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November, 2009
NOvA Monthly Report

Table of Contents:

PROJECT OFFICE OVERVIEW 2

GLOSSARY OF TERMS 4

NARRATIVE SUMMARIES OF TECHNICAL PROGRESS 6

WBS 1.0 & 2.0 ACCELERATOR & NUMI UPGRADES 6
WBS 1.1 & 2.1 SITE AND BUILDING 10
WBS 1.2 & 2.2 LIQUID SCINTILLATOR 13
WBS 1.3 & 2.3 WAVELENGTH SHIFTING FIBER 15
WBS 1.4 & 2.4 PVC EXTRUSIONS 17
WBS 1.5 & 2.5 PVC MODULES 19
WBS 1.6 & 2.6 ELECTRONICS 20
WBS 1.7& 2.7 DATA ACQUISITION 21
WBS 1.8, 2.8, & 2.9 DETECTOR ASSEMBLY 22
WBS 1.9 & 2.10 PROJECT MANAGEMENT 24

EVMS SUMMARY 25

CPI AND SPI CURVES. 25
BCWS, BCWP, ACWP HISTORY. 25
PERCENT COMPLETE 26
BASELINE CHANGE CONTROL LOG ACTIONS 27
ESTIMATE TO COMPLETE LOG 28
WBS LEVEL 2 CONTRACT PERFORMANCE REPORT 29
VARIANCE SUMMARY FOR NOVA CONTROL ACCOUNTS AT WBS LEVEL 2 31
VARIANCE ANALYSIS 33
CONTINGENCY ANALYSIS 35
MILESTONE ANALYSIS 37
Milestone Status: Window of -3 to +6 months around November 37
Missed Milestones 42
Milestone Analysis by Management Level 44

Project Office Overview

(J. Cooper)

Back in July 2009, the DOE Office of Engineering and Construction Management (OECM) set NOvA's rating to "yellow" based on the slide of the Schedule Performance Index from 0.99 to 0.85 during February through April 2009. During July the Project prepared for the DOE IPR CD-3b Review and developed a "Get to Green" plan presented at the July 21-23 review. Performance through November followed that plan and the Project now has had an SPI back above 0.90 for two months in a row. The November SPI is 0.979 and the CPI is 1.005

On November 10, 2009 the DOE OECM notified the NOvA FPD that NOvA's November rating would be changed back to green based on the October data.

A DOE OHEP pre-ESAAB meeting was held on October 21, 2009. The NOvA Project presented the project's re-plan of the accelerator portion of the project with identified Fermilab scientists and engineers agreed to by the laboratory as available to NOvA. This led to a signed CD-3b approval on October 29, 2009.

On November 17 the Project was able to compare the scientist and engineer resource plan to the actual hours reported in October and November and found the resources were not ramping up as fast as the re-plan required. 10. 5 FTEs of scientists+engineers were reported in both October and November while the re-plan called for 20.5 to be working on NOvA tasks in November. The Project initiated further discussions with the Fermilab Directorate on November 17 and a further round of pushing the agreed plan and agreed NOvA priority down the management chain to the required individuals was undertaken by the Directorate, the Accelerator Division, and NOvA Project managers.

At the end of November, discussions with the FPD and DOE OHEP began to focus on a further project review in March 2010 to examine the Fermilab scientist and engineer resources yet again.

Progress on the Ash River site continued in November on the site preparation phase of the project.

- The 3.6 mile access roadway was completed in September (gravel only).
- During November the rock excavation for the Far Detector building reached 73% completion with the entire excavation down to a depth of 20 feet. Discussions continued during November on the subject of "exfoliation" (surface rock fragmentation) from blasting around the edges of the building excavation. This area is known as the building "collar" and will support the above ground concrete work. By the end of November, many of the collar problems had been resolved, resolutions of others were in progress, but several intractable spots remained and discussion with the contractor on solutions continued.
- Rock bolting of the walls of the excavation in the first 20 foot lift continued in November.
- The floor slab for the above ground Loading Dock portion of the building was installed in October and structural steel erection was completed.

- At the end of November the contractor had worked 138 days without a lost time accident. There was one recordable incident in August 2009 (described in the August Monthly report).

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 Performed
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
ARM	A type of microprocessor
ARRA	America Recovery and Reinvestment Act of 2009
BAC	Budget at Completion
BCWP	Budgeted Cost of Work Performed
BCWS	Budgeted Cost of Work Scheduled
BGA	Ball Grid Array (circuit board connections)
BOE	Basis of Estimate
BPM	Beam Position Monitor
CalTech	California Institute of Technology
CD	Fermilab Computing Division
CPI	Cost Performance Index = BCWP/ACWP
CR	Change Request
DCCT	DC Current Transformer
DCM	Data Control Module
DCS	Detector Control System
EA	Environmental Assessment
EAC	Estimate at Completion
EAW	Environmental Assessment Worksheet (State of Minnesota)
EIR	External Independent Review
ESAAB	DOE Energy Systems Acquisition Advisory Board
ETC	Estimate to Complete
EVMS	Earned Value Management System
FEA	Finite Element Analysis
FEB	Front End Board
FHEP	Full Height Engineering Prototype
FONSI	Finding of No Significant Impact
FPD	Federal Project Director
FRA	Fermi Research Alliance, the DOE Contractor for Fermilab
FSAP	Full Scale Assembly Prototype
FSO	Fermilab Site Office of DOE
Gaylord	Unit of measure for PVC resin, a 48" x 40" x 36" box holding about 1200 pounds.
GCMS	Gas Chromatography Mass Spectrometry
GMP	Guaranteed Maximum Price

HPLC	High Performance Liquid Chromatography
IHEP	Institute of High Energy Physics (Russia)
IPND	Integration Prototype Near Detector
IPR	Independent Project Review (by DOE)
IU	Indiana University
LLRF	Low Level Radio Frequency
LOE	Level of Effort
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
QAS	Quality Assurance Scanners for waveshifting fiber
RLS	Resource Loaded Schedule
RFP	Request for Proposals
RQN	Recycler Quadrupole
RR	Recycler Ring
S E H	Short Elliot Hendrickson
SHPO	State Historic Preservation Officer
SMU	Southern Methodist University
SPI	Schedule Performance Index = BCWP/BCWS
SRT	Software Release Tools
Step-bot	automated machine to measure the step (if any) between two 16 cell PVC extrusions glued together to form a 32 cell PVC module
TD	Fermilab Technical Division
TDU	Timing Distribution Units
TECC	Thermo-Electric Cooler Controller
THPO	Tribal Historic Preservation Officer
UCLA	Univ of California, Los Angeles
UMN	Univ of Minnesota, Twin Cities
USACE	United States Army Corps of Engineers
UTD	University of Texas, Dallas
UV	University of Viginia

Narrative Summaries of Technical Progress

WBS 1.0 & 2.0 Accelerator & NuMI Upgrades

(P. Derwent)

1.0.1.1 Recycler Ring Modifications

Magnet stand design work continued with the focus on quadrupole magnets. Injection Line preliminary design work continued and magnets were shifted to resolve interferences. Effects of these movements are being studied. Initial vacuum calculations for the beam abort kicker region were started.

Mechanical engineering work continued on the 53MHz cavity design with the focus being a thermal model of the cavity.

Magnet Progress:

- The report on the PDS Design Review that took place in September is now documented in NOVA-doc-1794, which includes several recommendations to improve the safety and performance of this new magnet system. Measurements utilizing after-market shims to regulate strength of this magnet have occurred. Orders for SmCo5 bricks continue to progress.
- ADCW magnet assembly was delayed due to concerns relating to beam tube options. Assembly occurred in the late part of November, and magnet assembly was expected to resume in early December.
- Parts, including cutting of ferrite bricks, are on order for the first PDD magnet. Parts began to arrive in October and ferrites are expected to arrive in November. Brick magnetization will begin in December, just prior to the final arrival of other magnet parts to avoid long-term storage of magnetized bricks. All tooling parts are accounted for and some tooling assembly has occurred.
- Fabrication of flux shorting shims has occurred for the 20” permanent Recycler quads and further trimming and measurement has resumed.
- Modification and evaluation of the MLAW tooling continues. Differences in coil insulation techniques are being incorporated in the tooling modification. A design review is being planned.

1.0.1.2 Recycler Kicker Systems

Ten beam tubes have been sent out for brazing: three to Omley and seven to CoorsTek. The first braze joint done by Omley is leak tight.

A requisition for pulse cable for all the kicker systems has been entered. The drawings for the RR Ext / MI Inj / RR Abort pulser have been completed and parts for the prototype ordered.

The first RR Injection Kicker magnet has been assembled; however there are issues with the alignment of the capacitors on the high voltage buss. More capacitors have been ordered for a second buss, at which time that kicker will be RE-assembled with the new buss. The capacitors for the remaining magnets will be ordered once the first magnet has been measured with the second buss.

1.0.2.1 MI Modifications

Hardware and software development of the LLRF system is complete. Testing of the prototype system is scheduled to begin in January 2010.

1.0.2.2 MI RF Cavities

No new technical progress.

1.0.3.2 NuMI Target Hall Technical Components

Work progressed on analysis of the target carrier thermal expansion and temperature. It is believed that this will be in reasonable shape for the target conceptual design review scheduled for January. Stress analysis of target windows is continuing and nearly complete. Also, study of baffle temperature and stress is nearly complete.

The task of analyzing the hadron monitor for higher beam power has not formally started, and is falling behind schedule. The input from University of Texas experts (who built the existing hadron monitor) is that the only real issue is to see if one can use cabling that is more radiation resistant, to increase the lifetime of the monitors. The existing monitors are otherwise adequate.

Target alignment requirements currently put very tight restrictions on allowable target carrier thermal expansion, and a modest increase in the width of the target fin is under consideration to ease this.

1.0.3.3 NuMI Target Hall Infrastructure

NuMI Target Hall Space Planning & Horn 2 Relocation to ME:

Horn 2 medium energy stripline extension: Work continued on the print checks and assembly drawings.

Target Chase:

No new progress to report on surface chiller operating specs and chase cooling coil parameters. Work continued on Horn 1 stripline analysis to address comments from the Initial Design Review and subsequent meetings.

1.0.3.4 Decay Pipe, Hadron Absorber and Utilities

Analysis continues.

1.0.4 Beam Physics

No new technical progress.

WBS 2.0 ANU Construction (P. Derwent)

2.0.1.3 Recycler Instrumentation

The heliax cable for the BPM upgrade (ARRA purchase) has arrived, and has been transferred to a suitable location for storage until the 2012 shutdown.

Useful experience has been gained with the MiniBooNE BPM transition boards, which will result in small modifications to the (very similar) design for NOvA.

The DCCT electronics is in good shape, and awaits the arrival of an amplifier in order to perform the final measurements and move forward with the final detector design.

2.0.2.1. MI Modifications

Communication cables have been received and pulled into both MI39 and MI14 (new Main Injector GPP buildings which will be used by NOvA). Priority is being given to connecting the FIRUS system so that we can complete the beneficial occupancy requirements. We are expecting the delivery of the relay racks in early December. There is still some construction work to be completed in the service buildings but we plan to begin installation of the relay racks as soon as possible after we obtain beneficial occupancy. Cable trays and electrical wiring of the racks will also need to be completed. MI-39 will be given priority so that the installation of the gap clearing kicker can begin.

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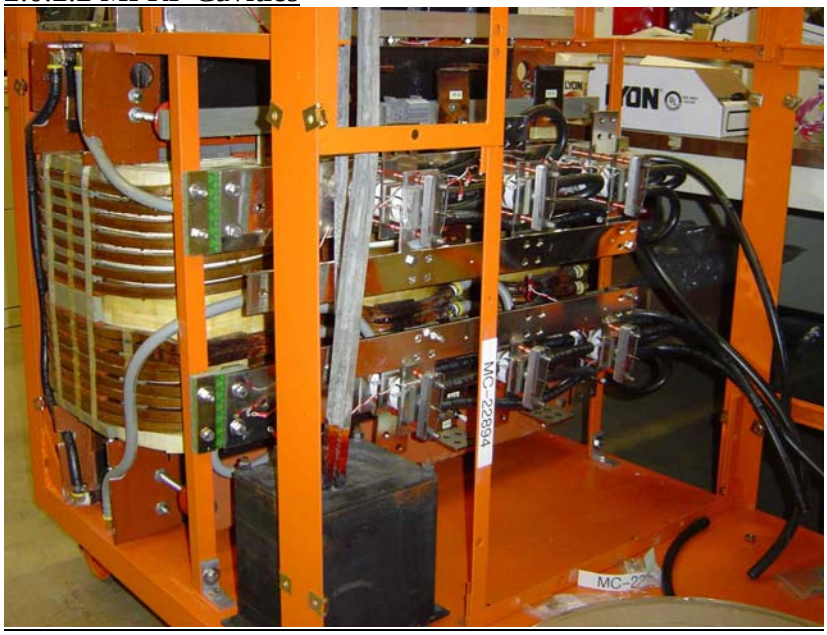
2.0.2.2 MI RF Cavities



Main Injector RF Cavity Ferrite Bias Supplies (FBS):
Assembly of the Main Injector Bias Supply started. The above picture shows the Bias Supply frame with main transformer and SCR pack installed.

