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October, 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 9
WBS 1.2 & 2.2 LIQUID SCINTILLATOR 12
WBS 1.3 & 2.3 WAVELENGTH SHIFTING FIBER 14
WBS 1.4 & 2.4 PVC EXTRUSIONS 16
WBS 1.5 & 2.5 PVC MODULES 18
WBS 1.6 & 2.6 ELECTRONICS 19
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

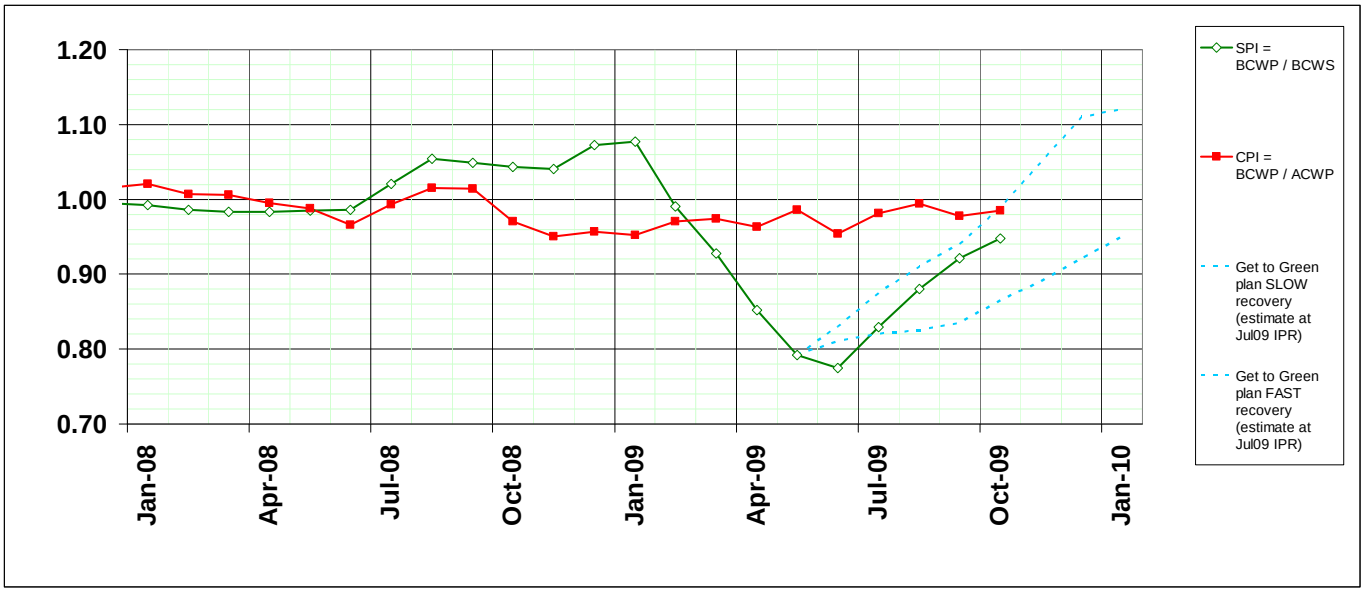
EVMS SUMMARY 25

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 36
MILESTONE STATUS: WINDOW OF -3 TO +6 MONTHS AROUND OCTOBER 38
MISSED MILESTONES 41
MILESTONE ANALYSIS BY MANAGEMENT LEVEL 43

Project Office Overview

(J. Cooper)

NOvA Project SPI performance through October is shown below and remains within the envelope indicated by the two dashed blue "Get to Green" lines.



On July 9 the DOE Office of Engineering and Construction Management set NOvA's rating to "yellow" based on the slide of the Schedule Performance Index slide during February through April 2009. During July the Project prepared for the DOE IPR CD-3b Review and developed the "Get to Green" plan presented at the July 21-23 review. Performance through October has gone according to the plan and the Project now has had an SPI back above 0.90 for two months in a row.

As agreed with DOE OHEP in September, a pre-ESAAB meeting was held on October 21, 2009 and attended by the Fermilab Directorate, DOE OHEP, and the DOE Office of Project Assessment (Office of Science). 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. The project's response to recommendations from the July IPR and the project's current EVMS status as displayed in the above plot were discussed. Following the meeting there was agreement that the ESAAB meeting scheduled for October 29 should proceed.

The ESAAB meeting was held and recommended CD-3b. Dennis Kovar signed the CD-3b approval document on October 29, 2009.

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

- The 3.6 mile access roadway was completed in September (gravel only).
- By October 9th the rock excavation for the Far Detector building was 67% complete with the entire excavation down to a depth of 20 feet. Discussions

continued during the rest of October 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.

- Rock bolting of the walls in the first 20 foot lift began in October.
- Foundations for the above ground Loading Dock portion of the building were installed in October and structural steel erection began.
- The contractor had worked 118 days by the end of October without a lost time accident. There was one recordable incident in August (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
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. Injection Line preliminary design work continued with a focus on adding beam tube details to the 3D model. This identified interferences with magnets. Solutions were proposed, and work continues to confirm they will be effective. The PDS strong-back interferences have been resolved.

