March 3, 2009
NOVA-doc-3637

December, 2008
NOvA Monthly Report

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Project Office Overview

(J. Cooper)

NOvA effort at Fermilab, ANL, and universities continued ramping back up during December following restored R&D funding provided by the FY08 Supplementary Funding Bill of July 2008 and by the initial FY09 funding available under the FY09 Continuing Resolution.

Almost all NOvA efforts were fully staffed by the end of December. Exceptions to full staffing were concentrated in two areas:

- NOvA data acquisition software effort is still a problem since Fermilab people had been reassigned to other higher priority projects. A new team will have to be constituted to do the NOvA work.
- NOvA Project Controls effort is still a problem since Fermilab NOvA people continue to participate heavily in preparations for the FRA EVMS Certification process. NOvA is the example project for this review, but effort has been required on the FRA Procedures separately from the NOvA implementation of those procedures.

A few other individuals are still missing in other areas throughout the collaboration.

As reported in June 2008, the Project has a FONSI. The remaining step prior to work at Ash River, Minnesota is to secure a USACE Wetlands Permit. The final 404 Wetlands Permit was granted by the USACE on December 24.

The NOvA Associate Project Manager Nancy Grossman stepped away from the project in December to take the laboratory job as ES&H Director. Paul Derwent (Fermilab) has replaced Nancy.

Glossary of Terms

A number of NOvA acronyms and other acronyms are often used in these monthly reports. In an effort to add clarity and reduce editing time, these acronyms are defined here in each report and are not always spelled out in the body of the text.

ACWP	Actual Cost of Work Perfomed
AD	Fermilab Accelerator Division
ADC	Main Ring Dipole , type A laminations, generation "C"
ADC	electronics, Analog to Digital Converter
ANL	Argonne National Laboratory
ANU	Accelerator and NuMI Upgrades
BCWP	Budgeted Cost of Work Performed
BCWS	Budgeted Cost of Work Scheduled
BOE	Basis of Estimate
BPM	Beam Position Monitor
CalTech	California Institute of Technology
CD	Fermilab Computing Division
CPI	Cost Performance Index = ACWP/BCWP
DCM	Data Control Module
DCS	Detector Control System
EA	Environmental Assessment
EAW	Environmental Assessment Worksheet (State of Minnesota)
EIR	External Independent Review
ESAAB	DOE Energy Systems Acquisition Advisory Board
EVMS	Earned Value Management System
FEA	Finite Element Analysis
FEB	Front End Board
FHEP	Full Height Engineering Prototype
FONSI	Finding of No Significant Impact
FSAP	Full Scale Assembly Prototype
FSO	Fermilab Site Office of DOE
FRA	Fermi Research Alliance, the DOE Contractor for Fermilab
IHEP	Institute of High Energy Physics (Russia)
IPND	Integration Prototype Near Detector
IU	Indiana University
LLRF	Low Level Radio Frequency
MI	Main Injector
MIE	Major Item of Equipment
MLAW	Recycler Injection Lambertson
MSU	Michigan State University
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
N-27	NOvA PVC mixture, version 27 (the final choice)
NEPA	National Environment Preservation Act
NHPA	National Historic Preservation Act

NOVA-doc-####	document number in the NOvA document database
PDB	Power Distribution Box
PDD	Permanent Dipole
PDDW	Permanent Dipole Wide gap
PDS	Permanent Dipole Small
PFL	Pulse Forming Line
PPD	Fermilab Particle Physics Division
RLS	Resource Loaded Schedule
RR	Recycler Ring
S E H	Short Elliot Hendrickson
SHPO	State Historic Preservation Officer
SMU	Southern Methodist University
SPI	Schedule Performance Index = BCWP/BCWS
TD	Fermilab Technical Division
TDU	Timing Distribution Units
TECC	Thermo-Electric Cooler Controller
THPO	Tribal Historic Preservation Officer
UCLA	Univ of California, Los Angeles
USACE	United States Army Corps of Engineers
UTD	University of Texas, Dallas

Narrative Summaries of Technical Progress

WBS 1.0 Accelerator & NuMI Upgrades

(P. Derwent)

1.0.1.1 Recycler Ring Modifications

ADC magnet prototyping: The drawings were started for the shims for stabilizing the coil positions of ADC magnets during the ramp.

Permanent magnets R&D: Several permanent quads were disassembled within Technical Division, starting the effort to gain back the knowledge on how to rebuild these magnets. Experimental trials of trimming a quad to several different values and measuring it began.

PDS magnets and MLAW magnets: no new progress.

1.0.1.2 Recycler Kicker Systems

Work concentrated mainly on the off-project gap clearing kickers. Work on the NOVA/ANU project scope will ramp up later this year. On project PFL (pulse forming line) parts are expected in January. Modeling of the RR Extraction/MI Injection kicker has begun.

1.0.1.3 Recycler Instrumentation

Work continued on finalizing the design of the BPM cables and transition boards.

1.0.1.4 Recycler Radiation Safety

Measurements will continue in the regions near MI39 and MI14 as part of planning for penetration and gap clearing kicker installation in 2009.

1.0.2.1 MI Modifications

LLRF work continues.

1.0.2.2 MI RF Cavities

Work continued on the rebuilding of the six joy blowers for the Main Injector cavities. Machine shop parts for pneumatic short and joy blower filters are expected to arrive soon. Requisitions were prepared and drawings for the machine shop were gathered for the building of the two new Main Injector Bias Supplies. Bus Bar drawings from Main Injector were reviewed to see how they could be modified for use on the two cavities to be installed.

1.0.2.3 MI Radiation Safety

See 1.0.1.4

1.0.3.1 NuMI Primary Proton Beam

Engineering efforts continued to complete procurement readiness for primary beam components designated as CD-3a items. The process is productive, and on both efforts, value engineering produced some design improvements which mesh well with newer

AD/EE efforts in other areas, and are believed to be more cost effective. Preparation of procurement packages should be a few weeks away.

1.0.3.2 NuMI Target Hall Technical Components
Received the report covering the1st half of IHEP target Design Study 2, which is analysis of cooling of the target casing. IHEP continued work on the target beam windows.

1.0.3.3 NuMI Target Hall Infrastructure

NuMI Target Hall Space Planning & Horn 2 Relocation to ME:
Work continued on the Horn 2 stripline extension.

The initial design review for this section was conducted on Dec. 15th (review material and reviewer feedback are posted in NOVA-doc-3539). The review went well and this completes the following task: WBS 1.0.3.3.4.2 Target Hall Space Planning & Horn 2 Reconfiguration & Equip Initial Design Rev.

Target Chase:
Analysis of components and chase items for temperature limits was completed. Work now continues on writing the final report.

1.0.4 Beam Physics
Beam dynamics simulations with the ORBIT code and with the ECLOUD module continued. Slip stacking analysis and other work continued.

WBS 2.0 ANU Construction

(P. Derwent)

2.0.4 ANU Project Management
Paul Derwent replaced Nancy Grossman as the ANU L2 / Associate Project Manager.

ANU management met with the project team working on the kicker systems to understand replanning to reflect how the work will be performed. This process was ongoing during December. Loss of funding in FY08 caused our human resource profile to be somewhat unrealistic in FY09. Discussions of tasks and resource needs for FY09 continued with an eye to determine what tasks are critical to get done and what resources can be used to complete them.

WBS 1.1 & 2.1 Site and Building

(S. Dixon)

1.1.1 Site conditions Investigation

1.1.1.1 Topographic Survey
1.1.1.2 Subsurface Investigation
1.1.1.3 Wetland Delineation
1.1.1.4 Revise Ash River Environmental Assessment Worksheet
These tasks are complete.

1.1.2. Title 1 Preparation

1.1.2.1 Site Preparation Advanced Technical Design
1.1.2.2 Building Design Modifications
1.1.4.1 Independent Cost Estimate Review
1.1.4.2 Secondary Containment Study
1.1.4.3 Overburden Study
1.1.4.5 Risk Management Assessment
These tasks are complete.

1.1.4.7 Advanced Technical Design – Far Detector Building

This task, currently underway, includes the development of design drawings for the Far Detector Building. In December 2008, the project team continued to meet with the Burns and McDonnell to track progress.

2.1.1 Site Preparation Package

2.1.1.1 Site Preparation Package - Title 2 (Design) Phase

This task includes the final design of the contract documents for the Site Preparation Package, a portion of which includes the rock excavation at the Far Detector Building Site. In December 2008, work continued on the contract documents including incorporating rock excavation requirements from a rock expert, Shannon & Wilson, a Burns and McDonnell sub consultant. The documents are expected to be ready for project wide review in January 2009.