2.0.3.1 NuMI Primary Proton Beam

Vendor fabrication continues for the 75kW Spang power supplies, anticipating possible test results next month. Beam testing for prototype beam transport profile monitors also continues.

2.0.4 ANU Project Management

ANU management continued to review resource requirements and labor actual charges to ensure ANU is gaining sufficient resources to accomplish work in a timely fashion. **Tracking is now being done on a weekly basis.**

The two new hires identified in AD Mechanical Support Department as part of the re-planning exercise are going forward. Selection for one position has begun in the Department. The second position has been approved, and forwarded to the laboratory WDRS for posting.

There remain 55 workdays of float in the ANU schedule before the target date of 1 Mar 2012 for the Accelerator Shutdown Begun milestone (WBS task 2.10.10.5).

Requisitions for kicker cable on ARRA funds were prepared and submitted.

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
1.1.4.7 Advanced Technical Design – Far Detector Building
These tasks are complete.

1.1.5.1 Near Detector surface Building – Final Design Phase

The design work for the Near Detector Surface Building is anticipated to require three (3) construction packages. The goal of this work is to produce a building that closely matches the conditions expected at the Far Detector Building in order to provide a full size understanding of the impact of the building components on the assembly, installation, and operation of the detector.

Design work on the first construction package (NDSB Shell) was completed in October 2009. This package will provide the foundation, building shell, and utility duct bank for the building. This work was issued for procurement in October 2009 and proposals were received in November 2009. The low proposer was ~8% higher than the project estimate. The project team is working with BSS/Procurement to award the subcontract in December 20009.

The second construction package (NDSB Outfitting) will provide the mechanical, electrical, and fire protection systems for the building. Also included in this package, will be the fixed access platform along the west side of the building. The fixed access platforms will mimic the access platforms for the Far Detector Building and will be based on the shop drawings submitted by the contractor. Work on this contract package was started in November 2009.

The third construction package (NDSB Moveable Access Platform) will provide a moveable access platform similar in type and construction to the platform to be installed in the Far Detector Building. The design of this construction package will not start until the shop drawings for the moveable access platform for the Far Detector Building is available.

1.1.5.2 Near Detector Surface Building – Procurement Phase

The contract documents for the first construction package (NDSB Shell) were issued for procurement in October 2009 and proposals were received in November 2009. The low proposer was ~8% higher than the project estimate. The project team is working with BSS/Procurement to award the subcontract in December 20009.

1.1.5.3 Near Detector surface Building – Construction Phase

No action on this WBS item this month.

2.1.1 Site Preparation Package

2.1.1.1 Site Preparation Package - Title 2 (Design) Phase

Tasks are completed.

2.1.1.2 Site Preparation Package - Wetland Mitigation

No Activity this month.

2.1.1.3 Site Preparation Package – Procurement Phase

Mobilization activities at the site began in May 2009.

2.1.1.4 Site Preparation Package – Build Phase

The contractor has worked 138 days without a lost time accident. Status of significant work activities includes:

- Access Road work is approximately 99% complete.
- Rock Excavation at Far Detector Building site is approximately 73% complete.
- Detailed weekly progress information can be found in NOVA-doc-3873.

The condition of the rock at the Far Detector Building site continues to present construction challenges for excavation activities. In November 2009, the project team continued to work with the contractor to develop a reasonable plan for the repair of the damaged rock.

2.1.2 Far Detector Building

2.1.2.1 Far Detector Building - Title 2 (Design) Phase

Tasks are completed.

2.1.2.2 Far Detector Building – Procurement Phase

Tasks are completed.

2.1.2.3 Far Detector Building – Build Phase

Status of significant work activities for the Far Detector Building includes:

- Floor slabs for the Loading Dock portion of the building were installed November 2009.
- Structural Steel erection for the north end of the Loading Dock building was completed in November 2009.

The contractor has a goal of providing a weather tight enclosure for the northern portion of the Loading Dock by the end of the 2009 construction season. The metal wall panels and roof will be installed in December 2009 in order to accomplish this goal.

As part of the Permit review in 2.1.4.1, the University of Minnesota has requested design changes to accommodate accessibility issues. Burns and McDonnell have developed a revision for the entry vestibule that includes a wheelchair lift. This design has been provided to the contractor for pricing with a proposal originally anticipated in October 2009. The proposal was received in November 2009 and a review by the project team was started. It is expected that this will be finalized in December 2009.

In October 2009, the contractor submitted a revised construction schedule that incorporates the schedule slippage due to the unforeseen conditions of the rock. The project team is reviewing this submittal in order to understand the impact on the overall project schedule.

2.1.3 Site and Building Security

No Activity this month.

2.1.4.1 Permits

The building permit for the Far Detector Building was received from the University of Minnesota in October 2009 and can be found in NOVA-doc-4184.

2.1.4.2 Quality Controls

Testing continued in November 2009. Reports can be found in NOVA-doc-4192

WBS 1.2 & 2.2 Liquid Scintillator

(S. Mufson)

1.2.2, 1.2.3, 1.2.8 R&D Studies

Chemical testing was started to understand whether the peculiar bis-MSB results on the 2008 mixed scintillator in the ISO tanker at Fermilab could be the result of settling. The test involves mixing bis-MSB with mineral oil and taking HPLC measurements of the bis-MSB concentration over the course of weeks to months.

1.2.5 QA/QC

At Fermilab, the NOvA Project Chemist has set up a purchase order with Heike Hofstetter at NIU, the chemist responsible for the Instrumentation Laboratory performing the HNMR and IR spectra in the dopant samples.

Construction of four additional IU spectrophotometer dark boxes is still underway. Testing of the new IU spectrophotometer dark boxes gives results that are not necessarily consistent with the measurements made over the course of several years of work. It seems now as if the culprit is the focusing lens, but tests are currently underway.

The R&D/rebuild of the long laser spectrophotometer for accurate attenuation length measurements of mineral oil continues. Preliminary measurements are now yielding consistent results.

A new alpha source was ordered with an improved design has been ordered. The redesign of the optics for the SMU spectrometer has finally started and a new, larger bandpass filter has been ordered.

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.

2.2 Construction (Mufson)

2.2.3 Procurement

Fermilab received another shipment of NOvA PPO from Curtiss Laboratories. PPO samples were sent prior to shipment. These samples were tested following the established procedures. The tests indicated that the material continued to be very uniform from one production to another. All the bis-MSB and about 50% of the PPO orders have been received.

A change request was processed for additional waveshifters for two purposes – to brighten the baseline scintillator formula for more light and to procure the additional waveshifters necessary for a 15 kt detector (at the price for the first 14 kt).

2.2.4 Production Methods

Development of an RFP for the production of 60,000 gal of scintillator for the ND by toll blenders in the Chicago area began in November. The plan is to produce two times the amount of scintillator needed for the ND, 30,000 gal at each blender, as a test of the FD production procedures. The goal is to make a choice between these two blenders for the FD production. The two blends are expected to run with mineral oil from a single producer, along with waveshifters on hand and pseudocumene from Dixie Chemical, so that the inputs to the test will be the same. The 30,000 gal of scintillator that does not get put into the ND will be stored, if it meets specs, or disposed of if it does not.

Preparations began for the production of 330 gallons of scintillator for the Vertical Slice 5 test in January, 2010. Mineral oil will be delivered in December from Precisional Lubricants (Renkert 70-T). The pseudocumene and waveshifters are already at Fermilab. The blending will be done in January in the 345-gallon tote in Lab F.

WBS 1.3 & 2.3 Wavelength Shifting Fiber

(C.Bromberg)

1.3.1 Requirements

1.3.2. Vendor Investigations

1.3.3 Wavelength Shifting Fiber Optimization Studies

Fiber optimization studies are complete.

1.3.4 Development of QA/QC Methods

There have been no changes to our expected QA/QC methods to be used with the new Quality Assurance Scanners (QAS). Details of these are now known and will be documented by the next report. Two fiber scanners, a Quality Assurance Scanner (QAS) and a Quality Control Scanner (QCS) were completed and tested. They are (nearly) identical with a consistent relative calibration.

1.3.5 Integration Prototype- Near Detector Production

Fourteen spools of IPND fiber, approximately 1/3 of the total IPND requirements have been sent to Minnesota. An additional sixteen spools will be rescanned and available for shipment to Minnesota when required.

1.3.6 Production WLS Fiber Specifications

No changes in fiber specification are anticipated.

1.3.7 Management – R&D Phase

No change during this month.

2.3 Wavelength Shifting Fiber Construction

(C. Bromberg)

2.3.1 Preparing order for Production Fiber

The QCS (Quality Control Scanner) was disassembled and packed for international transport and shipped to the Kuraray factory in Nakajyo, Japan. Three members of the MSU NOvA team made the trip to the Kuraray factory. The QCS was unpacked, assembled, and tested in about 2 days. After a few trial runs by Kuraray personnel, we received an enthusiastic response from Osamu Shinji, the designer of the fiber production facility and his team.

We agreed that for the 350 km of fiber to be delivered in January 2010 the average properties, such as attenuation length at 540 nm and total light output at 15 meters, if consistent with the previous 100 km delivery for the IPND, would be used to establish the baseline performance of the fiber. The total light output at 15 meters has a typical standard deviation of 8-10% in the IPND fiber. A preliminary agreement was made that a lower limit for an acceptable spool of fiber would be ~70% of the average. This will be reviewed after the time of the first delivery.

Kuraray personnel expressed concern that a recently added contract clause required that the QCS be returned to Fermilab at the end of the contract. After discussions with them it became clear that in certain circumstances having a QCS at Kuraray for the duration of the NOvA experiment could prove useful since Kuraray and MSU will both retain sample of the fiber made throughout the production phase. In addition, its return would carry a significant cost, involving a similar number of MSU personnel to accomplish as was necessary to install it. Finally, it would have to be reassembled and tested if it were ever to be useful at Fermilab. All of these factors argue strongly that the QCS should remain at Kuraray until NOvA completes data taking by 2020.

WBS 1.4 & 2.4 PVC Extrusions

(R. Talaga)

1.4.1 Physical Properties Determination and Test Method Development

The scope of this task is to develop methods for testing physical properties of extruded PVC.

A Review of the QC instruments and procedures was conducted on November 24, at Fermilab with outside reviewers. Initial feedback was positive and constructive. A full-blown QC team with instrumentation will be present at Extrutech for the December production. After the December production tests, decisions for purchase of construction phase QC instruments will be made.

1.4.2 Raw Materials

The scope of this task is to develop a PVC resin with sufficient mechanical strength and optical reflectivity to meet the requirements for the NOvA detector.

Aurora Plastics began production of replacement N-27 compound. They successfully produced 25,000 lbs at their North Carolina plant and will produce the remaining 10,000 lbs at their Ohio plant in the beginning of December for use at Extrutech on December 7-11. This was done at no cost to NOvA. Representatives from Aurora Plastics will be present for the Extrutech production.

1.4.3 Extrusions

The scope of this task is to extrude PVC resin, which is a powder, into solid PVC panels for NOvA.

An extruding test was performed at Extrutech in early November. On the first of the two-day tests, Vertical extrusions were produced successfully with N-27 from the North Carolina plant. In addition, about one half Gaylord of N-27 material made with Westlake PVC was tested, with a resulting decrease in extruder thrust. On the second day, the Horizontal die inserts were used for the first time in over two years. The test started out successfully, but another heater band failure forced us to stop the test before the planned number of 51-foot long extrusions could be produced. Extrutech assured us that the H die elements worked well and see no issues for the upcoming December production.