The PDS Design Review took place in September. The Review Report was received in October, and is documented in NOVA-doc-1794. Several recommendations were made which will improve the safety and performance of this new magnet system. Orders for SmCo5 bricks for the PDS magnet have moved forward.

ADCW magnet assembly was delayed due to concerns relating to beam tube options. Assembly is expected to resume in November.

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 then begin. All tooling parts are accounted for and tooling assembly commences in early November.

Fabrication of flux shorting shims is expected in November for the 20" permanent Recycler quads. Trimming will resume when cut bricks are received and new shims are fabricated.

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 RR Injection Kicker magnet has been potted. The capacitors for the remaining magnets will be ordered once the first magnet has been measured. The vendor who is making the RR Injection cable for the pulser is still having QC problems, although serious discussions on how to accomplish good cable have begun. Measurement of the resistors for loads has been completed. The measurements show that all the resistors are low and so another small batch of resistors has been ordered so that the final value can be achieved.

1.0.2.1 MI Modifications

Progress continues on developing the hardware and software for the LLRF system. Testing of the High level control is complete. This portion of the project is currently 80% complete and is on schedule to finish in November.

1.0.2.2 MI RF Cavities

Testing of two Main Injector RF cavities has been completed.

1.0.3.2 NuMI Target Hall Technical Components

A solid model for the analysis of the target carrier has been developed, and the calculation (MARS Monte Carlo) of beam heating for the carrier parts has been done. Analysis will now be carried out, to see if thermal expansion and temperature rises are within specification or design modifications are necessary.

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:
A meeting was held to discuss the Target Chase Cooling Requirements document together with the target chase heat loads and Design Concurrence Document. The requirements and heat loads were agreed upon and finalized with some minor revisions; both documents have been updated and approved in the docdb. Remaining items are the new surface chiller operating specs and chase cooling coil parameters (this is work in progress).

Work continued on Horn 1 stripline analysis to address comments from the Initial Design Review. Results from a revised analysis were presented at a NuMI upgrades meetings—some new items were identified for further analysis and work continues on that front.

1.0.3.4 Decay Pipe, Hadron Absorber and Utilities
Engineering resources have been assigned to the cooling system tasks and analysis has resumed.

1.0.4 Beam Physics

Study of the accelerator complex efficiencies continued. The Booster has demonstrated production 10×10^{16} protons/hr. which is approaching the NOvA demand of 13×10^{16} protons/hr. More improvement is expected in the coming year. However, the level of production is well short of the combined demand of NOvA and other potential users (MicroBooNE, g-2, and Mu2e) which could be as much as 22×10^{16} protons/hr. This mismatch of supply and demand remains a concern and the progress of the Booster must be closely monitored.

WBS 2.0 ANU Construction (P. Derwent)

2.0.1.3 Recycler Instrumentation

The remaining damper amplifiers have been received and tested. Steady progress is being made on the DCCT electronics.

2.0.2.1. MI Modifications

Purchase requisitions for equipment racks and communication cables are complete for the MI14 and MI39 service buildings. Delivery is expected this month and we hope to complete the cable pulls by the end of this month.

2.0.2.2 MI RF Cavities

Main Injector RF Cavity Ferrite Bias Supplies (FBS):
The fifty-four heat sinks above have been plated and assembly of the Silicon Controlled Rectifier packs has begun. Transformers have been mounted in the bias supply frames and we are officially complete with 20% of the assembly.

2.0.3.1 NuMI Primary Proton Beam

Vendor fabrication continues for the 75kW Spang power supplies. Beam testing for prototype beam transport profile monitors also continues, with good results.

2.0.4 ANU Project Management

ANU management provided input for the DOE CD3b Mini-review on October 21. ARRA procurements continue to be monitored. There are 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).

The two new hires identified in AD Mechanical Support Department as part of the replanning exercise are going forward. One has been posted on the FNAL jobs website and selection within the AD Mechanical Support Dept has begun. The second is still in the approval process.

We encountered fluid engineering staffing problems during the month. The lead fluid engineer for the project went on unexpected medical leave (for surgery on disk problem). Before he left, the AD Mechanical Support Dept had identified an engineer to cover during his absence and meetings were held to transfer appropriate knowledge and task information. Two days after the lead engineer went on leave, the replacement engineer passed away unexpectedly. AD Mechanical Support has been proactive in identifying a third engineer to pick up these tasks but it will require approximately one month to free said engineer from his other commitments. The lead engineer is expected back in January 2010.

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 complete in October 2009. This package will provide the foundation, building shell and utility duct bank for the building. This work was issued for Comment and Compliance Review in October 2009 and can be found in NOVA-doc-4255.

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.

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 are available.

1.1.5.2 Near Detector Surface Building – Procurement Phase

In October 2009, the documents for the first construction package (NDSB Shell) were issued for competitive procurement. The proposals are due in early November 2009.

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 118 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 67% 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 October 2009, the contractor submitted a comprehensive blasting plan for the remaining rock excavation. The project team reviewed the plan and concurred with the approach with comments. These documents can be found in NOVA-doc-4130.

On October 15th, the contractor presented a history of the excavation activities to date to the project team. On October 16th, the project team met with the contractor and the excavation subcontractor to discuss cost issues related to the rock excavation. At the center of the discussions was the Unforeseen Conditions clause in the contact. The information was reviewed, but no decision was reached on a path forward. The project team requested that the contractor review their documentation and contract language before formal submittal.