2.1.1.2 Site Preparation Package - Wetland Mitigation

The provisional Section 404 permit from the U.S. Army Corps of Engineers was received in November 2008. In order for the final permit to be issued, a Section 401 permit from the State of Minnesota is required. A Section 401 waiver letter from the Minnesota Pollution Control Agency was issued on December 10, 2008. This was forwarded to the US. Army Corps of Engineers and a validated Section 404 permit was issued on 24DEC08. Copies of the documentation can be found in NOVA-doc-1892.

In order to complete this task, the wetland banking credits will need to be purchased. The University of Minnesota is currently finalizing this action and it is expected that the credits will be obtained by February 2009.

2.1.1.3 Site Preparation Package – Procurement Phase

In December 2008, the project team continued discussions concerning the procurement strategy for the construction activities related to the Site and Building. The strategy will include a Request for Qualifications (RFQ) expected to be issued in January 2009 that will be used to assess the ability of the contractor to execute the work safely, on time and on budget. After evaluation by the integrated project team, a Request for Proposal (RFP) will be issued to the qualified contractors. The RFP will request proposals for both the Site Preparation Package and the Far Detector Building package. The objective of this exercise is to contract with one contractor for the entire construction work in order to address interface and coordination issues. While it is intended to award only the Site Preparation Package initially, having the cost of the Far Detector Building will aid in the planning of future funding allocations.

2.1.2 Far Detector Building

2.1.2.1 Far Detector Building - Title 2 (Design) Phase

This task includes the final design of the contract documents for the Far Detector Building. In December 2008, work continued on the contract documents. The documents are expected to be ready for project wide review in January 2009.

2.1.2.2 Far Detector Building – Procurement Phase

See description in 2.1.1.3 above.

2.1.3 Site and Building Security

The activities associated with this WBS item have been incorporated into the design of the Far Detector Building (WBS 2.1.2.1).

WBS 1.2 Liquid Scintillator

(S. Mufson)

1.2.1, 1.2.9 Requirements and Procurement

No change from last month.

1.2.4, 1.2.7 Production Methods

At Indiana four gallons of fluor concentrate were blended at IU for detailed studies of alpha testing scintillator concentration. The concentrate was given to Jon Karty of IU chemistry to determine if the concentrate was mixed correctly. After some further tests, the concentrate was found to be blended correctly.

1.2.2, 1.2.3, 1.2.8 R&D Studies

Indiana found a problem in the alpha test that requires us to investigate alternative tests of composition.

The problem: (NOTE: this problem was reported to the NOvA Project and to Fermilab ES&H. A sister source from Indiana was on-site at Fermilab and was confiscated for return to Indiana)

Investigation of the loss of activity of an Americium-241 laboratory alpha source

Chuck Bower, Fritz Busch, and Stuart Mufson
Astronomy Department, Indiana University, Bloomington IN

The NOvA experiment at Fermilab uses mineral oil based liquid scintillator for detecting passage of charged particles through its detector system. For multiple reasons, including cost savings, we have chosen to blend our own liquid scintillator commercially for this experiment.

A required quality assurance step is to verify that the blended scintillator emits a proper and consistent amount of light. We have chosen to use alpha particles to excite the scintillator for this quality assurance test. Alphas have the advantage of being a high rate, mono-energetic source, unlike cosmic ray muons (low rate), betas, and gammas (neither of which shows a mono-energetic peak in organic scintillator).

We did similar testing in a previous experiment, MACRO. That detector system was developed in the 1980's and built in the 1990's at the Gran Sasso Laboratory in Italy. As part of our R&D we bought two Am-241 sources around 1990 from Isotope Products, a company still in business but currently a subsidiary of Eckert and Ziegler. Each source had an initial activity of approximately 1 microCurie.

Aware that the possibility existed that the liquid scintillator might interact with the source, on multiple occasions we tested scintillator after it had been in contact with the source but never found any residual activity in the scintillator after the source was removed. We concluded that the Am-241 was not susceptible to chemical interaction or dissolution by the liquid scintillator.

Because alphas travel a very short distance in matter (order of 10-20 micrometers in liquid scintillator) and because mineral oil based liquid scintillator is moderately viscous, we found it necessary to clean the source between measurements of different samples.

Soap and water is a good solvent for liquid scintillator so that is what we chose for cleaning the source. All of this cleaning occurred in SW401, a small lab outfitted with chemical handling equipment that is part of the Astronomy Department.

The cleaning procedure was as follows: a small beaker was filled with a solution of Alconox (common cleaning detergent used in laboratories) and water. The source, which is mounted on a brass rod, was swirled around in this solution. The source was then wiped off with paper towel, rinsed with tap water, and dried with paper towel. The beaker of cleaning solution was poured into a waste can (also containing waste mineral oil and waste liquid scintillator). The paper towels were placed in the wastebasket. Periodically the chemical waste can is taken away by the chemical disposal unit of the IU Chemistry Department.

One of the two sources was used sporadically for a couple of years but was needed for testing a Fermilab so we transferred it there in November of 2007. At that time we started using the second source which had been dormant (at least with respect to immersion in liquid scintillator) for over a decade. In late November while looking at some Multi-Channel-Analyzer (MCA) spectra we noticed that the count rate for a fixed live-time collection period was slowly dropping. We became concerned that we might be somehow degrading the source and started looking at all recorded spectra that we could find for this second source. We ceased cleaning our alpha source immediately upon noticing this potential degradation.

Figure 1 is the compilation of all measurements for which recorded spectra could be found. For the early part of this source's use during the past year, we did not record the spectra. There is one datapoint from early in our measurements and it is plotted at the left edge of Figure 1. That datapoint was taken on 1 May 2008. The remainder of the data shown in figure 1 was collected from 22 Oct 2008 and later. The data are plotted in chronological order. The last time the source was cleaned was before datapoint #61.

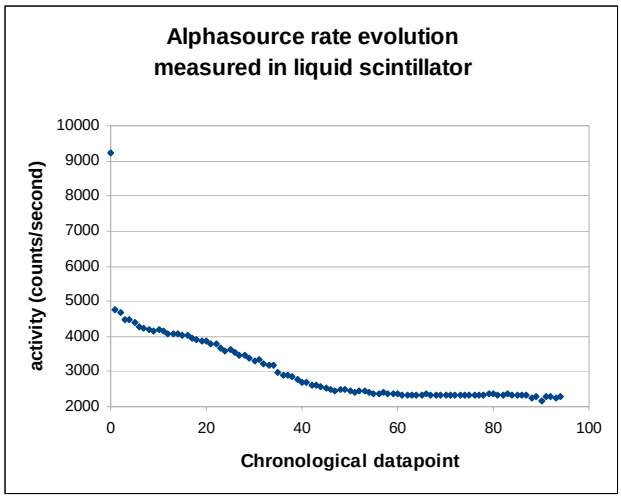


Figure 1.

After we stopped cleaning the source we did an activity check of the source with a thin window inorganic scintillator detector and compared the rate to two smoke detector sources, both of similar initial activities. Although this test is somewhat sensitive to the different physical packaging of the sources, the two smoke detector sources showed a rate in the alpha peak of approximately three times that of the laboratory source.

Upon searching through the laboratory notebook used during the alpha immersion and cleaning work, we found the approximate cleaning history for this source since we reintroduced it in 2007 after ~15 years of dormancy:

November 2007: 30 washes.
January 2007: 34 washes.
May 2008: 20 washes. (The first of these is the initial datapoint in Figure 1.)
June 2008: 12 washes.
October 22, 2008 thru November 7, 2008: 60 washes (these are datapoints 2 thru 59 of Figure 1, with a couple datapoints missing). Please note that it is possible a few washings were not recorded in the notebook and are thus not part of the above tally.

Our conclusion is that each washing in soap and water carried away a small amount of the Am-241 material in three different ways: into the chemical waste container, into the waste basket trash, and down the drain. Although we anticipated, looked for, but never found deterioration of the source due to immersion in liquid scintillator, we unfortunately didn't expect the cleaning process to have a deleterious effect. As soon as we noticed the rate loss problem, we stopped this cleaning procedure. We will no longer used alpha sources for quality assurance of liquid scintillator. We have in the past looked into using gammas for this purpose – the advantages being that gamma sources are sealed in plastic and they are sufficiently penetrating that the source can be placed outside the liquid scintillator container, not immersed in the liquid as was done with the alpha source. We plan on re-investigating the use of gammas for quality assurance of NOvA liquid scintillator.