1.4.4 Shipping and Handling1.4.6 Management

The scope of this task is to develop a support and moving system for loading and unloading PVC extrusions into trucks and to devise a shipping plan and determine the cost.

Continuing a testing program started last month, a fixture specially made for the unloading of extrusions was developed. A full stack of 48-foot 6 inch FHEP vertical extrusions (60 pieces) was loaded into an enclosed truck at Extrutech, strapped to the trailer and driven to Green Bay and back (~ 3 hours). The stack was unloaded using the caster jack system with the new fixture. Unloading proved to be less difficult than earlier trials and the new fixture was a success. Three representatives from a trucking company

met with NOvA shipping and production representative and discussed loading, unloading, strapping and other general shipping issues. Another meeting is set for December.

1.4.6 Management

The scope of this task is to manage the activities in WBS 1.4. The Monthly Progress report, the Schedule Turnaround Report and an EVMS variance report have been submitted to the Project Office.

WBS 1.5 & 2.5 PVC Modules

(K. Heller/ D. Hennessy)

1.5.1 Requirements

No Change this month.

1.5.2 End Seal R&D

Designed and tested new inject-able glue joint geometry. Test seemed to perform well.

Ordered and received 150 top and 150 bottom raceways. This is enough parts for 1 block of the IPND / Near Detector.

1.5.3 Photo Detector Interface R&D

No Change this month.

1.5.4 Module Factory R&D

Produced 13 FHEP verticals, and 11 were shipped.

Four more horizontal Near Detector test modules were started.

A second 50-foot module for Caltech Vertical Slice 5 was started.

Four new vacuum cups were produced, along with 20 new clamps for manifold snouts.

A "Cross-bot" was completed and tested. The Cross-bot measures flatness orthogonal to cell direction.

We executed the fiber fly-cutting procedure at the snout where the fibers couple to the APD for the first time (8 fly-cuts).

We narrowed factory candidates to two warehouse choices and began obtaining outfitting costs for each.

1.5.5 Quality Assurance and Quality Control Methods Development

Produced authentication procedures for factory workers (QC software).

1.5.6 Module shipping and storage R&D

1.5.7 Integration Prototype Detector Modules

1.5.8 Initial Production Module Specifications

1.5.9 Initial Factory Tooling Specifications

1.5.10 Management - R&D Phase

No change during this month.

WBS 1.6 & 2.6 Electronics

(L. Mualem)

1.6.1 APD Module

APD production has been delayed. Final costs for the required design changes have been completed. The new production timeline has not been completed yet.

Production of the test stand for the APDs continued. Design and production of special purpose circuit boards have begun.

Production of APD module parts for the IPND / Near Detector has begun. The high volume production techniques and gasket sealing designs are now completed. Prototype electronics boxes were delivered for integration testing at FNAL and UMN.

1.6.2 Front End Board

Planned designs for modifications on the FEB 3.0 design to progress to FEB 4.0 have been outlined and progress began.

1.6.3 Power Distribution

Design of circuits for power distribution boards is now complete. The layout will be done by a commercial vendor.

1.6.4 Management - R&D Phase

No change since the last report.

1.6.5 Vertical Slice Tests

The analysis of Vertical Slice 4 is still to come.

Preparations for the next vertical slice test are now underway. This will test full length modules at Caltech after they are built at Minnesota.

WBS 1.7& 2.7 Data Acquisition

(L. Mualem)

1.7.1 DAQ Software

We expect a new computing professional to come on board in the coming weeks, which should help pick up the pace of progress, particularly with 1.7.1.4 (Run Control) and 2.7.1.1.1.7 (Error handling).

1.7.2 DAQ Hardware

Problems with DCM embedded bootloader required significant effort. A Change Request was processed to bring a UVA senior engineer to FNAL to modify the bootloader code to work with new DCM system and memory.

Simulations effort on the timing system began. This effort is to ensure that the system will function and produce sufficient synchronization with the DCMs for the DAQ system.

1.7.3 Detector Control

No progress this month.

1.7.4 Detector Control System

Setup DCS test stand machines and wired in the new switch. Verified all support software, and setup to run with fieldpoints in new configuration. Wrote new controls code for accessing fieldpoints. Moved power supply testing to new location (requires rewiring).

1.7.5 Management - R&D Phase

No progress this month.

WBS 1.8, 2.8, & 2.9 Detector Assembly

(P. Lukens)

1.8.1. Plane Assembly Adhesive
1.8.4. Near Detector Assembly
1.8.2. Structural Design Validation

No change this month.

1.8.3. Liquid Scintillator Filling and Handling

Parts for the first scintillator filling machine were ordered in August, and assembly work continued in November.

1.8.5. Integration Prototype Near Detector (IPND)

During November, NOvA physicists and engineers continued planning for the resumption of IPND work in the next few months. Discussions with FESS occurred to better specify the needs of the detector enclosure, including a discussion about adding additional Near Detector blocks to the current installation plan of 4 IPND blocks. The IPND enclosure, that would accommodate the full Near Detector, is now being planned.

Final fabrication drawings for the IPND are not yet completed, due to a need for some method of draining the scintillator from these modules. Candidate valves were obtained, that will be evaluated for their suitability as drains.

Design and construction work for the assembly fixtures continued at ANL. Most of the tooling is now complete.

Extrusions for the prototype block are now being collected at ANL for the first prototype assembly. An inventory was completed of the IPND parts, so that missing pieces can be obtained.

1.8.6. Far Detector Assembly Engineering

Analysis of the block pivoter prototype continues, and no problems have been found in the design. Requisitions for several of the components of the FHEP pivoter table were submitted.

1.8.7. Far Detector Installation Procedures

No change this month.

1.8.8. Far Detector Prototypes

During November, the scintillator leak test in the CZero building elevator-shaft enclosure was monitored.

Plans for the Full Height Engineering Prototype were developed during November, since there are several problems handling such a large object.

Adhesive tests were performed, to determine the appropriate compression that should be applied during block assembly. A specification for compression pressure was developed, and prototype compression weights were obtained. These will be tested on the IPND prototype.

1.8.9. Management

During November, 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.

2.9 Far Detector Assembly Construction

(P. Lukens)

2.9.1 Far Detector Mechanical Systems

The second glue pump was received in November, which gives the adhesive dispenser the full capacity for Far Detector assembly. Work continues on commissioning the second pump, and several hoses and valves are still needed.

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

NOvA Technical Board meetings were held on November 3 and 17. The discussion was focused on technical progress towards completion of the FHEP and Near Detectors.

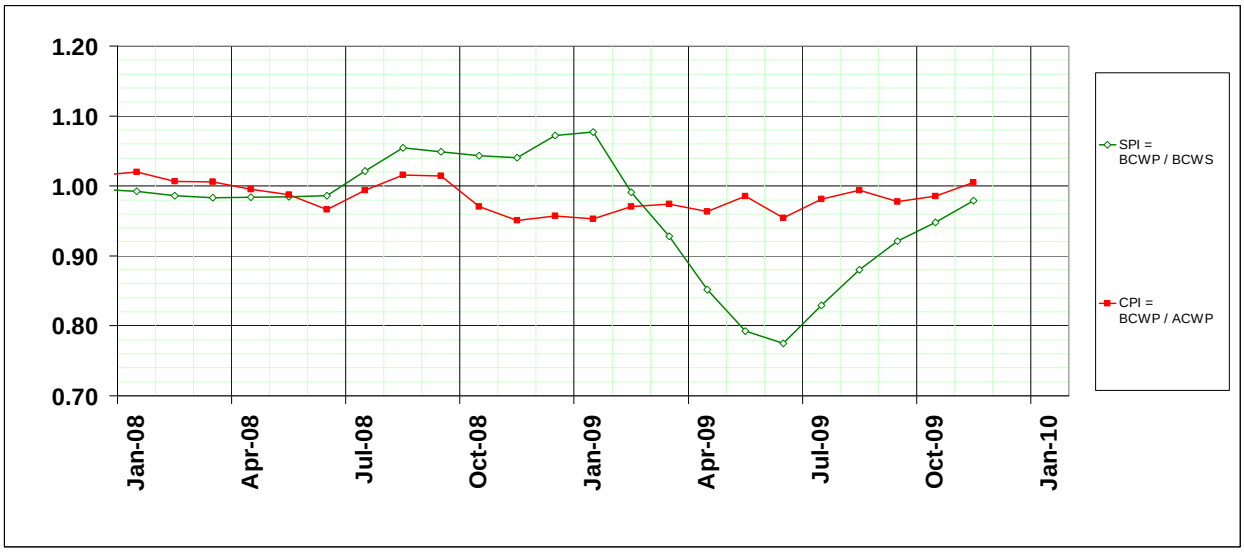
A **NOvA Project Management Group** meeting was held on November 17.

EVMS Summary

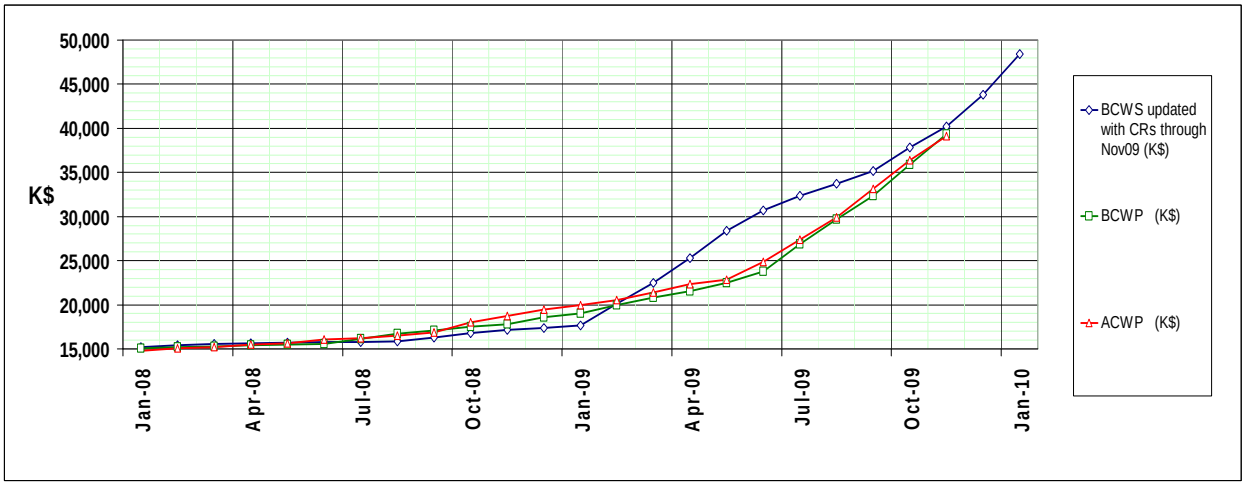
(S. Saxer, W. Freeman, H. Ferguson, E. McCluskey)

CPI and SPI curves.

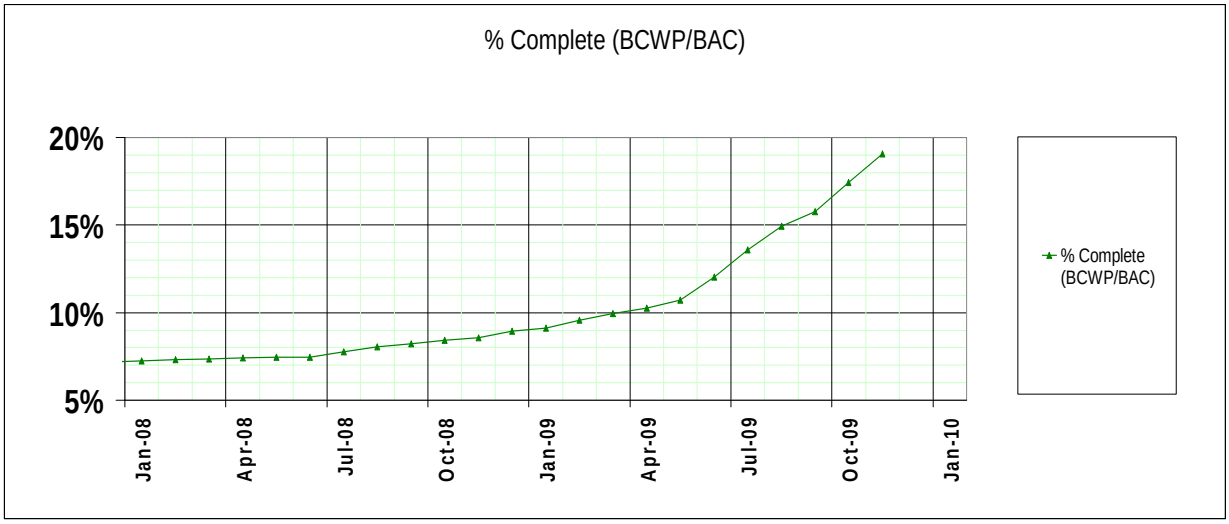
As discussed in the Overview section of this report, the Schedule Performance Index and Cost Performance Index have both remained above 0.90 since September.