In October 2009, the project team and the contractor began having bi-monthly meetings to discuss the changes and potential claims.

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:

- Foundations for the Loading Dock portion of the building were installed October 2009.
- Structural Steel erection for the north end of the Loading Dock building was begun in October 2009.

The contractor has begun the installation of structural steel and the metal siding at the northern end of the Loading Dock in order to complete a weather tight enclosure by the end of the 2009 construction season. The metal wall panels and roof will be installed in November and December 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 revised 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 is now expected in November 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 October 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

At Indiana a new column and set of injectors were received for the GCMS QC tests at IU Chemistry. Careful testing of large numbers of samples was done to determine the accuracy of the pseudocumene concentration measurements with the new apparatus. Testing was done by preparing pseudocumene + mineral oil samples with known concentrations and then testing the samples for the known mass density of pseudocumene. These tests have been successful. Similar tests are underway to determine the accuracy of the HPLC determinations of the waveshifter concentrations.

1.2.5 QA/QC

At Fermilab, the Project Chemist visited Northern Illinois University (not a NOvA Collaborator) to meet with Heike Hofstetter, the chemist responsible for the Instrumentation Laboratory performing the HNMR and IR spectra in the dopant samples. The equipment used and the results recorded were discussed.

At Indiana, several samples drawn in September 2009 from the ISO tanker of 2008 blended scintillator at Fermilab were investigated. An additional sample from the corner of the ISO tank was taken in October. These samples were analyzed at IU using the gamma test for light output, analytic chemistry to determine the composition, and the IU spectrophotometer for attenuation length. Light output and chemical composition tests were also done on samples of baseline scintillator blended at IU and scintillator drawn when it was first blended in September 2008.

We believe that we have finally demonstrated the chemical analysis of scintillator yields accurate results. The GCMS for pseudocumene needs five runs before reliable results can be obtained. The HPLC does not require warm-up runs.

The results of these tests showed that the baseline scintillator blended at IU had the largest light output. The 2008 scintillator samples were brighter than the same scintillator drawn from the tank after sitting for a year until 2009 September. Chemical tests show that the concentration of pseudocumene and waveshifters also fell. Further testing showed that the scintillator in the corner of the ISO tank had the same composition as the scintillator from the top near the manhole and from the bottom near the spigot. The scintillator in fall 2009 was well mixed. These tests will be continued.

Construction of three additional IU spectrophotometer dark boxes is underway. Testing of the IU spectrophotometer dark box built in September verifies that the device gives results consistent with the spectrophotometer used in all our R&D work.

A change request was processed that allocates the funds for three tintometers. These will be purchased in November through Fermilab and calibrated relative to the IU spectrophotometer at IU.

IU continued working on R&D/rebuild of the long laser spectrophotometer for accurate attenuation length measurements of mineral oil. Troubleshooting, interpreting, etc. the results of both chemical and light yield analysis of the Fermilab isotanker of NOvA liquid scintillator. Writing specs and acquiring information for purchase of parts for devices to be used in future production scintillator QA testing.

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

A second shipment of waveshifters was delivered in October from Curtiss Labs. In October, we performed the QC tests in the PPO and bis-MSB samples whose lots were part of the second delivery. The two shipments at Fermilab have been moved to a permanent storage location in the warehouse. Some pallets had to be repackaged because they did not fit in the available shelves.

2.2.4 Production Methods

The Project Chemist, Project Mechanical Engineer, and Scintillator Level 2 Manager have been investigating the production of 25,000 gallons of scintillator for the ND by toll blenders in the Chicago area as a test of the production model. The site of a toll blender in North Chicago, EMCO Distributors, was visitied during October. The company has the facilities to store incoming materials and do the mixing and blending of the different components. They have experience in QC with a nice equipment setup and room to accommodate any apparatus supplied by NOVA. It seemed a very capable group for the NOVA liquid scintillator needs.

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).

1.3.5 Integration Prototype- Near Detector Production

A second pass through the 16 spools has been completed with a new QAS. Photodiode and Spectrometer data are available. Light from the 700-micron wavelength shifting fiber is sampled by a 400 micron optical fiber. With the optical fiber, the rotational variations in the amplitude of the spectrometer data from a single fiber have been reduced to < 2%. For a sample of 15 spools, the attenuation length variations at fixed wavelength are < 2.5% over the full spectrum. However light is collected over only the central 33% of the area of the wavelength shifting fiber. This restriction in the physical acceptance makes it more difficult to predict the results of the photodiode scan, which accepts light from the entire fiber and at all angles. The photodiode intensity measurements have a ~5% variation at 1m increasing to ~8% at 15m, and ~10% at 26m.

Shipment of IPND fiber to Minnesota has begun. A single spool was shipped on October 9. It was reported by Minnesota that most of that spool has been dispensed in preparation of the threading machine for production work. The tension, > 150g, used on the Minnesota threading machine is twice as large as is used when the fiber is put onto the spool at Kuraray. We believe that this is one of the major contributors to the Minnesota difficulties. The QAS uses < 75g of tension on the fiber at all times. We have offered help in generating this low tension to the Minnesota factory manager.