Problem resolution:

From: "Crouch, Gregory Paul" <gcrouch@indiana.edu>
Date: December 12, 2008 3:48:11 PM GMT-05:00
To: Chuck Bower <bower@astro.indiana.edu>
Cc: Stuart Mufson <mufson@astro.indiana.edu>, Fritz Busch <fritz@astro.indiana.edu>
Subject: RE: Alpha source testing

Analysis of surface wipes taken in the Am-241 source "cleaning area" revealed no detectable contamination. As you suggested, any activity removed likely went to the sewer or solid waste stream. Because of the extremely small activity level involved, there are no regulatory or safety issues.

Thanks for your attention to (and thorough report of) this matter.

Greg Crouch
Director of Radiological Health and Safety
IUB Radiation Safety Officer - Laser Safety Officer
Research Administration
Indiana University
Jordan Hall 071
1001 E. Third St.
Bloomington, Indiana 47405

Phone: 812-855-3230
Fax: 812-856-9036

Web: http://research.iu.edu/rschcomp/radsafety/index.html

Indiana began tests in December that use a gamma source instead of an alpha source. Gamma sources do not have to be cleaned after every test.

1.2.5 QA/QC

Indiana carefully studied the attenuation length of the Parol-based scintillator sent to Caltech.

SMU continued work on the development of the automated attenuation length measurement apparatus.

Tests were completed to compare measurements of the attenuation length made with the SMU apparatus and the IU spec on the same sample of Parol 60C. A sample of parol was measured at Indiana and its attenuation was 2.6m. The sample was sent to SMU and the automated apparatus found and attenuation length of 1.2m. The sample was returned to Indiana and its attenuation length was measured to be 2.5m. There is a factor of two differences in the results from the two different measurement apparatuses. This difference is still under investigation.

Caltech ran their vertical slice setup for several weeks with the Parol-based scintillator. Results indicated that the light output of the Parol scintillator is ~15%-20% lower than the baseline scintillator. Caltech took more data during the month of December, see WBS 1.6.

1.2.6 Shipping

1.2.7 Blending Investigations

1.2.8 Component Acquisition Investigations

1.2.9 Integration Prototype Detector Scintillator Production

1.2.10 Production Scintillator Specifications

1.2.11 Management – R&D Phase

No change from last month.

WBS 1.3 Wavelength Shifting Fiber

(C.Bromberg)

1.3.1 Requirements

1.3.2. Vendor Investigations

1.3.3 Wavelength Shifting Fiber Optimization Studies

No change this month.

1.3.4 Development of QA/QC Methods

At MSU, development work on the scanning machine to be used for IPND fiber QA was completed. A broad LED light source that uses the drum holes as a collimator achieved the required few percent precision on the fiber illumination. Excellent control of the tension on the fiber was achieved via a mechanical constant torque device. Control wiring was installed for the clutch and brake, and functions of wind and unwind fiber from a spool have been successfully tested. Production style scans have been performed. We will be ready for the IPND fiber QA when it arrives.

1.3.5 Integration Prototype- Near Detector Production

Kuraray requested a small upward correction of the IPND fiber bid to include shipping and duty and to include a large change in the exchange rate. The correction was accepted as it was specified in previous quotes and the raw per meter price had not changed from the value in the BOE.

1.3.6 Production WLS Fiber Specifications

1.3.7 Management – R&D Phase

No change during this month.

WBS 1.4 PVC Extrusions

(R. Talaga)

1.4.1 Physical Properties Determination and Test Method Development

N-27 PVC creep test stands at constant (room) temperature stopped in October (see October report) due to a fault in the chiller. Repairs are being made to the setup and new samples are being prepared for insertion. It was decided to delay the start of creep tests until January 2009, after the long holiday break at ANL. A significant portion of the creep data are taken over the first few days of testing (logarithmic time dependence), at a time when the Lab would have been closed.

A first design of an instrument to measure extrusion flatness by means of a photographic system was made on the basis of tests performed at Fermilab this month. Purchase requests for all of the necessary hardware and software have been submitted and arrival of parts is expected in January.

1.4.2 Raw Materials
1.4.3 Extrusions
1.4.4 Shipping and Handling1.4.6 Management

No progress this month.

1.4.6 Management

The WBS 1.4 Control Account Manager attended a two-day seminar on Earned Value Management Systems in preparation for the EVMS Certification review.

WBS 1.5 PVC Modules

(K. Heller/ D. Hennessy)

1.5.1 Requirements

No Change this month.

1.5.2 End Seal R&D

Injection molder (PMC) completed mold flow analysis. The mold did not fully fill. We are exploring redesign of mold and exploring a change in resin.

1.5.3 Photo Detector Interface R&D

Updated Hamamatsu on latest dimensions of carrier board.

1.5.4 Module Factory R&D

There are now eight full size modules with two end seals each. These modules had only the inner seal will begin bubbler tests soon. This test will be the first for double-wide end sealed modules.

1.5.5 Quality Assurance and Quality Control Methods Development

A prototype optical connector mating piece for the fiber continuity machine was produced.

Pressure testing of end seals (50 with oil and 50 with air) continued.

1.5.6 Module shipping and storage R&D

No change during this month.

1.5.7 Integration Prototype Detector Modules

The factory is being cleared and the floor layout is being changed in readiness for IPND module production.

1.5.8 Initial Production Module Specifications

1.5.9 Initial Factory Tooling Specifications

No change during this month.

1.5.10 Management - R&D Phase

The WBS 1.5 Control Account manager completed training for earned value management.

WBS 1.6 Electronics

(L. Mualem)

1.6.1 APD Module

The tolerance requirements were produced for Hamamatsu to complete the order specifications. We are waiting for Hamamatsu's response, which will likely be delayed due to the holiday season.

QE testing effort for the APD modules continued. Subsequent QE tests indicated a slightly lower value, 83% instead of 87%. Investigations are ongoing as to the cause of the difference in the measurement.

1.6.2 Front End Board

ADCs for the FEB3 prototype and for the IPND have been received at Harvard. The boards and parts kits were sent out for assembly, and are expected back near the middle of January.

1.6.3 Power Distribution

Design of the boards for the Power Distribution Box have been completed and are being produced and assembled.

1.6.4 Management - R&D Phase

No change since last report.

1.6.5 Vertical Slice Tests

Effort continued on the readout of the vertical slice version 2. Additional runs were conducted using a scintillator produced with lower quality (shorter attenuation length) oil. This test was intended to determine the suitability of QA tests on the scintillator oil. Analysis of the tests indicated that the light yield is 82% of the baseline scintillator. This would be greater than 27 photoelectrons. This would be sufficient light yield, and therefore the planned oil testing method appears to be sufficient for the NOvA experiment. See WBS 1.2.

WBS 1.7 Data Acquisition

(L. Mualem)

1.7.1 DAQ Software

No progress this month.

1.7.2 DAQ Hardware

Effort on the hardware devices has resumed with Fermilab CD effort. The effort is up to 25% of one FTE. An additional engineer may be available soon. Prototype devices for the timing system are being purchased so that progress can begin on a first prototype.

1.7.3 Detector Control

1.7.4 Detector Control System

1.7.5 Management - R&D Phase

No progress this month.

WBS 1.8 Detector Assembly

(P. Lukens)

1.8.1. Plane Assembly Adhesive

Although this activity has been formally completed, related adhesive R&D work continued under WBS 1.8.6 during December.

1.8.2. Structural Design Validation

This activity is now 50% complete, with the receipt of the Harvard consultant's report (NOVA-doc-3218). No additional work on this occurred during December.

1.8.3. Liquid Scintillator Filling and Handling

There was no work on this task in December. A requisition for this work to be performed at Indiana University has been approved, and is currently with the Fermilab Procurement Department.

1.8.4. Near Detector Assembly

No change this month.

1.8.5. Integration Prototype Near Detector (IPND)

During December, NOvA physicists and engineers continued planning for the resumption of IPND work in the next few months. This month the Level 3 managers for this task, in conjunction with WBS 2.6/2.7 managers, began the collection, documentation and validation of electrical power requirements for the IPND electronics and DAQ systems. Discussions with FESS occurred to better specify the needs of the detector enclosure.

1.8.6. Far Detector Assembly Engineering

Argonne engineers continued work on the vacuum lifting fixture in December. They worked on an investigation of alternative of vacuum cups that might be easier and faster to align than those used to date. Reliable operation of the lifting fixture has not yet been achieved.

1.8.7. Far Detector Installation Procedures

Although this activity has been formally completed, some installation planning work continued under WBS 1.8.9 during December. The Level 3 manager for this task continues his review of FESS drawings of the Ash River civil construction. A fire protection system was specified for the adhesive dispenser, and the procurement process for a prototype system began.

1.8.8. Far Detector Prototypes

During December, installation of the tubing for the scintillator leak test in the CZero building elevator-shaft enclosure was installed, and the test modules were filled with liquid scintillator.