BCWS, BCWP, ACWP History.



Percent Complete



Baseline Change Control Log Actions

The NOvA Project Management Group serves as the highest level change control board. During November, five NOvA changes were approved by the NOvA Project Manager. One required a higher approval from the FPD as well since it involved a Level 2 Milestone.

CR Log of Baseline Changes for Monthly Report

CR #	Affected WBS #'s	CO Title	Date:	Level of Change	Final Cost Impact	Final Schedule Impact	Status
121	2.7.1.2, 2.7.1.7	DAQ Labor Reassignment/Schedule Adjustment	12/14/2009	L4 (NOVA PM)	$12,820.71	none	Approved by PM
117	2.2.3.5.6 (new)	Procure Additional Waveshifter for 15th Kiloton	12/1/2009	L2 (DOE Fermi)	$183,090.05		Approved by DOE FPD
115	2.0.1.1	MLAW Magnet Schedule Changes	12/7/2009	L4 (NOVA PM)	$112,806.98		Approved by PM
114	1.6.3	Power Distribution Box Version 3	11/25/2009	L4 (NOVA PM)	$77,747.33		Approved by PM
111	1.7.3 and new 1.7.7	Restructuring DAQ Integration Tasks	12/14/2009	L4 (NOVA PM)	$133,439.09		Approved by PM
				Total Baseline Cost Change this Month	$519,904.16		

Thursday, December 17, 2009 Page 1 of 1

Estimate to Complete Log

ETC013 was added during November. A discussion of the ETC forecast method used by NOvA appears in the March 2009 Monthly Report.

NOvA Log of Estimate to Complete Changes			by ETC#				
ETC#	**Item**	**WBS items/affected control accounts**	**CAM**	**estimated amount**	**NOvA-doc number for details**	**date of email approval**	**Disposition or resolution**
1	Labor reductions on 1.0.3	1.0.3.2, 1.0.3.3	Martens	< $100K decrease in base estimate	**3763**	15-Apr-09	
2	Near Cavern updated estimate following Conceptual design by Harza, checked by Wightman	2.8.1.4.5, 2.8.1.4.6	Lukens	only $20K increase in base estimate, but a change in contingency estimate from 100% to 50%	**3764**	15-Apr-09	
3	Changes to WBS 2.3 - WLS fiber forecast cost and schedule. Fiber cost is higher based on Kuraray quote for first 1,000 km.	2.3.1, 2.3.2	Bromberg	873 K$ increase in BAC	**4015**	14-Jul-09	
4	Changes to WBS 2.4 - PVC Extrusion forecast schedule starts earlier and the production period is shorter.	2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.4.5	Talaga	467 K$ decrease in BAC	**4016**	14-Jul-09	
5	Changes to WBS 2.6 forecast schedule - APD procurement schedule advance	2.6.1	Mualem	100 K$ decrease in BAC	**4017**	14-Jul-09	
6	PVC module schedule and forecast costs. Start module factory earlier, rent larger warehouse for a longer period to store PVC extrusions and PVC modules.	2.5.1, 2.5.2, 2.5.3	Heller	2,495 K$ increase in BAC	**4013**	14-Jul-09	
7	Liquid scintillator forecast price change based on the forecast cost of crude oil in future years	2.2.1, 2.2.2	Mufson	1,044 K$ increase in BAC	**4012**	14-Jul-09	This ETC also had a contingency estimate increase from 28% to 45%. The 45% contingency amount was superseded by CR106 in September 2009 and is now 157% on WBS 2.2.1.
8	Project RR Accelerator shutdown date shift	2.10	Cooper	none	**4047**	14-Jul-09	
9	Delay RR activities to 1-1-10	1.0, 2.0	Derwent				CR080 superseded this ETC before it was quantified
10	Changes to forecase schedule for IPND/ND- Append ND blocks to IPND. Earlier, therefore less escalation.	2.4.3, 2.5.3, 2.8.2	Talaga, Heller, Lukens	116 K$ decrease in BAC	**4046**	14-Jul-09	
11	Changes to forecast schedule for WBS 2.9 - Block Pivoter. Earlier, therefore less escalation.	2.9.1	Lukens	18 K$ decrease in BAC	**4018**	14-Jul-09	
12	Changes related to CR093 on PDD Magnet in WBS 1.0 and 2.0	1.0.1.1.2.1.5.3, 2.0.1.1.1.5.3	Derwent	57 K$ decrease relative to BAC	**4399**	1-Oct-09	
13	Changes to obsolete 3 tasks not yet started, but which have BCWS in the past.	2.0.1.1.1.10.1, 2.0.1.1.1.10.2, and 2.0.1.1.1.10.3	Derwent	179 K$ decrease	**4360**	12/4/2009	This action is offset by a corrresponding increase in EAC and BAC from new task 2.0.1.1.1.10.5 added as part of CR115.

WBS Level 2 Contract Performance Report

The usual CPR1 report is shown below.

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-Nov-2009 TO 30-Nov-2009

PERFORMANCE DATA

CTC-FndSrc 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$k	304	367	203	62	163	3,341	2,774	2,015	(567)	759	31,514	30,832	682
CTC-FndSrcTotals:	304	367	203	62	163	3,341	2,774	2,015	(567)	759	31,514	30,832	682
DC DOE-CA													
2.1 Site and Building													
Fully burdened AY$k	850	1,457	1,372	607	84	6,360	10,448	9,961	4,088	487	31,695	30,974	721
CTC-FndSrcTotals:	850	1,457	1,372	607	84	6,360	10,448	9,961	4,088	487	31,695	30,974	721
DD DOE-ACEL R&D													
1.0 ANU R&D													
Fully burdened AY$k	80	185	165	105	20	4,785	3,689	3,372	(1,096)	317	7,896	7,651	245
CTC-FndSrcTotals:	80	185	165	105	20	4,785	3,689	3,372	(1,096)	317	7,896	7,651	245
DE DOE-DET MIE													
2.1 Site and Building													
Fully burdened AY$k	82	16	18	(66)	(1)	841	848	241	8	608	1,808	1,107	700
2.10 Project Mgmt-Nova Project-Constr													
Fully burdened AY$k	151	143	131	(8)	12	1,561	1,553	1,298	(8)	255	9,598	9,350	248
2.2 Liquid Scintillator													
Fully burdened AY$k	361	361	356	(0)	5	1,339	1,337	1,313	(2)	23	19,337	20,399	(1,062)
2.3 WLS Fiber													
Fully burdened AY$k	21	22	0	1	22	29	93	59	64	34	10,075	11,086	(1,011)
2.4 PVC Extrusions													
Fully burdened AY$k	149	87	206	(62)	(119)	618	256	206	(362)	50	25,284	24,961	323
2.5 PVC Modules													
Fully burdened AY$k	28	28	13	0	15	221	221	134	0	87	11,358	13,970	(2,612)
2.6 Electronics													
Fully burdened AY$k	5	1	0	(4)	1	12	8	4	(4)	4	12,236	12,273	(37)
2.7 DAQ													
Fully burdened AY$k	113	8	0	(105)	8	300	70	0	(230)	70	3,469	3,398	71
2.8 Near Detector Assembly													
Fully burdened AY$k	35	2	(2)	(33)	3	150	93	77	(57)	16	4,244	4,259	(15)
2.9 Far Detector Assembly													
Fully burdened AY$k	56	22	7	(34)	14	485	321	190	(164)	131	13,291	12,938	353
CTC-FndSrcTotals:	1,000	689	729	(311)	(40)	5,557	4,800	3,521	(756)	1,280	110,700	113,742	(3,042)
DO DOE-ACEL OPS													
1.0 ANU R&D													
Fully burdened AY$k	0	0	14	0	(14)	312	293	242	(19)	50	1,318	1,268	50
CTC-FndSrcTotals:	0	0	14	0	(14)	312	293	242	(19)	50	1,318	1,268	50
DR DOE-POST CD-1 DET R&D													
1.1 Site and Building R&D													
Fully burdened AY$k	18	21	20	3	1	2,320	2,318	1,647	(2)	671	3,630	2,948	682
1.2 Liquid Scintillator R&D													
Fully burdened AY$k	2	2	4	(0)	(2)	283	275	271	(8)	5	297	292	5
1.3 WLS Fiber R&D													
Fully burdened AY$k	0	0	0	0	0	341	316	302	(25)	14	341	305	35
1.4 PVC Extrusion R&D													
Fully burdened AY$k	2	42	46	40	(4)	1,367	1,207	1,624	(161)	(417)	1,369	1,782	(413)
1.5 PVC Module R&D													
Fully burdened AY$k	36	246	0	209	246	1,701	1,341	1,539	(360)	(198)	2,115	2,248	(133)
1.6 Electronics R&D													
Fully burdened AY$k	10	108	23	98	85	1,359	641	960	(719)	(320)	1,922	2,265	(344)
1.7 DAQ R&D													
Fully burdened AY$k	45	314	83	270	231	1,092	704	1,467	(388)	(763)	1,517	2,294	(777)
1.8 Detector Assembly R&D													
Fully burdened AY$k	0	57	99	57	(43)	2,183	1,361	2,880	(822)	(1,519)	2,777	4,323	(1,546)
1.9 Project Management R&D													
Fully burdened AY$k	0	0	0	0	0	383	383	559	0	(176)	383	559	(176)
CTC-FndSrcTotals:	113	790	276	677	514	11,029	8,546	11,249	(2,483)	(2,704)	14,350	17,017	(2,666)
DY DOE CD-0 TO CD-1 R&D													
1.9 Project Management R&D													
Fully burdened AY$k	0	0	0	0	0	8,801	8,801	8,801	0	0	8,801	8,801	0
CTC-FndSrcTotals:	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	2,347	3,488	2,760	1,141	728	40,184	39,351	39,161	(833)	190	206,274	210,285	(4,010)
Management Resrv.											71,726		
Total	2,347	3,488	2,760	1,141	728	40,184	39,351	39,161	(833)	190	278,000		

Beginning in October, 2009, FRA EVMS also requires a CPR1 for non-costed scientific effort. That special CPR1 is shown below and the units are reported hours, not dollars. The cumulative data begins with Oct 2009.