In addition Minnesota reported that there was a break in the fiber mid-spool and that paper separators in the MINOS fiber were missing from the NOvA fiber. Kuraray reported that they had no recollection of such paper separators on the MINOS fiber spools, and MINOS personnel later confirmed that there were no paper separators in the MINOS fiber production spools. An apology for causing this distraction was sent to Kuraray. Thirteen additional spools were shipped to Minnesota the last week in October. The QAS data for these spools was reviewed above.

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

First delivery of fiber from Kuraray from the 1050 km order will not be until January/February 2010.

We have obtained from US Customs approval for the duty waiver. We await State Department approval.

DOE has approved the purchase of fiber to complete a 14 kT detector, and a purchase order is being prepared.

The scanner for Kuraray is nearing completion. It will be shipped broken down into component parts and reassembled in Japan. The shipment date has been set for November 9-10.

Production for the Far Detector fiber and the remainder of the Near Detector fiber are likely to begin in November. Kuraray will continue to provide their standard QC for any fiber produced prior to the operation of the QAS. A Fermilab property tag for each QAS and permission to loan one QAS to Kuraray have been obtained.

WBS 1.4 & 2.4 PVC Extrusions

(R. Talaga)

1.4.1 Physical Properties Determination and Test Method Development

N-27 PVC creep test stands at constant (room) temperature continued during September.

A preliminary report on the accuracy of the camera system was encouraging but there is a question if measuring the average width of a web or a wall is sufficient because those objects are not defined by simple straight lines. For example, webs made by the prototype die have an hourglass shape.

1.4.2 Raw Materials

As reported last month, a new order for 36,000 lbs of N-27 PVC resin was extruded in July. There were noticeable differences from the batch of N-27 made by Aurora in 2007.

After informing Aurora of this issue, they believed the problems came about because the new batch of N-27 was produced at their Ohio plant, with a higher mixing capacity of the North Carolina plant (which had supplied all of the previous orders of N-27). A larger mixing capacity would require longer mixing times to achieve the correct temperatures, which was not done.

Aurora prepared a new blend of N-27 at their North Carolina plant in September and delivered it to Extrutech for testing in October. This was done at no cost to NOvA. They also provided N-27 made with Westlake PVC instead of the NOvA specified Shintech PVC because they believe the two brands of PVC to have similar properties and expect the Westlake PVC would cost 10% less. There was a test at Extrutech (see 1.4.3. below) on October 7, with Aurora Plastics representatives present. Aurora agreed that the N-27 made in their Ohio plant did not perform well when compared to the 2007 and 2009 N-27 blends made in North Carolina. However, we did not have the opportunity to test the Westlake PVC in October. That test will be done later this year.

As a result of the failure of Ohio-produced N-27, the PVC group (level 2 manager, all level 3 managers and the Project Chemist) visited Aurora Plastics on October 26 at their Ohio plant. We met with the company president and their technical staff to understand why the N-27 (Ohio) blend failed and why it was not seen in their QC procedures. We toured the plant and QC facilities and had a detailed discussions and a productive visit.

The outcomes of the Aurora Plastics meeting were:

(1) Aurora will replace at no cost to NOvA the entire order of 36,000 lbs of N-27 with quality material.
(2) Aurora will optimize their blending protocol at the North Carolina plant and at the Ohio plant and, as proof, deliver one third of the 36,000 lb replacement with N-27 made in Ohio.
(3) Aurora will perform QC tests against a standard of the N-27 made in North Carolina in 2007.
(4) Other more technical details involving reflectivity and material strength were discussed and will be checked by Aurora.

1.4.3 Extrusions

An extruding test, paid for by Aurora Plastics, was conducted at Extrutech on October 7 to test the new N-27 blends (see 1.4.2 above). At the start of the extruding test it was noticed that one of the extruder heater bands in the barrel zone malfunctioned, so the extrusion profile was not optimal. Nevertheless, extrusions were produced and the change in processing characteristics and impact strength when N-27 (2007 North Caroline) was switched over to N-27 (2009 Ohio). Upon re-introduction of N-27 (2007 North Carolina) the processing characteristics and impact strength improved, as expected. Finally, upon introduction of N-27 (2009 North Carolina) there was no apparent change in the processing characteristics and impact test, proving that N-27 blends made in North Carolina performed as expected, to the satisfaction of NOvA.

Because the heater band malfunctioned we chose not to extrude the N-27 blend made with Westlake PVC. Another extruding test planned for November will include a test of the Westlake material.

1.4.4 Shipping and Handling1.4.6 Management

A full stack of 48-foot 6 inch FHEP vertical extrusions (60 pieces) was loaded into an enclosed truck at Extrutech and driven to Green Bay and back (~ 3 hours). The first test was with a non-Air Ride truck. The stack shifted a bit: layers of extrusions slid sideways by up to a couple of inches. The stack was unloaded using the same caster jack system as for loading. Unloading proved to be more difficult because the casters had to roll over a step (made by the loading dock bridge as it rested on the truck floor). Eventually the stack was removed with the aid of a forklift. The next day an Air Ride enclosed van was used to perform the same test, after the stack was straightened. Loading with caster jacks was easy and quick. This time, straps were used to secure the load in the truck (no strap attachments were available in the previous truck). After the same tour of Green Bay, the truck returned and the load was found to have shifted, albeit less than before. Unloading was easier than before because the bed of this truck was more even with the loading dock floor.