Work on the Full Scale Assembly Prototype (FSAP) consisted of preparation of the vacuum lifter and adhesive dispenser, described above under WBS 1.8.6. The third (out of three) batches of FSAP modules were delivered to ANL.

1.8.9. Management

During December, the Level 2 and Level 3 detector assembly managers participated actively in most of the WBS 1.8 technical work described elsewhere in this section.

WBS 1.9 & 2.10 Project Management

(J. Cooper)

1.9 Project Management – R&D

This set of WBS items is complete.

2.10 Project Management – Final Design & Construction

2.10.2 FY08

One **NOvA Technical Board** meeting was held on December 9. The main part of the meeting was devoted to EVMS training of CAMs.

A **NOvA Project Management Group** meeting was held on December 16. The talks presented and minutes of the meeting are available in NOVA-doc-3523(v4).

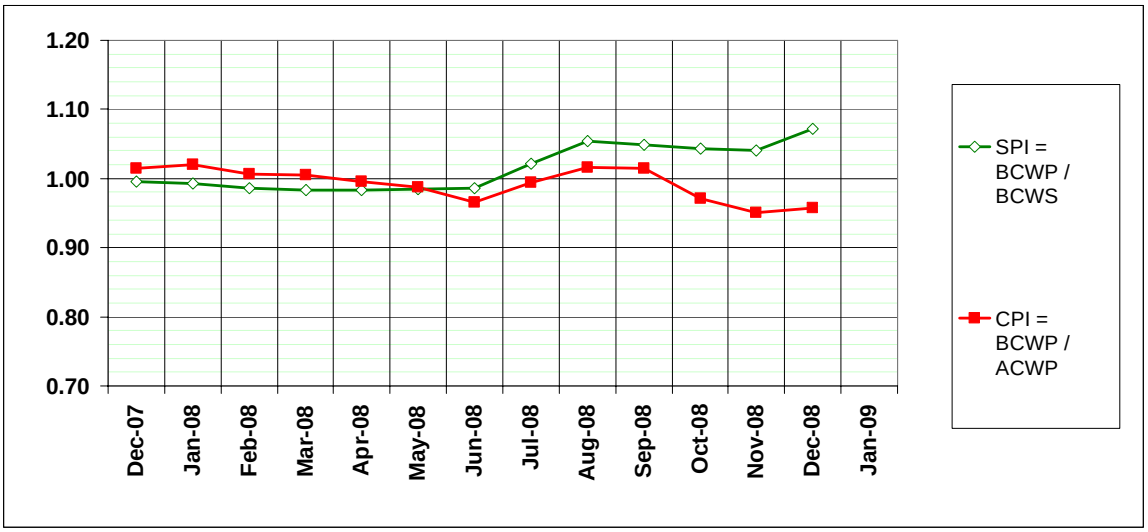
Now that the project has re-started and the full EVMS reporting is in process, the next step is to do the full reporting cycle more quickly. The Project Office has established a schedule for all the reporting input for each month and in November began to push each Level 2 Manager, each CAM, and Project Controls to execute the cycle within the allotted month. In the established schedule, these monthly reports should appear on the 20th working day of the following month (we realize that this month's report is appearing at ~ the 45th working day).

EVMS Summary

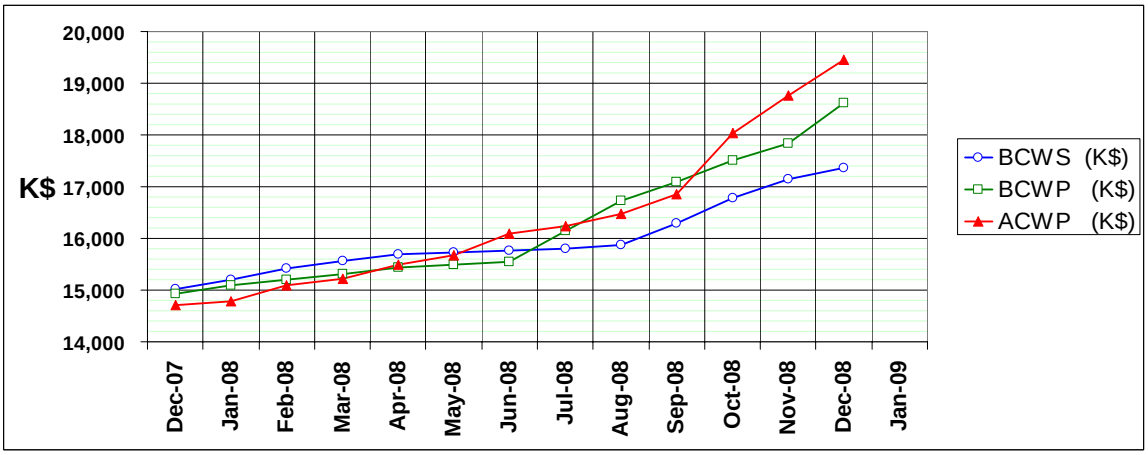
(S. Saxer, W. Freeman, H. Ferguson, E. McCluskey)

This monthly report focuses on the EVMS status relative to the baselined RLS as reviewed by DOE (Lehman) on April 30, 2008 and approved (CD-2) by Ray Orbach on September 15, 2008.

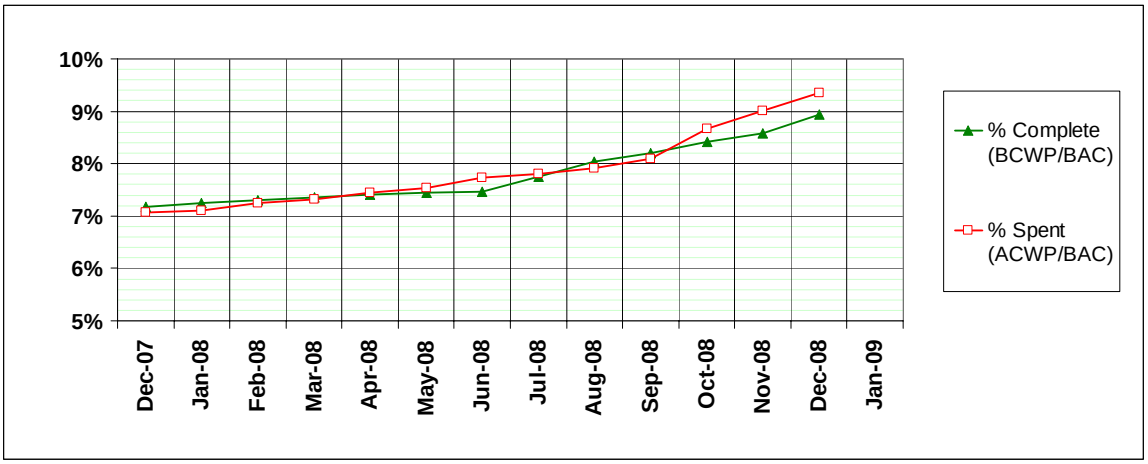
CPI and SPI curves.



BCWS, BCWP, ACWP History.



Percent Complete Plots.



Baseline Change Control Log Actions

The NOvA Project Management Group serves as the highest level change control board. During December, no NOvA changes required signature from this board and all changes were within the approval authority of the NOvA Project Manager.

CR Log Query for Monthly Report

CR #	Affected WBS #'s	CO Title	Date Closed	Level of Change	Final Cost Impact	Final Schedule Impact	Status
52	new task 1.8.8.1.17	Procure New Sealant Dispensing Equipment	12/23/2008	L4 (NOVA PM)	$100,484.69	none	Approved by PM
51	1.8.5.3.5, 1.8.5.3.6	Cost Adjustment for Prototype Scintillator Filling Equipment	12/23/2008	L4 (NOVA PM)	$13,403.75		Approved by PM
				Total Contingency Use this Month	$113,888.44		

Thursday, January 15, 2009 Page 1 of 1

WBS Level 2 Contract Performance Report

COST PERFORMANCE REPORT
FORMAT 1 - WORK BREAKDOWN STRUCTURE

CONTRACTOR	CONTRACT	PROGRAM	4. REPORT PERIOD
NAME Fermi National Accelerator Laboratory	NAME	NAME NOvA Project	FROM 01-Dec-2008 TO 31-Dec-2008