CONTRACT PERFORMANCE REPORT
FORMAT 1 - WORK BREAKDOWN STRUCTURE

1. CONTRACTOR	2. CONTRACT	3. PROGRAM	4. REPORT PERIOD
a. NAME Fermi National Accelerator Laboratory	a. NAME	NAME NOvA Project	FROM 01-Nov-2009 TO 30-Nov-2009

8. PERFORMANCE DATA

WBS[2]	CURRENT PERIOD					CUMULATIVE TO DATE				
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE	
ITEM	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1.0 ANU R&D	472	197	155	(275)	42	877	549	347	(328)	201
1.2 Liquid Scintillator R&D	0	0	0	0	0	0	0	0	0	0
1.3 WLS Fiber R&D	0	0	0	0	0	0	9	0	9	9
1.4 PVC Extrusion R&D	0	2	32	2	(30)	0	2	72	2	(70)
1.5 PVC Module R&D	125	28	319	(97)	(291)	220	72	610	(148)	(538)
1.6 Electronics R&D	78	0	291	(78)	(291)	78	0	503	(78)	(503)
1.7 DAQ R&D	26	26	139	0	(113)	146	26	257	(120)	(231)
1.8 Detector Assembly R&D	0	0	60	0	(60)	0	0	119	0	(119)
1.9 Project Management R&D	0	0	0	0	0	0	0	0	0	0
2.0 ANU Construction	351	376	101	25	275	750	769	152	18	617
2.10 Project Management - Nova Project - Construction	0	0	118	0	(118)	0	0	257	0	(257)
2.2 Liquid Scintillator	47	47	66	0	(19)	101	101	189	0	(88)
2.3 WLS Fiber	6	6	0	0	6	42	13	0	(28)	13
2.4 PVC Extrusions	46	82	0	36	82	102	134	0	33	134
2.5 PVC Modules	41	15	0	(25)	15	81	49	0	(32)	49
2.6 Electronics	15	15	0	0	15	33	33	0	0	33
2.7 DAQ	163	15	64	(148)	(49)	357	33	180	(324)	(147)
2.8 Near Detector Assembly	9	9	0	0	9	40	20	0	(20)	20
2.9 Far Detector Assembly	0	0	0	0	0	0	0	0	0	0
Total	1,378	818	1,345	(561)	(527)	2,826	1,810	2,687	(1,017)	(877)

Variance Summary for NOvA Control Accounts at WBS Level 2

The FRA EVMS required reporting thresholds to DOE at WBS Level 2 are shown below. There are thresholds for dollars and separate thresholds for non-costed scientific effort in hours:

Customer Variance Analysis Report Thresholds		
Green Thresholds – Cost and Schedule Performance falling outside of yellow or red thresholds		
Yellow Thresholds		
Cost Variance Schedule Variance	**Type**	**Threshold limit**
Dollars	Current Period	≥ ± 5% to < ± 10% and ≥ $125K
	Cumulative	≥ ± 5% to < ± 10% and ≥ $250K
Hours	Current Period	≥ ± 5% to < ± 10% and ≥ 875 hrs
	Cumulative	≥ ± 5% to < ± 10% and ≥ 1750 hrs
Red Thresholds		
Cost Variance Schedule Variance	**Type**	**Threshold limit**
Dollars	Current Period	≥ ± 10% and ≥ $250K
	Cumulative	≥ ± 10% and ≥ $500K
Hours	Current Period	≥ ± 10% and ≥ 1750 hrs
	Cumulative	≥ ± 10% and ≥ 3500 hrs

Note: This applies to SV% (Schedule Variance in %) or CV% (Cost Variance in %) and the SV or CV in $.

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 tables below summarize the status.

Report Period: Nov-09														
	Current Period							Cumulative						
WBS Level 2	BCWS (AY$)	BCWP (AY$)	ACWP (AY$)	SV (AY$)	SV (%)	CV (AY$)	CV (%)	BCWS (AY$)	BCWP (AY$)	ACWP (AY$)	SV (AY$)	SV (%)	CV (AY$)	CV (%)
R&D														
1.0 ANU R&D	80,030	185,183	179,148	105,153	131%	6,036	3%	5,096,820	3,981,764	3,614,119	(1,115,055)	-22%	367,646	9%
1.1 Site and Building R&D	17,660	21,092	19,797	3,432	19%	1,295	6%	2,319,689	2,318,028	1,646,845	(1,661)	0%	671,183	29%
1.2 Liquid Scintillator R&D	2,143	2,092	4,277	(52)	-2%	(2,186)	-104%	283,043	275,412	270,659	(7,631)	-3%	4,753	2%
1.3 WLS Fiber R&D	0	353	0	353	100%	353	100%	340,909	315,511	301,956	(25,398)	-7%	13,555	4%
1.4 PVC Extrusion R&D	1,574	41,743	46,013	40,169	2553%	(4,270)	-10%	1,367,192	1,206,533	1,623,998	(160,659)	-12%	(417,465)	-35%
1.5 PVC Module R&D	36,295	245,500	0	209,206	576%	245,500	100%	1,700,599	1,341,017	1,539,427	(359,582)	-21%	(198,410)	-15%
1.6 Electronics R&D	10,405	108,173	23,193	97,768	940%	84,980	79%	1,359,219	640,565	960,291	(718,654)	-53%	(319,726)	-50%
1.7 DAQ R&D	44,801	314,443	83,085	269,641	602%	231,358	74%	1,091,732	703,875	1,467,331	(387,857)	-36%	(763,456)	-108%
1.8 Detector Assembly R&D	0	56,716	99,316	56,716	100%	(42,600)	-75%	2,183,002	1,361,387	2,880,039	(821,615)	-38%	(1,518,652)	-112%
1.9 Project Management R&D	0	0	0	0	0%	0	0%	9,184,127	9,184,127	9,359,785	0	0%	(175,658)	-2%
Construction														
2.0 ANU Construction	304,331	366,707	203,295	62,376	20%	163,412	45%	3,340,964	2,773,846	2,014,943	(567,117)	-17%	758,904	27%
2.1 Site and Building	932,079	1,473,206	1,390,009	541,127	58%	83,197	6%	7,200,665	11,296,553	10,201,288	4,095,888	57%	1,095,265	10%
2.10 Project Management - Nova Project - Construction	151,264	143,130	131,262	(8,134)	-5%	11,868	8%	1,561,041	1,552,907	1,297,508	(8,134)	-1%	255,400	16%
2.2 Liquid Scintillator	361,206	361,096	355,680	(110)	0%	5,416	2%	1,338,807	1,336,739	1,313,296	(2,068)	0%	23,443	2%
2.3 WLS Fiber	20,653	21,702	0	1,048	5%	21,702	100%	29,362	93,299	58,842	63,937	218%	34,457	37%
2.4 PVC Extrusions	148,941	87,311	205,920	(61,630)	-41%	(118,609)	-136%	618,136	255,650	205,920	(362,486)	-59%	49,730	19%
2.5 PVC Modules	27,837	27,837	12,932	0	0%	14,904	54%	221,183	221,183	134,058	0	0%	87,125	39%
2.6 Electronics	4,674	729	0	(3,945)	-84%	729	100%	11,904	7,959	4,033	(3,945)	-33%	3,925	49%
2.7 DAQ	113,032	7,751	0	(105,281)	-93%	7,751	100%	300,264	70,418	0	(229,846)	-77%	70,418	100%
2.8 Near Detector Assembly	34,789	1,620	(1,706)	(33,169)	-95%	3,326	205%	150,281	92,817	76,589	(57,463)	-38%	16,229	17%
2.9 Far Detector Assembly	55,667	21,536	7,406	(34,131)	-61%	14,130	66%	485,020	321,032	189,883	(163,989)	-34%	131,149	41%
R&D SubTotal (WBS 1.0-1.9)	192,908	975,294	454,828	782,386	406%	520,466	53%	24,926,331	21,328,219	23,664,449	(3,598,112)	-14%	(2,336,230)	-11%
Construction SubTotal (WBS 2.0-2.10)	2,154,473	2,512,624	2,304,799	358,151	17%	207,825	8%	15,257,628	18,022,404	15,496,360	2,764,776	18%	2,526,044	14%
Project Total	2,347,382	3,487,919	2,759,628	1,140,537	49%	728,291	21%	40,183,959	39,350,622	39,160,809	(833,336)	-2%	189,814	0%

FRA EVMS does not require the same thresholds for higher level roll-ups, but it is useful to look at the numbers for the same <u>percentage</u> thresholds here. In the overall project roll-up (see bottom line in the table), the project is green on the Cumulative CV (0%) and the Cumulative SV (-2%).

The current period CV is positive (+21 %) and the SV is positive (+49%), showing continuing improvement towards less negative cumulative numbers during November.

The Construction roll-up (second line from the bottom in the above table) shows an overall project summary with the cumulative CV and SV both in the red but positive, now both > +14%. The current period SV is positive (+17 %) and the current period CV is positive (+8 %). Both the current and cumulative numbers are dominated by continued progress on the Ash River Site work during November. The current numbers are dominated by progress on the Ash River Site work for SV and by ANU Construction for CV.

On the R&D side (roll-up is on the third line from the bottom in the table above), the R&D shows an overall project summary with Cumulative SV in the red (-14%, but again with an improvement over the level in the previous month which was at -18%). The Cumulative CV is also in the red (-11%, but the downward trend through September flattened at -14% in October and is now an upward trend in November).

The R&D current month SV is positive (+406 %) and the current month CV is positive yellow (+53 %). The SV is gaining ground as we catch up on the detector R&D tasks (most of which were in the past), but the CV may drop further in future months as some technical delays are being overcome by application of additional resources over a longer period.

FRA EVMS has required a similar WBS Level 2 Contract Performance Report 1 for non-costed scientific effort since October 2009. This is shown in the table below where the units are hours and the cumulative is since October 2009.

Report Period: Nov-09														
	Current Period Sci Hrs							Cumulative since Oct 2009						
WBS Level 2	BCWS (Hrs)	BCWP (Hrs)	ACWP (Hrs)	SV (Hrs)	SV (%)	CV (Hrs)	CV (%)	BCWS (Hrs)	BCWP (Hrs)	ACWP (Hrs)	SV (Hrs)	SV (%)	CV (Hrs)	CV (%)
R&D														
1.0 ANU R&D	472	197	155	(275)	-58%	42	21%	877	549	347	(328)	-37%	201	37%
1.2 Liquid Scintillator R&D	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
1.3 WLS Fiber R&D	0	0	0	0	0%	0	0%	0	9	0	9	0%	9	100%
1.4 PVC Extrusion R&D	0	2	32	2	100%	(30)	-1678%	0	2	72	2	0%	(70)	-3900%
1.5 PVC Module R&D	125	28	319	(97)	-78%	(291)	-1056%	220	72	610	(148)	-67%	(538)	-746%
1.6 Electronics R&D	78	0	291	(78)	-100%	(291)	0%	78	0	503	(78)	-100%	(503)	0%
1.7 DAQ R&D	26	26	139	0	2%	(113)	-427%	146	26	257	(120)	-82%	(231)	-873%
1.8 Detector Assembly R&D	0	0	60	0	0%	(60)	0%	0	0	119	0	0%	(119)	0%
1.9 Project Management R&D	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
Construction														
2.0 ANU Construction	351	376	101	25	7%	275	73%	750	769	152	18	2%	617	80%
2.10 Project Management - Construction	0	0	118	0	0%	(118)	0%	0	0	257	0	0%	(257)	0%
2.2 Liquid Scintillator	47	47	66	0	0%	(19)	-41%	101	101	189	0	0%	(88)	-87%
2.3 WLS Fiber	6	6	0	0	0%	6	100%	42	13	0	(28)	-68%	13	100%
2.4 PVC Extrusions	46	82	0	36	79%	82	100%	102	134	0	33	32%	134	100%
2.5 PVC Modules	41	15	0	(25)	-62%	15	100%	81	49	0	(32)	-40%	49	100%
2.6 Electronics	15	15	0	0	0%	15	100%	33	33	0	0	0%	33	100%
2.7 DAQ	163	15	64	(148)	-91%	(49)	-321%	357	33	180	(324)	-91%	(147)	-449%
2.8 Near Detector Assembly	9	9	0	0	0%	9	100%	40	20	0	(20)	-50%	20	100%
2.9 Far Detector Assembly	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
R&D SubTotal (WBS 1.0-1.9)	701	253	996	(448)	-64%	(743)	-294%	1,321	658	1,908	(663)	-50%	(1,250)	-190%
Construction SubTotal (WBS 2.0-2.10)	678	565	349	(113)	-17%	216	38%	1,505	1,151	778	(353)	-23%	373	32%
Project Total	1,378	818	1,345	(561)	-41%	(527)	-64%	2,826	1,810	2,687	(1,017)	-36%	(877)	-48%

All L2 current and cumulative items are in the green.

Variance Analysis

At the Control Account Level, FRA EVMS variance analysis thresholds also have dollar thresholds and hour threshold (for non-costed scientific effort) as shown in the table below. Control Accounts in the Red band require a written variance analysis.

Variance Analysis Thresholds for Control Accounts		
Green Thresholds – Cost and Schedule Performance falling outside of yellow or red thresholds		
Yellow Thresholds		
Cost Variance Schedule Variance	**Type**	**Threshold limit**
Dollars	Current Period	≥ ± 5% to < ± 10% and ≥ $50K
	Cumulative	≥ ± 5% to < ± 10% and ≥ $100K
Hours	Current Period	≥ ± 5% to < ± 10% and ≥ 350 hrs
	Cumulative	≥ ± 5% to < ± 10% and ≥ 700 hrs
Red Thresholds		
Cost Variance Schedule Variance	**Type**	**Threshold limit**
Dollars	Current Period	≥ ± 10% and ≥ $100K
	Cumulative	≥ ± 10% and ≥ $200K
Hours	Current Period	≥ ± 10% and ≥ 700 hrs
	Cumulative	≥ ± 10% and ≥ 1400 hrs

Note: This applies to SV% (Schedule Variance in %) or CV% (Cost Variance in %) and the SV or CV in $ or hours.