As a result of these tests, a new method for securing the stack in the truck (using air bags) and offloading (not using forklift to lift the stack while moving out) will be tried in November.

1.4.6 Management

An EVMS update was presented to all managers, including this L2 PVC manager.

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

Injection molded & extruded examples of all manifold parts were delivered. List follows:

- 1400 Fiber Trays delivered (IPND order complete)
- 26 Raceway Covers delivered.
- 994 Optical Connectors Delivered (IPND order complete)
- 22,400 Retaining Rings delivered (IPND order complete)
- 100 Manifold Covers delivered.
- 120 Snouts delivered.
- 8,000 Nylon Rivets delivered (IPND order complete)
- Center Seal Parts delivered (IPND order complete)

The specification measurements on end seal sample parts were completed. First manifolds assembled & sealed. We used low viscosity adhesive (DP420) to deal with the difficulty of injection experienced with 2216 (equivalent of DP190).

1.5.3 Photo Detector Interface R&D

No Change this month.

1.5.4 Module Factory R&D

First full length module produced which included all fiber and end seal parts. Only the piccolo tube (scintillator fill tube) was not included. We rebuilt the 50-foot Two-to-One table so it meets specification on step height and flatness when two extrusions are glued together to make one NOvA module..

Five FHEP vertical modules produced.

We completed one near detector horizontal module.

1.5.5 Quality Assurance and Quality Control Methods Development

Software was at near detector module factory and we fixed issues with Mac OSX, so now code runs on Windows, Mac OSX, and Linux.

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 and production timeline have not been completed yet. Production of the test stand for the APDs continued. The commercial parts have been purchased and the mechanical parts are being produced. A test of the cooling system for the test stand showed good results in getting to the target -15C temperature. Test of fly cutting of the light collection surfaces has been tested at the Minnesota module factory.

Production of APD module parts for IPND has begun. Parts for over 300 heat sinks and clips have all arrived and are being assembled at IU. The high volume production techniques and gasket sealing designs were all completed. 280 spacer frame parts were produced, but may need to be reproduced, depending on the final results of the APD stack design. The additional parts for full near detector quantities have arrived. Tests have shown that some of the parts are too short. Discussions with the manufacturer are underway to understand what to do about the substandard parts. Further work was done on the pressure test apparatus as well.

1.6.2 Front End Board

Failure analysis was performed on "current limiter" circuits to be deployed, one per channel, on the HV distribution boxes. Detailed simulations were completed corresponding to 17 distinct "single point failures" and the Project Electronics Engineer wrote a report with recommendations to Steve Chappa (Fermilab Safety Committee). Thi

Harvard performed simulations in an effort to analyze the timing extraction method presented at the last collaboration meeting. A technical interchange on the subject of "physical process based noise simulations" for the APD/Amplifier/shaper and subsequent sampling and signal processing is in progress.

Harvard performed board modifications on several FEB 3.0s to send to Fermilab for test purposes. An incorrect regulator footprint on that board required the hand modifications. Firmware was also tweaked as needed.

1.6.3 Power Distribution

PDB:

- Decision to use the transistor current limiter design was made.
- Schematic for the new FEB card was completed by UVa engineer Stephen Goadhouse.
- cadence license problems fixed at UVa.
- New faceplate design for FEB card finished.
- beginning the layout of the final cards now.

Power Supplies:

- Testing of supplies is nearly complete, with the hurdle of a functional 24V pod expected soon.

1.6.4 Management - R&D Phase

No change since the last report.

1.6.5 Vertical Slice Tests

The analysis 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

The DAQ software effort has shown progress in several areas, particularly DAQ monitoring. There was also a lot of effort expended in getting the packages organized so that they could be built by SRT. There was also some work in understanding the WBS, particularly the production efforts, and why they were all piling up at Oct. 1. Part of this has been fixed, but more effort is needed to rationalize the WBS.

1.7.2 DAQ Hardware

During October Rick work continued on debugging the newest DCMs. The BGA parts did not go onto the board well and it was found to be too much warping of the PC board when it was heated. A support jig was constructed to hold the board flat and the BGA parts were re-flowed or replaced successfully. Boundary scan testing of the board-plus-parts confirmed the expected connectivity and board testing moved to loading flash memory and testing the processor peripherals. The processor starts booting but it appears the configuration of the memory is not correct; initialization information in the boot loader must be corrected. After some debugging the Ethernet ports are working except when one active line moves to the second port. It is believed this is another initialization parameter that needs to be corrected. DAQ software experts are looking at the boot loader changes while the rest of the peripheral testing and mechanical fitting proceed.

Work continued on software for the TDU ARM micro-processor and the GPS receiver. Firmware for the TDU is being written.

Preparations began for purchases of hardware for the prototype Near Detector network, buffer farm, disk storage, database, and control room.

1.7.3 Detector Control

No progress this month.

1.7.4 Detector Control System

Progress continued on testing power supply operation in support of testing efforts. We are currently holding on software development for DCMs, FEBs, and power supplies pending next generation of DCM prototypes and decisions on power supply vendor and models.

