



**Simulation** – This summer has provided an opportunity for simulation teams to produce several benchmark datasets that can be used for systematic checks. Production of 86-string configuration datasets for background and neutrino signals will serve several purposes, including enabling researchers to study online data filtering strategies for 2011 data runs.

A study of the optical properties of the ice is under study, simulating the blue Cherenkov light that IceCube detects. The generation of new ice property benchmark datasets is necessary to perform high statistics comparison with experimental data.

Collaboration partners worldwide continue work on 59-string background production, with the European Grid processing 38% of the data. The Universität Mainz, the University of Maryland, and Ruhr-Universität Bochum also process significant portions.

The Grid Laboratory of Wisconsin continues to process over 50% of 59-string neutrino signal event production, with the University of Wisconsin Computer Sciences, Stockholm University, the IceCube Research Center in Wisconsin, and the University of Maryland making significant contributions.

***Education and Outreach*** – Reviewers at the IceCube Live review in early August recommended the development of a public IceCube Live page, and development of a detailed plan for implementation is underway. By combining the web based event viewer display being developed by the filtering and processing teams with the live detector statistics, we look forward to presenting a powerful outreach tool.

A new IceCube poster series is being designed, with three separate posters focusing on neutrino science, Digital Optical Modules, and Life at the South Pole. In addition, two exhibition cases at the UW physics building are under development. One will feature a South Pole scene and the other houses a large-screen neutrino event display.

IceCube collaboration members continue to make presentations at public events. Dr. Spencer Klein recently delivered a talk on “Neutrino Astronomy in Antarctica” at the Science@Cal lecture series at University of California Berkeley.

***2011 Detector Completion Planning*** – Planning continues for events during the week of April 25-30, 2011. A small committee is determining the schedule and the IceCube Executive Committee and the IceCube Board are contributing ideas regarding the content.

Invitations were sent to invited speakers for the “IceCube Invites Particle Physics” and the “Ice Drilling Technology Symposium,” both scheduled for the later half of the collaboration week. Responses are overwhelmingly positive and we look forward to hosting these two significant meetings.

The 2011 Detector Completion events will be discussed at the upcoming IceCube Collaboration meeting and IOFG meetings in Brussels in September.

***Upcoming IceCube Meetings and Events***

IceCube Collaboration Meeting, Brussels	September 20-23, 2010
IceCube IOFG Meeting, Brussels	September 24, 2010
IceCube Collaboration Meeting, Madison	April 25 – 29, 2011

***Acronym List***

EHWD	Enhanced Hot Water Drill
DOM	Digital Optical Module
DAQ	Data Acquisition