In November, 44 of the 68 NOvA Control Accounts were active with scheduled work, performed work, or actual costs in the cumulative view. 3 Control Accounts have been closed since some of the R&D is now complete. 18 of the active Control Accounts required a written variance analysis based on the $ thresholds in November.

Zero active Control Accounts required a written variance analysis based on the "hour" thresholds.

We continue a new summary method for these variances and divide the project into four major parts:

- The Accelerator work, summing both R&D and Construction
- The Ash River Building work on the Cooperative Agreement
- The Detector R&D work (which will be complete in about a year)
- The Detector Construction (which has just begun but eventually constitutes the bulk of the effort).

Accelerator work variance analysis:

Our baseline had work starting in February 2009 and we immediately lost ground because people were not available to do the work. During February-May, the project lost SV ground at the rate of 600-900 K$/ month. In August and September this monthly SV dropped to zero as people began to return to NOvA tasks when the Fermilab Summer 2009 Accelerator Shutdown began to wind to a close. November marks the second POSITIVE SV month in a row since January 2009. The cumulative SV has now improved from a low of -2.1 M$ in July, Aug & Sept to -1.68 M$ in November.

The cumulative CV remains positive at 1.1 M$, up a little from 1.0 M$ in October.

Ash River Building work on the Cooperative Agreement variance analysis:

Our baseline had work beginning in April 2009 because we thought the Recovery Act funds would be available then. We unfortunately started a few tasks in the schedule in April but didn't get the funding until June and then could not change tasks that had begun in the past. For the DOE IPR in July, we updated our schedule to reflect the contractor's schedule, but slipped the contractor's tasks by 3 months to account for possible delays in starting construction or for possible delays due to a hard winter during 2009-2010. During April and May the project lost SV of -2.3 M$, but work actually did finally begin in June and by October we had recovered the lost ground and more to reach an SV of positive 3.5 M$. In November the SV rose again to a positive 4.1 M$.

The CV is positive at 0.5 M$, up a little from 0.4 M$ in October.

Detector R&D variance analysis:

Our baseline had work beginning in February 2009 and for this part of the project we ran into three technical problems:

- Problems with the vacuum lifting fixture to move and rotate 53' by 4' PVC modules were finally solved in May 2009.
- Problems with the adhesive machine to apply adhesive to the PVC modules when they are rotated by the machine to an upside down position were solved in June 2009.
- Problems in obtaining injection molded PVC parts for the fiber manifolds at one end of the PVC modules were resolved during October and November 2009.

Due to these technical problems, these already in-process tasks did not realize BCWP. As of August, the BCWS for this work had largely passed in the schedule and the cumulative SV had flattened out at -3.4 M$. As we complete the tasks, we will regain the lost ground. Both September, October and now November have shown positive current month SVs and the cumulative SV in November is -2.5 M$.

The delay in this R&D will not impact the Detector construction schedule since the end point of the R&D is the assembly of the Near Detector in a new surface building at Fermilab. There is no CD-4 jeopardy from this delay. From the Project point of view, the key item is to assemble the detector, not to use it for data collection. The NOvA scientific Collaboration wishes to accumulate surface running for experience in analyzing neutrino data. The delay will impact the length of time the Near Detector can run on the surface with the NuMI beam before the accelerator shutdown of the NuMI beam for NOvA work. We had hoped to run the detector for two years and now that will be shortened to just a little over one year.

However, we expect the negative CV (at – 2.7 M$ in November) may grow for the Detector R&D since more effort, materials and services were required than expected to resolve the technical problems.

Detector Construction variance analysis:

This part of the schedule has just begun. We have a SV of -0.8 M$ on 5.5 M$ of scheduled work. The CV is +1.3 M$.

Contingency Analysis

FRA EVMS requires the project to assess contingency in each monthly report. The contingency is split into two types:

- Assigned contingency at the task by task level. FRA EVMS calls this "management reserve".
- Available contingency. This is contingency available for risk mitigation and schedule advance.

All NOvA Change Requests include the effect of the change on each form of contingency. The object is to make sure any actions using Available Contingency fit within the Available Contingency calculated in the previous month. The CRs for November are summarized below.

MR/Contingency Usage for Monthly Report

CR#	WBS #'s	CR Title	Approval Date	Level of Change	Final Cost Impact	Final Schedule Im	Status
Contingency/Management Reserve Use:		**Contingency**					
114	1.6.3	Power Distribution Box Version 3	11/25/2009	L4 (NOVA PM)	$77,747.33	none	Approved by PM
117	2.2.3.5.6 (new)	Procure Additional Waveshifter for 15th Kiloton	12/1/2009	L2 (DOE Fermi)	$183,090.05	none	Approved by DOE FPD
				TOTAL =	**$260,837.38**		
Contingency/Management Reserve Use:		**Management Reserve**					
111	1.7.3 and new 1.7.7	Restructuring DAQ Integration Tasks	12/14/2009	L4 (NOVA PM)	$133,439.09	none	Approved by PM
115	2.0.1.1	MLAW Magnet Schedule Changes	12/7/2009	L4 (NOVA PM)	$112,806.98	none	Approved by PM
121	2.7.1.2, 2.7.1.7	DAQ Labor Reassignment/Schedule Adjustment	12/14/2009	L4 (NOVA PM)	$12,820.71	none	Approved by PM
				TOTAL =	**$259,066.78**		

TOTAL BASELINE COST (MR and CONTINGENCY) CHANGE THIS MONTH = $519,904.16

The effect of Change Requests alone does not complete the contingency analysis. Tasks in progress or completed during the month also have an effect. Completed tasks can use or release Assigned Contingency. Completed tasks can use Available Contingency. In progress tasks can release Assigned Contingency when statused, since the assigned contingency is spread throughout the task duration.

For a complete accounting of Contingency we use the Open Plan scheduling tool, status it every month, and run the output into Cobra. Cobra keeps track of ACWP via costs and accruals. Open Plan keeps track of completed and in progress tasks. We use the EAC column of the CPR1 for this analysis, but do the analysis at the task level. Available Contingency is simply calculated as the difference between the TPC and the sum of ACWP + BCWS + Assigned Contingency.

The results for November are shown in the table below.

NOvA Contingency Status for November 2009	($M)
Assigned Contingency	65.0
Available Contingency	2.7
Total Contingency	**67.7**
EAC from CPR1	**210.3**
TPC	**278.0**

Milestone Analysis

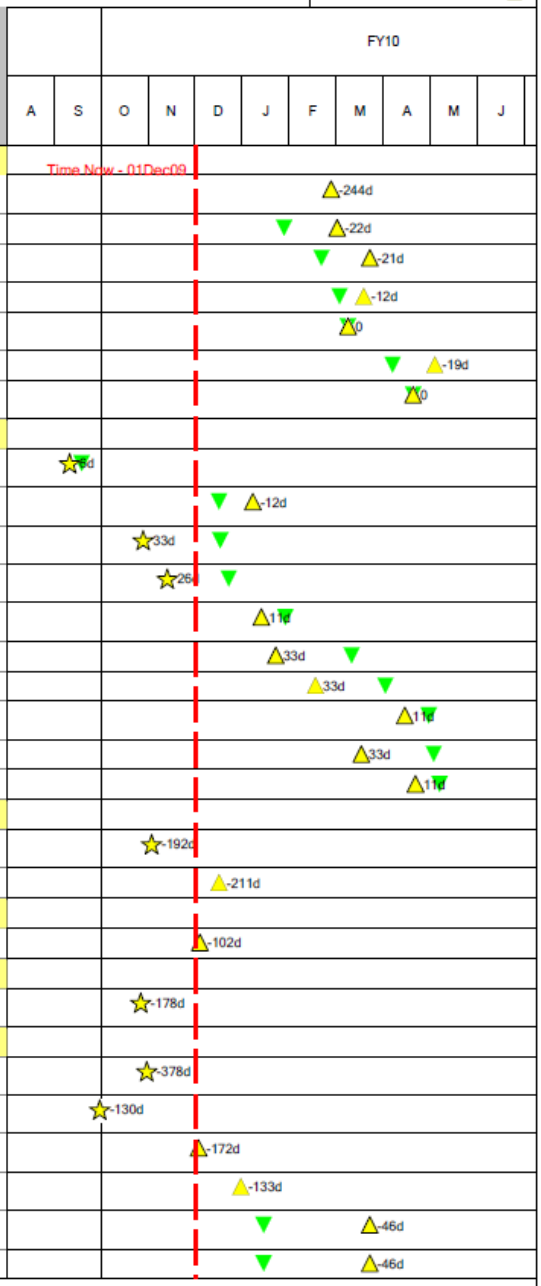
Milestone Status: Window of -3 to +6 months around November

1 milestone was completed this month.

NOVA_PROJECT
Milestone Gantt Chart - 6-month look ahead
Monthly Report - November 09
Time Now: 01Dec09
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	25Feb10	06Mar09	L.5
1.0.1.1.6.3	RR 53 Mhz RF Design Review Complete	01Mar10	28Jan10	L.5
1.0.3.1.5.3	NuMI Profile Monitor Technical Design Review Complete	22Mar10	19Feb10	L.5
1.0.3.3.5.3	NuMI Target Chase Cooling Design Complete	18Mar10	02Mar10	L.5
1.0.1.1.6.5	RR Beamline Modifications Design Review Complete	08Mar10	08Mar10	L.5
1.0.3.3.5.2	NuMI Shielding Assessment Complete	03May10	06Apr10	L.5
1.0.3.2.5.1	NuMI Target, Baffle & Carrier Initial Design Review Complete	19Apr10	19Apr10	L.4
1.1 – Site and Building				
1.1.5.1.1.8	PO issued for final design of Near Detector Surface Building	10Sep09	18Sep09	L.5
1.1.5.1.1.22	Final design completed - Near Detector Surface Building	07Jan10	16Dec09	L.5
1.1.5.2.1.4	RFP issued for ND surface building construction	28Oct09	17Dec09	L.5
1.1.5.1.2.8	PO issued for final design of Access Platforms	12Nov09	22Dec09	L.5
1.1.5.2.1.8	NTP issued for Near Detector Surface Building	13Jan10	29Jan10	L.5
1.1.5.1.2.22	Final design completed - Access Platforms	22Jan10	10Mar10	L.5
1.1.5.2.2.4	RFP issued for Access Platforms	16Feb10	02Apr10	L.5
1.1.5.3.1.8	Beneficial Occupancy - Near Detector Surface Building	14Apr10	29Apr10	L.5
1.1.5.2.2.8	NTP issued for Access Platforms	17Mar10	03May10	L.5
1.1.5.3.1.10	Near Detector Surface Building Completed	21Apr10	06May10	L.5
1.2 – Liquid Scintillator R&D				
1.2.9.3.12	Mineral oil batch 3 for IPND delivered (obsolete)	02Nov09	02Feb09	L.5
1.2.9.6.11	Prototype scintillator production completed	16Dec09	17Feb09	L.4
1.3 – Wave-Length-Shifting Fiber R&D				
1.3.5.5	IPND WLS fiber production completed	03Dec09	09Jul09	L.4
1.4 – PVC Extrusion R&D				
1.4.2.5.2	PO for raw PVC resin for 16-cell horizontal extrusions released	26Oct09	16Feb09	L.5
1.5 – PVC Module R&D				
1.5.4.2.12	Prototype gluing machine for IPND ready to operate	30Oct09	01May08	L.5
1.5.2.1.1.14	Preproduction prototype manifold design (for IPND) completed	29Sep09	26Mar09	L.5
1.5.5.4	Pressure-testing hardware for IPND production ready to operate	03Dec09	30Mar09	L.5
1.5.5.7	Fiber mapping and continuity hardware for IPND production ready to operate	30Dec09	18Jun09	L.5
1.5.7.3.7	IPND modules for first 8-plane segment completed (OBSOLETE)	22Mar10	14Jan10	L.4
1.5.7.3.10	IPND module production review completed	22Mar10	14Jan10	L.5



Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 17Dec09

Baseline: NOVA_PMB
Page 1 of 5

NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead
Monthly Report - November 09
Time Now: 01Dec09
Baseline: NOVA_PMB

Baseline Date
Completed Milestone
Current Forecast Date

Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level
1.5.7.3.8	IPND module production 50% complete (2 blks)	05Apr10	29Jan10	L.4
1.5.7.3.9	IPND module production completed (4 blks)	17May10	12Mar10	L.3
1.6 – Electronics R&D				
1.6.2.4.12	FEB prototype III released to DAQ	04Jan10	16Jun09	L.5
1.6.2.5.1	FEB modules for IPND started	05Jan10	29Jun09	L.5
1.6.1.2.8	QA/QC station ready	30Mar10	20Jul09	L.5
1.6.1.6.1.7	APD modules for 8-plane segment completed	15Sep09	27Jul09	L.5
1.6.1.6.1.9	APD modules for IPND completed	02Jul10	23Oct09	L.4
1.6.3.5.8	IPND power distribution system online	08Oct10	17Nov09	L.5
1.6.2.5.13	FEB modules for ND/S completed	30Jun10	23Mar10	L.5
1.7 – DAQ System R&D				
1.7.1.4.4.7	Run control system for software first release	05Jan10	03Mar09	L.5
1.7.2.3.1.3	Requirements approved	23Dec09	05Mar09	L.5
1.7.2.3.4	Evaluation components received	27Jan10	02Apr09	L.5
1.7.2.1.6.2	IPND data concentrator PCBs and components received	06Jan10	14Apr09	L.5
1.7.1.8.3.6	Global trigger system for software first release	10Feb10	13May09	L.5
1.7.1.6.4.1.6	Event buffer farm server for software first release	15Feb10	15May09	L.5
1.7.2.2.3.5	Prototype PCBs and components received for control and timing system	17Dec09	20May09	L.5
1.7.2.4.1.3	Requirements approved	19Mar10	05Jun09	L.5
1.7.4.11	Detector control system released	15Apr10	12Jun09	L.5
1.7.1.6.3.1.13	Event buffer farm core software for software first release	11Mar10	16Jun09	L.5
1.7.2.4.3	Evaluation components received	16Apr10	06Jul09	L.5
1.7.1.8.4.8	Global trigger system for software second release	12Apr10	15Jul09	L.5
1.7.1.11	DAQ software ready for IPND	12Apr10	15Jul09	L.4
1.7.2.1.8	IPND data concentrators ready for installation	25May10	21Aug09	L.4
1.7.2.5.1.3	Requirements approved	08Jul10	06Oct09	L.5
1.7.2.5.3	Evaluation components received	05Aug10	03Nov09	L.5
1.7.7.1.1.5	Release Integrated Software Environment	21Dec09	02Dec09	L.5
1.7.2.2.4.4	Control and timing prototype tests completed	08Apr10	30Dec09	L.5
1.7.2.6.1.3	Requirements approved	28Sep10	13Jan10	L.5
1.7.7.3.1.4	Certify power suppplies integrated with IP/ND equipment	08Feb10	09Feb10	L.5
1.7.2.6.3	Evaluation components received	26Oct10	11Feb10	L.5
1.7.7.1.2.13	Integration Test Plan Reviewed	02Apr10	16Mar10	L.5
1.7.2.7.1.3	Requirements approved	09Dec10	25Mar10	L.5
1.7.2.7.3	Evaluation components received	11Jan11	22Apr10	L.5

Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 17Dec09

Baseline: NOVA_PMB
Page 2 of 5

NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead
Monthly Report - November 09
Time Now: 01Dec09
Baseline: NOVA_PMB

Baseline Date ▼
Completed Milestone ☆
Current Forecast Date △

Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level	A	S	O	N	D	J	F	M	A	M	J
							FY10								
1.7.7.1.3.9	Test Stand Released for Operations for IPND Testing	15Apr10	10Jun10	L.5									△39d	▼	
1.7.7.3.4.3	Certify Timing System Operation Under Integration	26May10	22Jul10	L.5										△39d	
1.8 – Detector Assembly R&D															
1.8.5.2.12	IPND systems designs completed	24Feb10	21Apr09	L.5							△-211d				
1.8.6.4	30% design of far detector mechanical systems and tooling completed	03Mar10	28Apr09	L.5							△-211d				
1.8.8.2.6	Select site for block installation at FNAL	01Oct09	05May09	L.5			☆-104d								
1.8.5.4.5	IPND block assembly facility completed	15Apr10	11Jun09	L.6									△-211d		
1.8.5.6.1.4	Notice to proceed on Phase 1 of IPND Infrastructure in MSB (OBSOLETE)	04Sep09	18Jun09	L.6		☆-56d									
1.8.5.6.1.6	Notice to proceed on Phase 2 of IPND Infrastructure in MSB (OBSOLETE)	01Sep09	01Sep09	L.6		☆-1d									
1.8.5.6.1.11	Infrastructure contract work completed (OBSOLETE)	04Sep09	04Sep09	L.5		☆0									
1.8.5.6.2.4	Notice to proceed - Phase 1 of IPND containment (OBSOLETE)	08Sep09	08Sep09	L.6		☆-1d									
1.8.5.6.2.6	Notice to proceed - Phase 2 of IPND containment (OBSOLETE)	09Sep09	09Sep09	L.6		☆-1d									
1.8.5.6.3.5	Beneficial occupancy of IPND enclosure (OBSOLETE)	10Sep09	10Sep09	L.4		☆0									
1.8.5.7.8	IPND module filling completed	05Jan11	26May10	L.5										▼	
2.0 – ANU Construction															
2.0.1.2.8.1	Gap Clearing/RR Inj Kicker Magnet Design Complete	01Dec09	01Sep09	L.3		▼			△-62d						
2.0.4.3.22	ANU Schedule Contingency Milestone	01Oct09	01Oct09	L.5			☆-1d								
2.0.1.1.5.7	MLAW Design Review Complete	15Dec09	15Dec09	L.5					△0						
2.0.1.1.5.8	Ready to Order Parts for MLAW Magnets	30Dec09	30Dec09	L.5						▼0					
2.0.1.1.5.3	RR Orders Placed for Copper for 53 Mhz RF	23Mar10	19Feb10	L.5							▼	△-22d			
2.0.1.1.5.9	Sufficient Parts for First MLAW Magnet	26Apr10	26Apr10	L.5									▼0		
2.0.2.2.5.2	MI RF Cavities Fabrication of Ferrite Bias Supplies Complete	12May10	13Oct10	L.5										△107d	
2.1 – Site and Building															
2.1.2.2.4	Issue RFP for Far Detector Building	09Mar09	14Sep09	L.5		▼									
2.1.2.5.1	Notice to proceed - far detector building-phase II	25Aug09	16Oct09	L.4	☆36d		▼								
2.1.2.2.7	Purchase order released - far detector building	25Aug09	16Nov09	L.5	☆58d			▼							
2.2 – Liquid Scintillator															
2.2.3.5.4	Waveshifter production 15% completed	30Sep09	23Sep09	L.5		▼☆-5d									
2.2.3.5.5	Waveshifter production completed - 14KT	26May10	26May10	L.4										▼0	
2.3 – Wave-Length-Shifting Fiber															
2.3.1.5	WLS fiber PO issued	01Sep09	02Nov09	L.2	☆42d		▼								
2.3.2.1.6	WLS fiber production begins	02Feb10	09Feb10	L.3							△▼d				
2.3.2.1.7	WLS fiber production 3% complete	03Mar10	08Jun10	L.5								△68d		▼	
2.4 – PVC Extrusions															

Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 17Dec09

Baseline: NOVA_PMB
Page 3 of 5

NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead
Monthly Report - November 09
Time Now: 01Dec09
Baseline: NOVA_PMB

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Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level
2.4.1.2.3.2	Vendor Samples POs issued	02Mar10	25Sep09	L.5
2.4.1.1.5	Extrusion PO issued	01Dec09	01Oct09	L.2
2.4.1.2.5	Raw material POs issued	23Jun10	01Feb10	L.5
2.4.2.1.4	First horizontal extrusions available for evaluation	30Jul10	11May10	L.4
2.4.3.1.1.5	Near detector horizontal extrusions completed	08Dec09	11Nov10	L.5
2.4.3.1.2.5	Near detector vertical extrusions completed	01Sep09	13Dec10	L.5
2.5 – PVC Modules				
2.5.3.3.3.6	All near detector modules completed and shipped (6 blks + muon catcher)	13Jul10	06May10	L.5
2.5.3.3.3.2	Near detector module fabrication started	08Dec09	13Jul12	L.5
2.6 – Electronics Production				
2.6.1.5.6	APD Modules Complete - Near Detector	19Nov10	25May10	
2.7 – Data Acquisition System				
2.7.1.10.2.3	Release integration database servers for use	21Dec09	21Oct09	L.5
2.7.1.10.3.3	Release production database servers for use	15Jan10	11Nov09	L.4
2.7.2.2.2.2	Pre-production PCBs and components received for control and timing system	26Jul10	22Jan10	L.4
2.7.1.1.1.6	Error handling system for software second release	25Mar10	26Feb10	L.5
2.7.1.3.1.10	Run control system for software second release	05Jun10	01Mar10	L.5
2.7.1.5.8	Data logger server for software first release	23Jul10	03Mar10	L.5
2.7.1.4.1.6	Event buffer farm core software for software second release	09Feb11	12Apr10	L.5
2.7.2.1.2.7	Release production hold	10Jun10	13Apr10	L.5
2.7.2.1.2.8	Production data concentrators received	24Jun10	27Apr10	L.3
2.8 – Near Detector Assembly				
2.8.2.3.2.2.1	Modules for final two near detector blocks available	14Jul10	07May10	L.6
2.9 – Far Detector Assembly				
2.9.2.2.21.3	Final design approved-south bookend	21Dec09	20Feb09	L.5
2.9.3.1.3	Scintillator transfer facility final design approved	01Feb10	27Feb09	L.5
2.9.1.1.3	Final design approved - module lifting fixture	18Feb10	05Mar09	L.5
2.9.2.2.22.3	Final design approved- north bookend	15Jan10	13Mar09	L.5
2.9.1.1.9	Module lifting fixtures completed	09Mar10	11Jan10	L.5
2.9.1.1.11	Module lifting fixtures ready for shipping	11Mar10	13Jan10	L.5
2.9.1.2.7	Adhesive dispenser completed	04Feb10	14Jul10	L.4
2.9.1.4.3	Construction of block pivoter and pallet begins	03May10	01Nov10	L.4
2.10 – Project Management - Construction				
2.10.9.23	DOE OECM - FRA EVMS Certified	25Jan10	01Jun09	L.2
2.10.10.4	2009 Shutdown Completed	10Sep09	12Jun09	L.4

Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 17Dec09

Baseline: NOVA_PMB
Page 4 of 5

NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead
Monthly Report - November 09
Time Now: 01Dec09
Baseline: NOVA_PMB

Baseline Date ▼
Completed Milestone ☆
Current Forecast Date △

Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level	A	S	O	N	D	J	F	M	A	M	J
							FY10								
2.10.8.2	CD-3b	29Oct09	01Oct09	L.1			▼	☆-21d							
2.10.9.6	CD-3b Funds Available	29Oct09	01Oct09	L.3			▼	☆-21d							
2.10.9.8	FY10 Funds Available	01Oct09	02Nov09	L.3			☆21d ▼								
2.10.9.12	Decision point for buying additional waveshifter powders	03Dec09	11May10	L.2					△108d					▼	

Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 17Dec09

Baseline: NOVA_PMB
Page 5 of 5

Missed Milestones

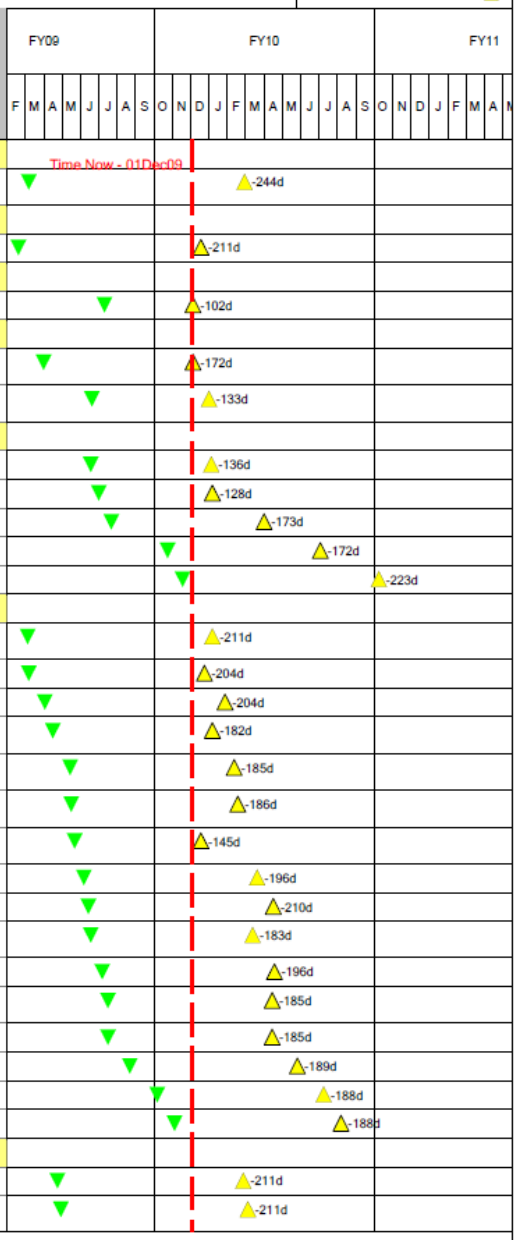
38 milestones should be finished by now but are not yet completed and are shown in the table below. This number has decreased from a high of 39 in September 2009.