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

No change this month.

1.8.2. Structural Design Validation

No additional work on this occurred during September.

1.8.3. Liquid Scintillator Filling and Handling

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

1.8.5. Integration Prototype Near Detector (IPND)

During October, NOvA physicists and engineers continued planning for the resumption of IPND / Near Detector 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 blocks to the current plan. A new enclosure, that would accommodate the full Near Detector, is now being planned.

Final fabrication drawings for the IPND / Near Detector are not yet completed, pending an exploration of methods of draining the scintillator from these modules.

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 / Near Detector 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

There was no significant work in this area during August.

1.8.8. Far Detector Prototypes

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

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

Adhesive tests with PVC extrusions were performed to determine the appropriate compression that should be applied during block assembly.

1.8.9. Management

During October, 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 adhesive dispenser design and lifting fixture design were declared complete in October. The prototype devices operated well during the FSAP construction. Construction of the second lifting fixture has begun.

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 October 6, 13 and 27. The discussion was focused on technical progress towards completion of the FHEP and Near Detectors.

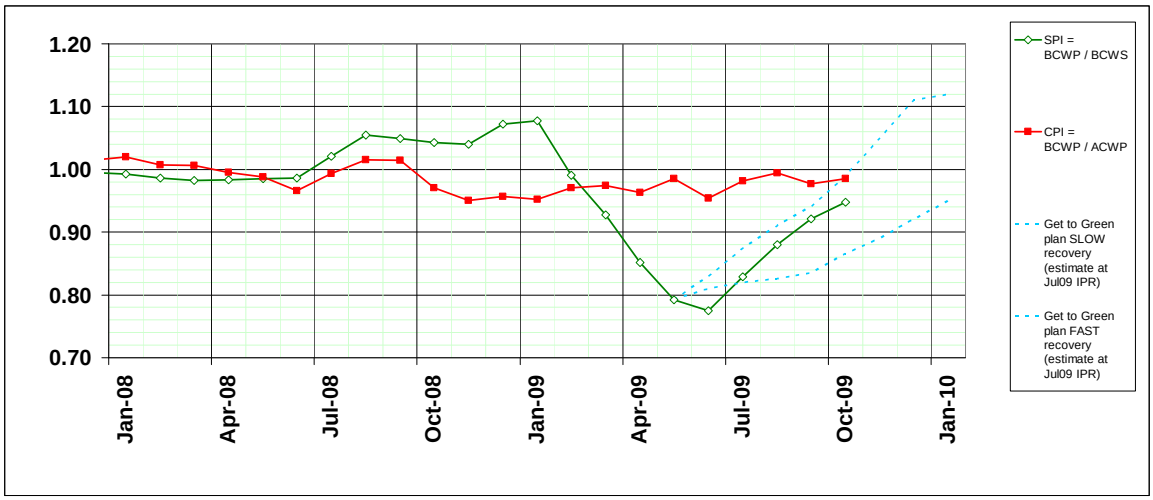
No **NOvA Project Management Group** meeting was held during October.

EVMS Summary

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

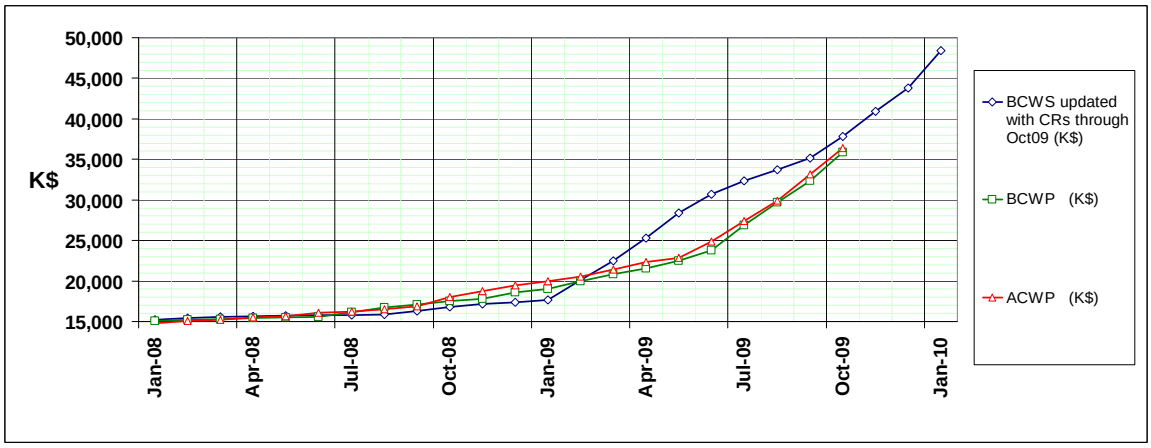
CPI and SPI curves.

As discussed in the Overview section of this report, the Schedule Performance Index continued remained above 0.90 during October.