PERFORMANCE DATA

CostAcctFndSrc WBS[2] Results...	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE			LATEST	
ITEM	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	BUDGETED	REVISED ESTIMATE	VARIANCE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
DA DOE-ACEL MIE													
2.0 ANU Construction													
Fully burdened AY$k	0	1	31	1	(30)	207	221	214	15	7	29,547	29,530	17
CostAcctFndSrcTotals:	0	1	31	1	(30)	207	221	214	15	7	29,547	29,530	17
DC DOE-CA													
2.1 Site and Building													
Fully burdened AY$k	7	468	46	461	422	289	688	866	399	(178)	46,239	46,430	(191)
CostAcctFndSrcTotals:	7	468	46	461	422	289	688	866	399	(178)	46,239	46,430	(191)
DD DOE-ACEL R&D													
1.0 ANU R&D													
Fully burdened AY$k	11	143	28	132	116	1,390	2,035	1,742	645	292	7,536	7,219	317
CostAcctFndSrcTotals:	11	143	28	132	116	1,390	2,035	1,742	645	292	7,536	7,219	317
DE DOE-DET MIE													
2.1 Site and Building													
Fully burdened AY$k	7	7	0	0	7	80	80	0	0	80	2,296	2,167	129
2.10 Project Management - Nova Project - Construction													
Fully burdened AY$k	62	62	40	0	22	606	606	492	0	114	5,562	5,417	145
2.2 Liquid Scintillator													
Fully burdened AY$k	0	0	0	0	0	0	0	0	0	0	18,516	18,507	9
2.3 WLS Fiber													
Fully burdened AY$k	0	0	0	0	0	0	0	0	0	0	10,081	10,097	(16)
2.4 PVC Extrusions													
Fully burdened AY$k	0	0	0	0	0	0	0	0	0	0	25,276	25,263	13
2.5 PVC Modules													
Fully burdened AY$k	12	12	0	0	12	37	37	0	0	37	10,306	10,262	44
2.6 Electronics													
Fully burdened AY$k	0	0	0	0	0	0	0	0	0	0	11,843	11,838	6
2.7 DAQ													
Fully burdened AY$k	0	0	0	0	0	0	0	0	0	0	3,532	3,532	(0)
2.8 Near Detector Assembly													
Fully burdened AY$k	0	0	0	0	0	0	61	0	61	61	4,249	4,164	85
2.9 Far Detector Assembly													
Fully burdened AY$k	8	8	0	0	8	28	28	5	0	23	11,406	11,324	82
CostAcctFndSrcTotals:	89	89	40	0	50	751	813	497	61	316	103,067	102,571	496
DO DOE-ACEL OPS													
1.0 ANU R&D													
Fully burdened AY$k	0	5	7	5	(1)	80	205	22	125	183	1,227	1,040	188
CostAcctFndSrcTotals:	0	5	7	5	(1)	80	205	22	125	183	1,227	1,040	188
DR DOE-POST CD-1 DET R&D													
1.1 Site and Building R&D													
Fully burdened AY$k	36	16	266	(20)	(250)	2,203	2,275	1,493	71	781	2,275	1,493	781
1.2 Liquid Scintillator R&D													
Fully burdened AY$k	8	8	2	0	6	243	244	201	0	43	271	228	43
1.3 WLS Fiber R&D													
Fully burdened AY$k	13	11	29	(1)	(18)	147	143	160	(4)	(17)	299	315	(17)
1.4 PVC Extrusion R&D													
Fully burdened AY$k	0	6	12	6	(6)	926	932	949	6	(17)	1,348	1,367	(19)
1.5 PVC Module R&D													
Fully burdened AY$k	0	3	128	3	(125)	540	513	1,020	(28)	(508)	1,422	1,931	(509)
1.6 Electronics R&D													
Fully burdened AY$k	0	3	18	3	(15)	273	286	523	13	(237)	1,473	1,718	(245)
1.7 DAQ R&D													
Fully burdened AY$k	0	2	2	2	0	214	216	779	2	(563)	1,384	1,936	(553)
1.8 Detector Assembly R&D													
Fully burdened AY$k	51	21	81	(30)	(60)	920	866	1,629	(54)	(763)	2,851	3,612	(761)
1.9 Project Management R&D													
Fully burdened AY$k	0	0	0	0	0	383	383	559	0	(176)	383	559	(176)
CostAcctFndSrcTotals:	107	71	538	(37)	(468)	5,850	5,857	7,313	7	(1,455)	11,706	13,161	(1,455)
DY DOE CD-0 TO CD-1 R&D													
1.9 Project Management R&D													
Fully burdened AY$k	0	0	0	0	0	8,801	8,801	8,801	0	0	8,801	8,801	0
CostAcctFndSrcTotals:	0	0	0	0	0	8,801	8,801	8,801	0	0	8,801	8,801	0
Undist. Budget											0	0	0
Sub Total	215	778	689	563	89	17,367	18,620	19,454	1,253	(834)	208,123	208,751	(628)
Management Resrv.											69,877		
Total	215	778	689	563	89	17,367	18,620	19,454	1,253	(834)	278,000		

Variance Summary for NOvA Control Accounts at WBS Level 2

The NOvA Control Accounts have been rolled up to WBS Level 2 in this report to match the Level 2 Contract Performance Report 1 on the previous page. The table below summarizes the status.

For the SPI and CPI, green shading is within limits (0.88 -1.20). Red shading is outside the limits (>1.5 or <0.85) and requires reporting (N/A involves a divide by zero). Yellow shading is approaching the red limit.

Report Period: Dec-08													
	Current Period						Cumulative						
WBS Level 2	BCWS (AY$)	BCWP (AY$)	ACWP (AY$)	SPI	CPI		BCWS (AY$)	BCWP (AY$)	ACWP (AY$)	SV (AY$)	CV (AY$)	SPI	CPI
R&D													
1.0 ANU R&D	11,282	148,680	34,144	13.18	4.35		1,469,499	2,239,748	1,763,926	770,249	475,822	1.52	1.27
1.1 Site and Building R&D	35,558	16,001	265,893	0.45	0.06		2,203,404	2,274,519	1,493,436	71,115	781,083	1.03	1.52
1.2 Liquid Scintillator R&D	8,436	8,436	2,441	1.00	3.46		243,482	243,507	200,578	25	42,929	1.00	1.21
1.3 WLS Fiber R&D	12,635	11,149	28,816	0.88	0.39		146,905	143,189	159,848	-3,716	-16,659	0.97	0.90
1.4 PVC Extrusion R&D	0	6,198	12,405	N/A	0.50		925,639	931,837	948,616	6,198	-16,780	1.01	0.98
1.5 PVC Module R&D	0	3,239	128,231	N/A	0.03		540,108	512,507	1,020,264	-27,600	-507,757	0.95	0.50
1.6 Electronics R&D	0	2,748	17,600	N/A	0.16		273,209	286,484	523,098	13,275	-236,614	1.05	0.55
1.7 DAQ R&D	0	2,053	1,593	N/A	1.29		214,243	216,297	778,955	2,053	-562,658	1.01	0.28
1.8 Detector Assembly R&D	50,788	21,031	81,415	0.41	0.26		919,841	865,571	1,628,883	-54,270	-763,312	0.94	0.53
1.9 Project Management R&D	0	0	0	1.00	1.00		9,184,127	9,184,127	9,359,813	0	-175,686	1.00	0.98
Construction													
2.0 ANU Construction	0	1,167	30,671	N/A	0.04		206,551	221,354	214,470	14,804	6,885	1.07	1.03
2.1 Site and Building	13,820	474,404	46,000	34.33	10.31		368,823	768,167	865,617	399,344	-97,450	2.08	0.89
2.10 Project Management - Nova Project - C	61,975	61,975	39,585	1.00	1.57		606,278	606,278	491,909	0	114,369	1.00	1.23
2.2 Liquid Scintillator	0	0	0	1.00	1.00		0	0	0	0	0	1.00	1.00
2.3 WLS Fiber	0	0	0	1.00	1.00		0	0	0	0	0	1.00	1.00
2.4 PVC Extrusions	0	0	0	1.00	1.00		0	0	0	0	0	1.00	1.00
2.5 PVC Modules	12,092	12,092	0	1.00	N/A		36,882	36,882	0	0	36,882	1.00	N/A
2.6 Electronics	0	0	0	1.00	1.00		0	0	0	0	0	1.00	1.00
2.7 DAQ	0	0	0	1.00	1.00		0	0	0	0	0	1.00	1.00
2.8 Near Detector Assembly	0	0	0	1.00	1.00		0	61,242	0	61,242	61,242	N/A	N/A
2.9 Far Detector Assembly	8,492	8,492	0	1.00	N/A		27,930	27,930	4,692	0	23,238	1.00	5.95
R&D SubTotal (WBS 1.0-1.9)	118,698	219,534	572,538	1.85	0.38		16,120,458	16,897,786	17,877,417	777,328	-979,631	1.05	0.95
Construction SubTotal (WBS 2	96,380	558,131	116,256	5.79	4.80		1,246,463	1,721,853	1,576,687	475,390	145,166	1.38	1.09
Project Total	215,078	777,665	688,794	3.62	1.13		17,366,921	18,619,638	19,454,104	1,252,718	-834,465	1.07	0.96

In the overall project roll-up (see bottom line in the table), the project is within tolerance on both Cumulative and Monthly CPI. Since the project started up early following the FY08 Supplementary Appropriation in July 2008, we expect to be ahead of schedule, and the monthly & cumulative SPIs confirm that we are slightly ahead.