28 of the missed milestones are associated with the detector R&D, reinforcing the narrative Detector R&D summary in the Variance Analysis section of this report.

NOVA_PROJECT
Milestone Gantt Chart - Missed milestones
Monthly Report - November 09
Time Now: 01Dec09
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	25Feb10	06Mar09	L.5
1.2 -- Liquid Scintillator R&D				
1.2.9.6.11	Prototype scintillator production completed	16Dec09	17Feb09	L.4
1.3 -- Wave-Length-Shifting Fiber R&D				
1.3.5.5	IPND WLS fiber production completed	03Dec09	09Jul09	L.4
1.5 -- PVC Module R&D				
1.5.5.4	Pressure-testing hardware for IPND production ready to operate	03Dec09	30Mar09	L.5
1.5.5.7	Fiber mapping and continuity hardware for IPND production ready to operate	30Dec09	18Jun09	L.5
1.6 -- Electronics R&D				
1.6.2.4.12	FEB prototype III released to DAQ	04Jan10	16Jun09	L.5
1.6.2.5.1	FEB modules for IPND started	05Jan10	29Jun09	L.5
1.6.1.2.8	QA/QC station ready	30Mar10	20Jul09	L.5
1.6.1.6.1.9	APD modules for IPND completed	02Jul10	23Oct09	L.4
1.6.3.5.8	IPND power distribution system online	08Oct10	17Nov09	L.5
1.7 -- DAQ System R&D				
1.7.1.4.4.7	Run control system for software first release	05Jan10	03Mar09	L.5
1.7.2.3.1.3	Requirements approved	23Dec09	05Mar09	L.5
1.7.2.3.4	Evaluation components received	27Jan10	02Apr09	L.5
1.7.2.1.6.2	IPND data concentrator PCBs and components received	06Jan10	14Apr09	L.5
1.7.1.8.3.6	Global trigger system for software first release	10Feb10	13May09	L.5
1.7.1.6.4.1.6	Event buffer farm server for software first release	15Feb10	15May09	L.5
1.7.2.2.3.5	Prototype PCBs and components received for control and timing system	17Dec09	20May09	L.5
1.7.2.4.1.3	Requirements approved	19Mar10	05Jun09	L.5
1.7.4.11	Detector control system released	15Apr10	12Jun09	L.5
1.7.1.6.3.1.13	Event buffer farm core software for software first release	11Mar10	16Jun09	L.5
1.7.2.4.3	Evaluation components received	16Apr10	06Jul09	L.5
1.7.1.8.4.8	Global trigger system for software second release	12Apr10	15Jul09	L.5
1.7.1.11	DAQ software ready for IPND	12Apr10	15Jul09	L.4
1.7.2.1.8	IPND data concentrators ready for installation	25May10	21Aug09	L.4
1.7.2.5.1.3	Requirements approved	08Jul10	06Oct09	L.5
1.7.2.5.3	Evaluation components received	05Aug10	03Nov09	L.5
1.8 -- Detector Assembly R&D				
1.8.5.2.12	IPND systems designs completed	24Feb10	21Apr09	L.5
1.8.6.4	30% design of far detector mechanical systems and tooling completed	03Mar10	28Apr09	L.5



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Sort: BaselineFinish
Run: 17Dec09

Baseline: NOVA_PMB
Page 1 of 2

NOVA_PROJECT

Milestone Gantt Chart - Missed milestones
Monthly Report - November 09
Time Now: 01Dec09
Baseline: NOVA_PMB

Baseline Date
Completed Milestone
Current Forecast Date

Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level	FY09 (F M A M J J A S)	FY10 (O N D J F M A M J J A S)	FY11 (O N D J F M A M)
1.8.5.4.5	IPND block assembly facility completed	15Apr10	11Jun09	L.6		-211d	
2.0 -- ANU Construction							
2.0.1.2.8.1	Gap Clearing/RR Inj Kicker Magnet Design Complete	01Dec09	01Sep09	L.3		-62d	
2.4 -- PVC Extrusions							
2.4.1.2.3.2	Vendor Samples POs Issued	02Mar10	25Sep09	L.5		-105d	
2.4.1.1.5	Extrusion PO Issued	01Dec09	01Oct09	L.2		-40d	
2.7 -- Data Acquisition System							
2.8 -- Near Detector Assembly							
2.8.1.1.6	Administrative and safety signoffs on near detector cavern excavation design	30Mar11	08May09	L.6			-47
2.9 -- Far Detector Assembly							
2.9.2.2.21.3	Final design approved-south bookend	21Dec09	20Feb09	L.5		-211d	
2.9.3.1.3	Scintillator transfer facility final design approved	01Feb10	27Feb09	L.5		-231d	
2.9.1.1.3	Final design approved - module lifting fixture	18Feb10	05Mar09	L.5		-240d	
2.9.2.2.22.3	Final design approved- north bookend	15Jan10	13Mar09	L.5		-211d	
2.10 -- Project Management - Construction							
2.10.9.23	DOE OECM - FRA EVMS Certified	29Jan10	01Jun09	L.2		-165d	

Project: NOVA_PROJECT
View: NOVA_BARVW_59
Filter: Milestone = [BOOL.T] and C3 <> 'O' and COMPSTAT <> [ACTS.2] and BFDATE < {12/01/09}
Sort: BaselineFinish
Run: 17Dec09

Baseline: NOVA_PMB
Page 2 of 2

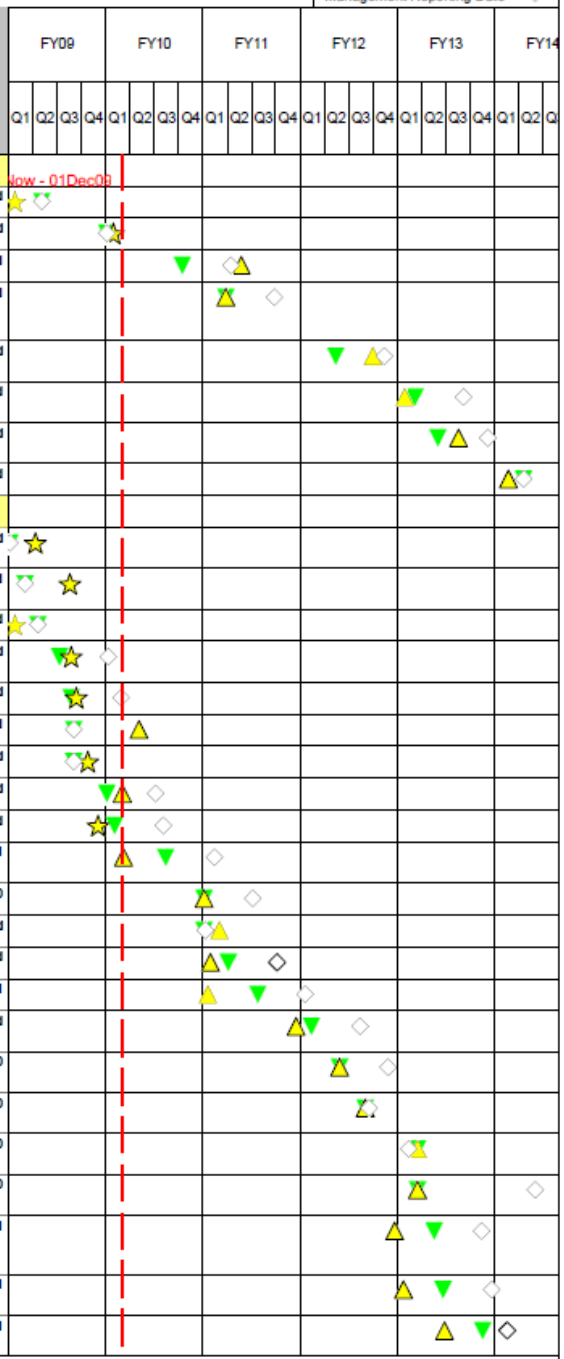
Milestone Analysis by Management Level

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

Nova_Project
Milestone Gantt Chart
Nova_Milestones_L1_L2 = [BOOL.T] and ESDATE >= {10/1/08}
November 09 Status
TimeNow: 01Dec09

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-3a	02Feb09	24Oct08	02Feb09	63d	63d
CD-3b	01Oct09	29Oct09	01Oct09	-21d	-21d
IPND ready to take data	12Jul10	18Feb11	12Jan11	-27d	-152d
Beneficial occupancy (Substantial completion) - far detector building construction	22Dec10	23Dec10	22Jun11	123d	-1d
Beneficial occupancy of near detector cavern	10Feb12	27Jun12	10Aug12	30d	-97d
NuMI neutrino event observed in Superblock 1	03Dec12	26Oct12	03Jun13	147d	24d
Near detector completed and ready to operate	01Mar13	16May13	03Sep13	74d	-54d
14 kt installation completed	16Jan14	19Nov13	16Jan14	35d	36d
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	15May09	01Dec08	-115d	-114d
DOE OHEP CD-3a Mini-review	15Jan09	24Oct08	15Jan09	52d	52d
Site preparation purchase order released	06Apr09	22May09	06Oct09	93d	-34d
Waveshifter PO issued	22May09	08Jun09	23Nov09	117d	-10d
DOE OECM - FRA EVMS Certified	01Jun09	29Jan10	01Jun09	-166d	-165d
DOE OHEP CD-3b Review	01Jun09	23Jul09	01Jun09	-38d	-37d
Extrusion PO issued	01Oct09	01Dec09	01Apr10	82d	-40d
WLS fiber PO issued	02Nov09	01Sep09	03May10	165d	42d
Decision point for buying additional waveshifter powders	11May10	03Dec09	11Nov10	237d	108d
Mineral oil PO issued	01Oct10	01Oct10	01Apr11	124d	0
IPND blocks completed	04Oct10	02Dec10	08Oct10	-38d	-41d
APDs PO issued	03Jan11	27Oct10	01Jul11	170d	43d
Block pivoter completed	20Apr11	15Oct10	20Oct11	254d	127d
Decision point for buying additional APDs	11Nov11	13Sep11	11May12	166d	43d
Decision point for buying additional WLS fiber	23Feb12	23Feb12	23Aug12	128d	0
MI Ring Modifications Ready for Beam Transport	01Jun12	01Jun12	14Jun12	8d	0
RR Modifications Ready for Beam Transport	13Dec12	13Dec12	09Nov12	-23d	0
Ready to Commission Upgrades with Medium Energy Neutrino Beam	13Dec12	13Dec12	03Mar14	301d	0
Decision point for buying additional extrusions, modules, mineral oil, pseudocumene	13Feb13	17Sep12	13Aug13	227d	100d
Far Detector extrusions for 14kt completed	20Mar13	22Oct12	20Sep13	228d	100d
Far detector modules for 14 kt shipped	15Aug13	26Mar13	15Nov13	164d	100d



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Sort: BaselineFinish
Run: 17Dec09

Baseline: NOVA_PMB
Page 1 of 1