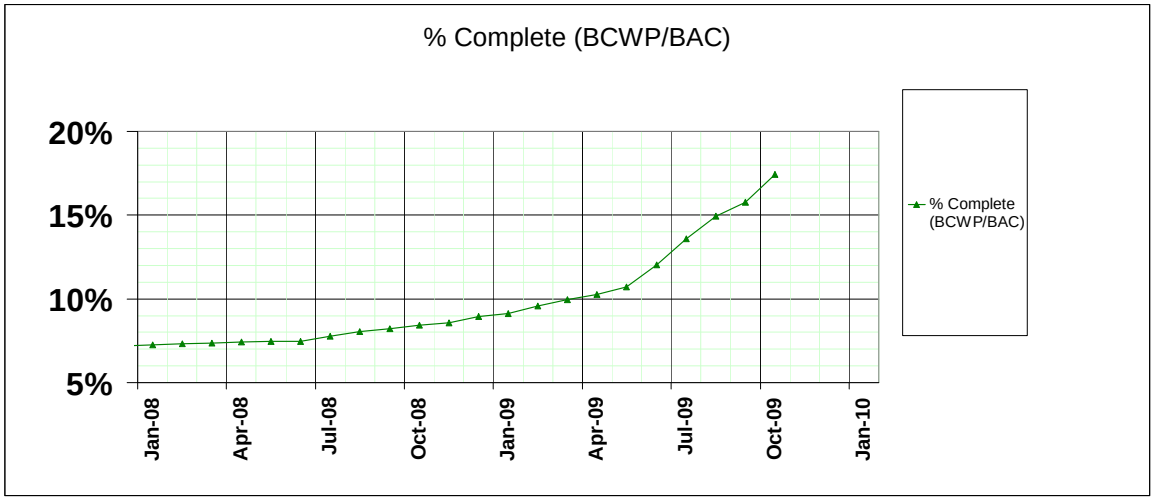


BCWS, BCWP, ACWP History.

The BCWS curve (dark blue) reflects the updated schedule developed for the July DOE IPR.



Percent Complete



Baseline Change Control Log Actions

The NOvA Project Management Group serves as the highest level change control board. During September, twelve NOvA changes were approved by the NOvA Project Manager. All twelve required a higher approval as well since we exceeded the threshold requiring FPD approval.

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
79	new task 2.1.2.4.2.1.4, existing tasks in 2.5.4 and 2.9.5	Contingency: Add Minnesota Admin Assistant and Asst Factory Module Manager	11/2/2009	L3 (Directorate)	$343,575.00	none	Approved by DOE FPD
116	various	Cumulative CR D	11/13/2009	L2 (DOE Fermi)	$0.00		Approved by DOE FPD
104	1.5, 2.5, 2.8	Revise ND/IPND Module Labor and Shipping	11/3/2009	L3 (Directorate)	$379,519.74	L3 milestone	Approved by DOE FPD
113	1.8, 2.9	Reschedule Several Detector Assembly Tasks	11/10/2009	L2 (DOE Fermi)	$3,374.75	L2 Milestone	Approved by DOE FPD
112	1.5.5.18 new task	Create Full Length Functional Test Modules	11/4/2009	L4 (NOVA PM)	$6,961.11	none	Approved by DOE FPD
110	2.7.1.1 and 2.7.1.2	Schedule Adjustment DAQ Software	11/4/2009	L4 (NOVA PM)	$13,313.49		Approved by DOE FPD
109	Various	Update Cobra Rates to FY10 Fermilab OH and FESS Chargeback Rates	11/2/2009	L2 (DOE Fermi)	($1,027,183.62)		Approved by DOE FPD
108	2.1.1.5	Increase A/E Site Prep Package Fee for Rock Issues	11/5/2009	L4 (NOVA PM)	$247,000.30		Approved by DOE FPD
107	new tasks 2.0.1.2.1.1.17 - 20	Procure Vacuum Oven for Beamtubes	11/5/2009	L4 (NOVA PM)	$46,304.23		Approved by DOE FPD

Friday, December 11, 2009 Page 1 of 2

CR #	Affected WBS #'s	CO Title	Date:	Level of Change	Final Cost Impact	Final Schedule Impact	Status
101	2.0.1.2, various tasks	Kicker Magnet Cooling Skid and Piping Changes	11/4/2009	L4 (NOVA PM)	($113,845.68)	none	Approved by DOE FPD
97	2.10.4.3	Factory Machines Engineering Review	10/30/2009	L4 (NOVA PM)	$25,686.64		Approved by DOE FPD
79	new task 2.1.2.4.2.1.4, existing tasks in 2.5.4 and 2.9.5	MR: Add Minnesota Admin Assistant and Asst Factory Module Manager	11/2/2009	L3 (Directorate)	$334,974.00		Approved by DOE FPD
				Total Baseline Cost Change this Month	$259,679.96		

Friday, December 11, 2009 Page 2 of 2

Estimate to Complete Log

A discussion of the ETC forecast method used by NOvA appears in the March 2009 Monthly Report.

ETC012 was added during October.