The Construction roll-up (second line from the bottom) shows an overall project summary with the Cumulative SPI and CPI within reporting thresholds on about $1.7M of BCWP. The Current Month of Construction shows large positive variances on $558K of BCWP.

The R&D roll-up (third line from the bottom) shows an overall project summary with the Cumulative SPI and CPI within the thresholds for reporting on $16.9M of BCWP. The Current Month SPI has a positive variance as expected since we are working ahead of schedule due to early funding. The Current Month CPI has a large negative variance due primarily to WBS 1.1 where fees associated with the Cooperative Agreement are coming in faster as the work is completed faster.

In December, 25 of the 68 NOvA Control Accounts were active with scheduled work, performed work, or actual costs in the cumulative view. 23 of the active Control Accounts required a written variance analysis in December. These were written by the CAMs and approved by the Project Manager.

A summary of the variances in this reporting period includes a wide variety of explanations nearly identical to those reported in the October and November Monthly reports. Since December is only the third month of variance reporting and the project is not yet current in writing these reports (some written in March 2009), corrective actions noted in the October and November reports will not take effect for several months.

Instead of repeating the list of October and November variance explanations here for a third time, this month's summary discusses the 3 or 4 largest (positive and negative) variances and their explanations as extracted from the December Variance Analysis Reports.

Cumulative SPI:

- 2.1.2 Far Detector Building SPI = 37.97 on $ 12 K of BCWS
  Work was started in October 2008 using FY07 carryover funds as a Project Manager sanctioned strategy to advance this critical path item. Since this is a Level of Effort task, there is little BCWS or BCWP until the task starts in the baseline schedule in February. The small ($12k) Cumulative BCWS is one month of costs that were scheduled prior to the interruption caused by the FY08 Omnibus Appropriations Bill.

- 1.0.3 NuMI Upgrades SPI = 4.34 on $ 173 K of BCWS
  The work for 1.0.3 is ahead of schedule because funding and resources became available before the start dates in the project baseline. In December 2008 the NOvA project was rebaselined to start in February 2009 with the expectation that funding would be restored by the US Congress at that time. In the summer of 2008 a supplemental appropriations bill provided funding for the NOvA project earlier than expected but the project was not rebaselined. With funding and resources available, work began within control account 1.0.3 ahead of schedule. Begining work early helps mitigate NOvA risk #95 (see Nova docdb 2841) which is the potential lack of Accelerator Division personnel.

- 2.1.1 Site Preparation Package SPI = 0.83 on $ 356 K of BCWS
  A significant contributor to this negative variance is coordination required between this control account and the WBS 2.1.2 control account. While the Site Prep Package includes the rock excavation of the below grade components for the Far Detector Building, the final dimensions and location of the excavation must be coordinated with the design of the Far Detector Building. This coordination is taking longer than scheduled.

Cumulative CPI:

- 1.0.3 NuMI Upgrades CPI = 2.10 on $ 750 K of BCWP

The positive cost variance has been steadily growing and now appears to be due to a systematic over estimate of the manpower needed to complete the tasks. We will continue to monitor the situation and in the future can consider changing the estimate at completion as more data becomes available.

- 1.1 Site & Building R&D CPI= 1.52 on $ 2,275 K of BCWP

  This positive variance is due to a better understanding of the work scope and a design cost from the architectural/engineering firm (Burns and McDonnell) less than anticipated. The NOvA Project was scheduled to reach the construction phase in October 2007, but funding delays in the beginning of FY08, funding cancelation and subsequent supplemental funding allocations contributed to the less than ideal execution of the work. Once work resumed, a better understanding of the site conditions, wetland permitting process and building design resulted in actual costs less than estimated. In addition, costs associated this WBS have had incorrect effort reporting to WBS 2.1.1 and 2.1.2 in December.

- 1.8 Detector Assembly R&D CPI= 0.53 on $ 866 K of BCWP

  The cumulative cost variance is largely due to the fact that several technical issues with the detector structure and its assembly remained unresolved, or the level of effort needed to complete the design was underestimated. The largest cost to this task is labor, both within Fermilab and purchased from ANL. Through November, $778K has been purchased from ANL (P.O. 563811).

  The most significant variances are due to two categories of work:

  - W.B.S. 1.8.2 - Structural Design Validation, $283K ACWP – 64% complete
    - Labor estimates for the structure analysis were too low, contributing to an overrun in cost and schedule here. The design of the Far Detector was developed as the understanding of internal stresses improved, so the overall time and cost overran the schedule.
  - W.B.S. 1.8.8 – Far Detector Prototypes, $791K ACWP – 19% complete
    - Technical problems with the module lifting fixture and the prototype adhesive dispenser have slowed work on these items, so they remain incomplete. Lifting fixture work has required more effort than anticipated to obtain a reliable vacuum connection between the fixture and the module. The adhesive dispenser work was delayed while several safety questions, which had not been anticipated, were resolved. The adhesive pump that was obtained for the dispenser proved unsuitable, due to an unforeseen problem with clogging in the pumping mechanism. All these issues have delayed completion of the prototype program. An

order for a replacement pump was placed in December and all safety issues with the dispenser mechanism have been addressed. A new vacuum cup system was designed for the lifting fixture, and early tests indicated that the reliability needed for this system may be achieved soon.

- 1.7 DAQ R&D CPI = 0.28 on $ 216 K of BCWP

  The cumulative cost variance decreased slightly in this period, though it is still large and will likely be so for the remainder of the R&D period. The majority of the cumulative variance was in several areas. The amount of debugging that was necessary on the first version of the DAQ hardware was more extensive than anticipated. The initial version of the device was more complicated than originally anticipated. Some of this variance may be reclaimed in that there will be less development needed since the hardware has a more standard interface rather than a custom implementation. The DAQ software variance is still under investigation for a complete accounting. More is expected to come of these investigations in the next report.

A similar summary of the largest variances for the Current Period is not instructive due to the small amounts of work scheduled.

Milestone Analysis

Milestones completed this month: 0

Milestones which should be complete by now but are not yet completed: 4

NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead

Monthly Report - Dec08

Time Now: 01Jan09

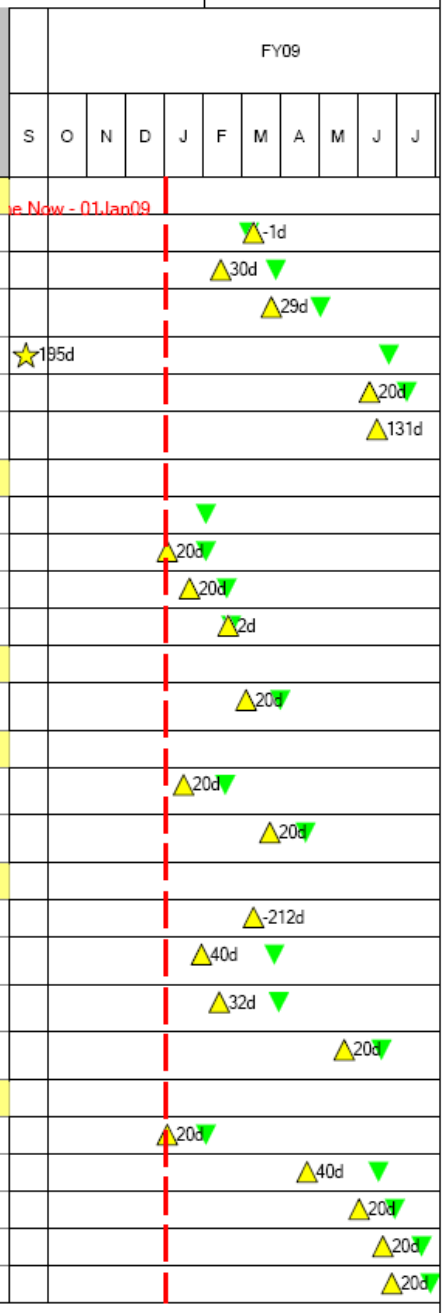
Baseline: NOVA_PMB

Baseline Date ▼

Completed Milestone ☆

Current Forecast Date △

Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level
1.0 -- ANU Planning, Engineering & Design				
1.0.3.2.5.9	NuMI Hadron Monitor Initial Re-design Complete	09Mar09	06Mar09	L.5
1.0.2.2.4.1	MI Cavity Pre-install Testing Complete	13Feb09	27Mar09	L.5
1.0.3.1.5.2	NuMI Profile Monitor Conceptual Design Review Complete	23Mar09	01May09	L.5
1.0.1.1.6.6	RR PDS Magnet Design Finalized	12Sep08	24Jun09	L.5
1.0.1.1.6.5	RR Beamline Modifications Design Review Complete	09Jun09	08Jul09	L.5
1.0.3.2.5.1	NuMI Target, Baffle & Carrier Initial Design Review Complete	15Jun09	21Dec09	L.4
1.2 -- Liquid Scintillator R&D				
1.2.9.3.9	Mineral oil batch 2 for IPND delivered	14May08	02Feb09	L.5
1.2.9.3.12	Mineral oil batch 3 for IPND delivered	02Jan09	02Feb09	L.5
1.2.9.6.11	Prototype scintillator production completed	20Jan09	17Feb09	L.4
1.2.10.3	Liquid scintillator final specifications completed	18Feb09	20Feb09	L.5
1.3 -- Wave-Length-Shifting Fiber R&D				
1.3.3.7	Baseline (IPND) WLS fiber dye concentration chosen	03Mar09	31Mar09	L.5
1.4 -- PVC Extrusion R&D				
1.4.2.5.2	PO for raw PVC resin for 16-cell horizontal extrusions released	16Jan09	16Feb09	L.5
1.4.2.6.2	PO for raw PVC resin for 16-cell vertical extrusions released	23Mar09	20Apr09	L.4
1.5 -- PVC Module R&D				
1.5.4.2.12	Prototype gluing machine for IPND ready to operate	09Mar09	01May08	L.5
1.5.2.1.1.14	Preproduction prototype manifold design (for IPND) completed	29Jan09	26Mar09	L.5
1.5.5.4	Pressure-testing hardware for IPND production ready to operate	12Feb09	30Mar09	L.5
1.5.5.7	Fiber mapping and continuity hardware for IPND production ready to operate	20May09	18Jun09	L.5
1.6 -- Electronics R&D				
1.6.1.6.1.1	APD module production for IPND started	02Jan09	02Feb09	L.5
1.6.2.4.12	FEB prototype III released to DAQ	20Apr09	16Jun09	L.5
1.6.2.5.1	FEB modules for IPND started	01Jun09	29Jun09	L.5
1.6.1.2.8	QA/QC station ready	19Jun09	20Jul09	L.5
1.6.1.6.1.7	APD modules for 8-plane segment completed	26Jun09	27Jul09	L.5



Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 20Jan09

Baseline: NOVA_PMB
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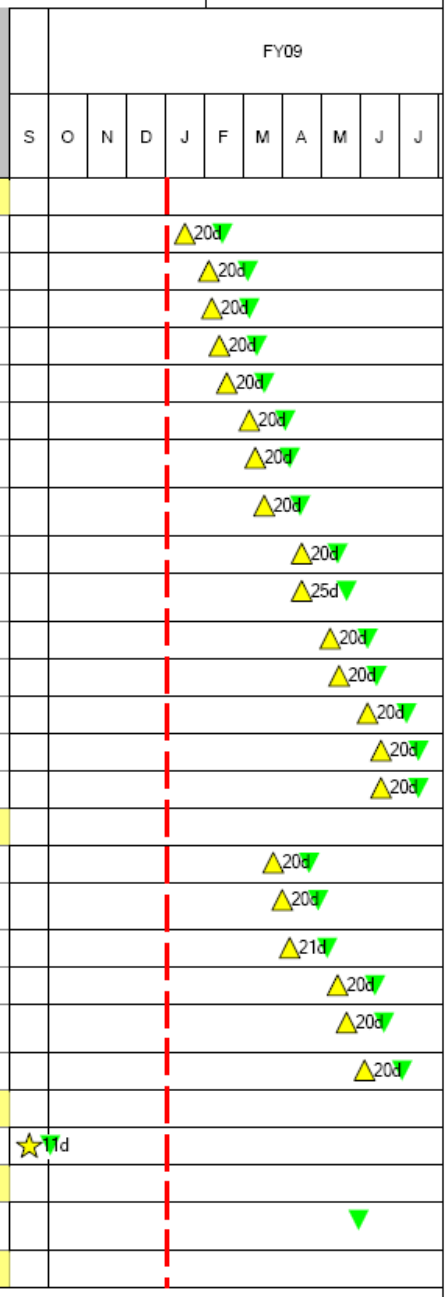
NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead
Monthly Report - Dec08
Time Now: 01Jan09
Baseline: NOVA_PMB

Baseline Date ▼
Completed Milestone ☆
Current Forecast Date △

Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level
1.7 -- DAQ System R&D				
1.7.2.2.2.3.4	Schematic approved	15Jan09	13Feb09	L.5
1.7.1.4.4.7	Run control system for software first release	03Feb09	03Mar09	L.5
1.7.2.3.1.3	Requirements approved	05Feb09	05Mar09	L.5
1.7.2.2.3.3	PCB manufacturing approved	11Feb09	11Mar09	L.5
1.7.1.6.4.1.6	Event buffer farm server for software first release	16Feb09	16Mar09	L.5
1.7.2.3.4	Evaluation components received	05Mar09	02Apr09	L.5
1.7.1.6.3.1.13	Event buffer farm core software for software first release	09Mar09	06Apr09	L.5
1.7.2.1.6.2	IPND data concentrator PCBs and components received	17Mar09	14Apr09	L.5
1.7.1.8.3.6	Global trigger system for software first release	15Apr09	13May09	L.5
1.7.2.2.3.5	Prototype PCBs and components received for control and timing system	15Apr09	20May09	L.5
1.7.2.4.1.3	Requirements approved	07May09	05Jun09	L.5
1.7.4.11	Detector control system released	14May09	12Jun09	L.5
1.7.2.4.3	Evaluation components received	05Jun09	06Jul09	L.5
1.7.1.8.4.8	Global trigger system for software second release	16Jun09	15Jul09	L.5
1.7.1.11	DAQ software ready for IPND	16Jun09	15Jul09	L.4
1.8 -- Detector Assembly R&D				
1.8.5.2.12	IPND systems designs completed	24Mar09	21Apr09	L.5
1.8.6.4	30% design of far detector mechanical systems and tooling completed	31Mar09	28Apr09	L.5
1.8.8.2.6	Select site for block installation at FNAL	06Apr09	05May09	L.5
1.8.5.4.5	IPND block assembly facility completed	13May09	11Jun09	L.6
1.8.5.6.1.4	Notice to proceed on Phase 1 of IPND infrastructure in MSB	20May09	18Jun09	L.6
1.8.5.6.2.4	Notice to proceed - Phase 1 of IPND containment	04Jun09	02Jul09	L.6
1.9 -- Project Management - R&D				
1.9.4.3	CD-2	15Sep08	01Oct08	L.0
2.0 -- ANU Construction				
2.0.2.2.5.1	MI RF Cavities Bus Bar Fabrication & Installation Complete	07Aug09	29May09	L.4
2.1 -- Site and Building				



Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 20Jan09

Baseline: NOVA_PMB
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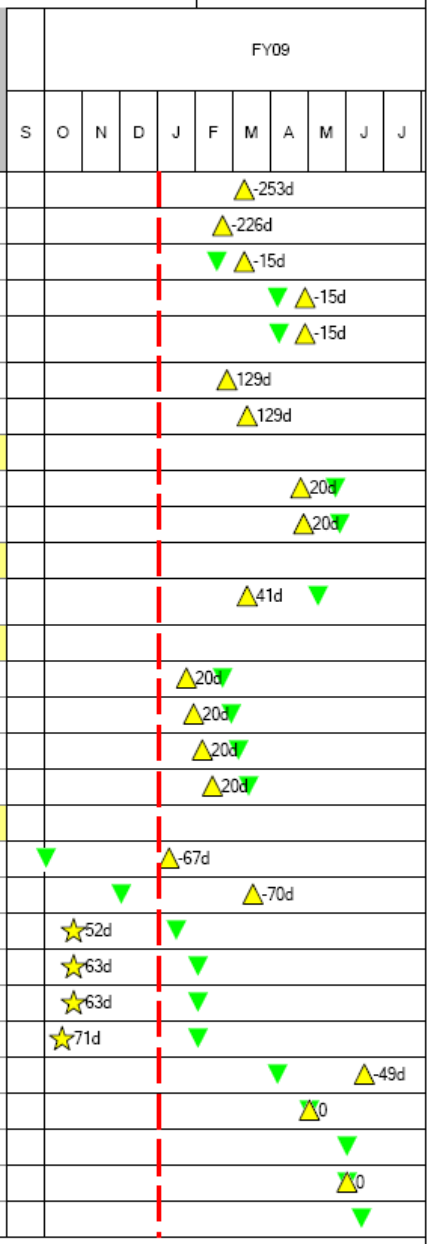
NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead
Monthly Report - Dec08
Time Now: 01Jan09
Baseline: NOVA_PMB

Baseline Date ▼
Completed Milestone ☆
Current Forecast Date △

Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level
2.1.1.2.6	Wetland permit issued	09Mar09	05Mar08	L.4
2.1.1.1.21	Site Prep Package Title 2 completed	20Feb09	27Mar08	L.5
2.1.1.3.4	Issue RFP for Site Prep Package	09Mar09	16Feb09	L.5
2.1.1.3.7	Site preparation purchase order released	27Apr09	06Apr09	L.2
2.1.1.4.1	Notice to proceed - far detector site preparation package	28Apr09	07Apr09	L.5
2.1.2.1.21	Far Detector Building Title 2 completed	24Feb09	26Aug09	L.5
2.1.2.2.4	Issue RFP for Far Detector Building	12Mar09	14Sep09	L.5
2.2 -- Liquid Scintillator				
2.2.3.4	Waveshifter PO issued	24Apr09	22May09	L.2
2.2.3.5.1	Waveshifter production and delivery begins	27Apr09	26May09	L.5
2.8 -- Near Detector Assembly				
2.8.1.1.6	Administrative and safety signoffs on near detector cavern excavation design	12Mar09	08May09	L.6
2.9 -- Far Detector Assembly				
2.9.2.2.21.3	Final design approved-south bookend	23Jan09	20Feb09	L.5
2.9.3.1.3	Scintillator transfer facility final design approved	30Jan09	27Feb09	L.5
2.9.1.1.3	Final design approved - module lifting fixture	05Feb09	05Mar09	L.5
2.9.2.2.22.3	Final design approved- north bookend	13Feb09	13Mar09	L.5
2.10 -- Project Management - Construction				
2.10.9.21	DOE OECM - FRA EVMS Readiness Assessment	09Jan09	01Oct08	L.2
2.10.9.22	DOE OECM - FRA EVMS Certification Review	16Mar09	01Dec08	L.2
2.10.9.20	DOE OHEP CD-3a Mini-review	24Oct08	15Jan09	L.2
2.10.8.1	CD-3a	24Oct08	02Feb09	L.1
2.10.9.5	CD-3a Funds Available	24Oct08	02Feb09	L.3
2.10.9.7	FY09 Funds Available	14Oct08	02Feb09	L.3
2.10.10.3	2009 Shutdown Begun	15Jun09	06Apr09	L.3
2.10.9.24	Director's CD-3b Review	01May09	01May09	L.3
2.10.9.23	DOE OECM - FRA EVMS Certified	09Sep09	01Jun09	L.2
2.10.9.25	DOE OHEP CD-3b Review	01Jun09	01Jun09	L.2
2.10.10.4	2009 Shutdown Completed	21Aug09	12Jun09	L.4



Project: NOVA_PROJECT
View: NOVA_BARVW_56
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Sort: BaselineFinish
Run: 20Jan09

Baseline: NOVA_PMB
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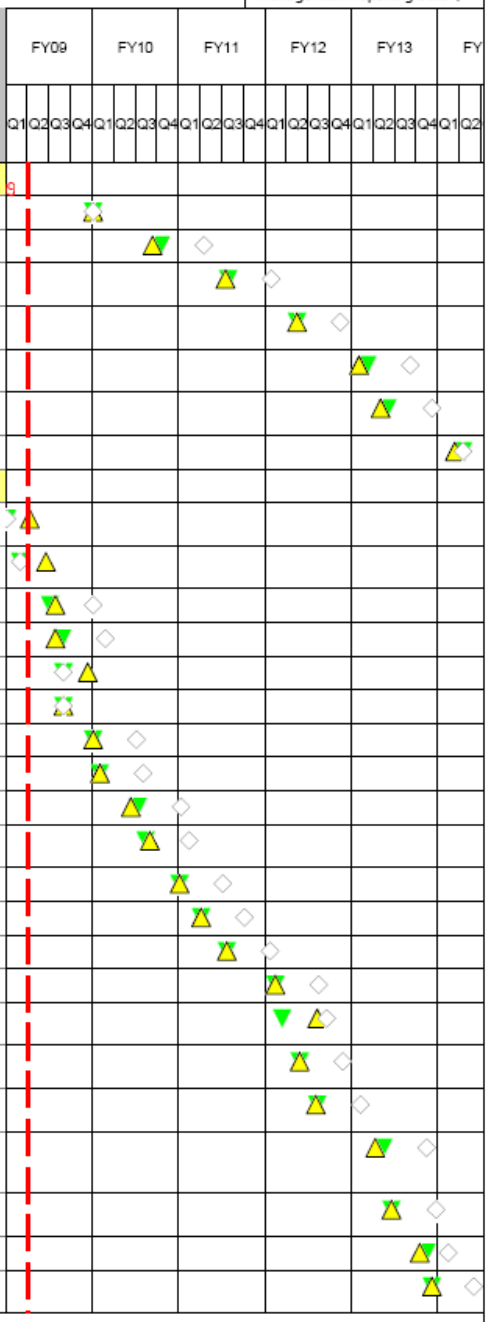
Milestone Analysis by Management Level

This looks ahead to all remaining L1 and L2 milestones in the project.

Nova Project
Milestone Gantt Chart
L.1 - L.2 Milestones
Dec08 Status
TimeNow: 01Jan09

Baseline Date
Completed Milestone
Current Forecast Date
Management Reporting Date

Activity Desc.	Baseline Date	Forecast / Actual Date	Management Reporting Date	Reporting Milestone Float	Baseline Variance
L.1 -- DOE - OHEP Associate Director Milestone					
CD-3b	01Oct09	01Oct09	01Oct09	0	0
IPND ready to take data	12Jul10	09Jun10	12Jan11	147d	22d
Benefical occupancy - far detector building construction	28Apr11	12Apr11	28Oct11	139d	12d
Beneficial occupancy of near detector cavern	10Feb12	10Feb12	10Aug12	127d	0
NuMI neutrino event observed in Superblock 1	03Dec12	30Oct12	03Jun13	145d	22d
Near detector completed and ready to operate	01Mar13	30Jan13	03Sep13	150d	22d
14 kt installation completed	16Jan14	11Dec13	16Jan14	21d	22d
L.2 -- DOE- NOVA Project Director Milestone					
DOE OECM - FRA EVMS Readiness Assessment	01Oct08	09Jan09	01Oct08	-67d	-67d
DOE OECM - FRA EVMS Certification Review	01Dec08	16Mar09	01Dec08	-71d	-70d
Site preparation purchase order released	06Apr09	27Apr09	06Oct09	112d	-15d
Waveshifter PO issued	22May09	24Apr09	23Nov09	147d	20d
DOE OECM - FRA EVMS Certified	01Jun09	09Sep09	01Jun09	-71d	-70d
DOE OHEP CD-3b Review	01Jun09	01Jun09	01Jun09	-1d	0
Extrusion PO issued	01Oct09	01Oct09	01Apr10	122d	0
WLS fiber PO issued	02Nov09	02Nov09	03May10	123d	0
IPND blocks completed	09Apr10	10Mar10	08Oct10	148d	22d
Decision point for buying additional waveshifter powders	11May10	02Jun10	11Nov10	114d	-15d
Mineral oil PO issued	01Oct10	01Oct10	01Apr11	124d	0
APDs PO issued	03Jan11	03Jan11	01Jul11	127d	0
Block pivoter completed	20Apr11	20Apr11	20Oct11	127d	0
Decision point for buying additional APDs	11Nov11	11Nov11	11May12	123d	0
MI Ring Modifications Ready for Beam Transport	14Dec11	09May12	14Jun12	24d	-100d
Decision point for buying additional WLS fiber	23Feb12	23Feb12	23Aug12	128d	0
RR Modifications Ready for Beam Transport	10May12	01May12	09Nov12	134d	7d
Decision point for buying additional extrusions, modules, mineral oil, pseudocumene	13Feb13	11Jan13	13Aug13	149d	22d
Far Detector extrusions for 14kt completed	20Mar13	20Mar13	20Sep13	128d	0
Far detector modules for 14 kt shipped	15Aug13	16Jul13	15Nov13	86d	22d
Ready to Commission Upgrades with Medium Energy Neutrino Beam	03Sep13	03Sep13	03Mar14	121d	0



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Run: 20Jan09

Baseline: NOVA_PMB
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