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	

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	NAME	NAME	FROM 01-Oct-2009
Fermi National Accelerator Laboratory		NOvA Project	TO 31-Oct-2009

PERFORMANCE DATA

CTC-FndSrc / WBS[2] / Results... / ITEM	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE			LATEST REVISED	
	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	BUDGETED	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$K	265	473	265	208	208	3,037	2,407	1,812	(629)	595	31,401	30,849	553
CTC-FndSrcTotals:	265	473	265	208	208	3,037	2,407	1,812	(629)	595	31,401	30,849	553
DC DOE-CA													
2.1 Site and Building													
Fully burdened AY$K	857	1,619	1,675	762	(56)	5,510	8,991	8,588	3,481	403	31,695	30,959	736
CTC-FndSrcTotals:	857	1,619	1,675	762	(56)	5,510	8,991	8,588	3,481	403	31,695	30,959	736
DD DOE-ACEL R&D													
1.0 ANU R&D													
Fully burdened AY$K	148	167	161	19	6	4,705	3,504	3,206	(1,201)	298	7,896	7,654	241
CTC-FndSrcTotals:	148	167	161	19	6	4,705	3,504	3,206	(1,201)	298	7,896	7,654	241
DE DOE-DET MIE													
2.1 Site and Building													
Fully burdened AY$K	97	11	19	(87)	(8)	759	832	223	73	609	1,808	1,114	693
2.10 Project Management - Nova Project - Construction													
Fully burdened AY$K	171	171	193	0	(22)	1,410	1,410	1,166	0	244	9,598	9,354	244
2.2 Liquid Scintillator													
Fully burdened AY$K	524	522	524	(2)	(1)	978	976	958	(2)	18	19,154	20,203	(1,049)
2.3 WLS Fiber													
Fully burdened AY$K	1	1	0	(1)	1	9	72	59	63	13	10,075	11,077	(1,002)
2.4 PVC Extrusions													
Fully burdened AY$K	94	83	0	(11)	83	469	168	0	(301)	168	25,284	24,856	429
2.5 PVC Modules													
Fully burdened AY$K	32	32	13	0	19	193	193	121	0	72	11,358	13,974	(2,616)
2.6 Electronics													
Fully burdened AY$K	1	1	0	0	1	7	7	4	0	3	12,236	12,256	(19)
2.7 DAQ													
Fully burdened AY$K	185	36	0	(150)	36	187	63	0	(125)	63	3,456	3,395	61
2.8 Near Detector Assembly													
Fully burdened AY$K	14	2	32	(12)	(30)	115	91	78	(24)	13	4,244	4,261	(17)
2.9 Far Detector Assembly													
Fully burdened AY$K	98	25	7	(74)	18	429	299	182	(130)	117	13,291	13,066	225
CTC-FndSrcTotals:	1,218	883	788	(335)	95	4,557	4,111	2,792	(445)	1,320	110,505	113,556	(3,051)
DO DOE-ACEL OPS													
1.0 ANU R&D													
Fully burdened AY$K	0	0	12	0	(12)	312	293	229	(19)	64	1,318	1,254	64
CTC-FndSrcTotals:	0	0	12	0	(12)	312	293	229	(19)	64	1,318	1,254	64
DR DOE-POST CD-1 DET R&D													
1.1 Site and Building R&D													
Fully burdened AY$K	17	7	0	(10)	7	2,302	2,297	1,627	(5)	670	3,630	2,953	677
1.2 Liquid Scintillator R&D													
Fully burdened AY$K	2	2	3	(0)	(1)	281	273	266	(8)	7	297	290	7
1.3 WLS Fiber R&D													
Fully burdened AY$K	0	2	0	2	2	341	315	302	(26)	13	341	306	35
1.4 PVC Extrusion R&D													
Fully burdened AY$K	6	3	55	(4)	(53)	1,366	1,165	1,578	(201)	(413)	1,369	1,782	(413)
1.5 PVC Module R&D													
Fully burdened AY$K	95	268	44	173	223	1,664	1,096	1,539	(569)	(444)	2,115	2,433	(318)
1.6 Electronics R&D													
Fully burdened AY$K	15	8	26	(8)	(18)	1,349	532	937	(816)	(405)	1,844	2,225	(382)
1.7 DAQ R&D													
Fully burdened AY$K	59	34	89	(25)	(55)	1,047	389	1,384	(657)	(995)	1,383	2,387	(1,003)
1.8 Detector Assembly R&D													
Fully burdened AY$K	0	16	153	16	(136)	2,183	1,305	2,781	(878)	(1,476)	2,777	4,277	(1,500)
1.9 Project Management R&D													
Fully burdened AY$K	0	0	0	0	0	383	383	559	0	(176)	383	559	(176)
CTC-FndSrcTotals:	196	339	371	144	(31)	10,916	7,755	10,974	(3,160)	(3,218)	14,139	17,213	(3,074)
DY DOE CD-0 TO CD-1 R&D													
1.9 Project Management R&D													
Fully burdened AY$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
Cost of Money	0	0	0	0	0	0	0	0	0	0	0	0	0
Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0
Undist. Budget											0	0	0
Sub Total	2,684	3,482	3,272	798	210	37,837	35,863	36,401	(1,974)	(538)	205,755	210,285	(4,531)
Management Resrv.											72,245		
Total	2,684	3,482	3,272	798	210	37,837	35,863	36,401	(1,974)	(538)	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 hours, not dollars. The data begins with Oct 2009, so the current and cumulative are identical.

CONTRACT PERFORMANCE REPORT
FORMAT 1 - WORK BREAKDOWN STRUCTURE

1. CONTRACTOR	2. CONTRACT	PROGRAM	4. REPORT PERIOD
a. NAME	a. NAME	NAME	FROM 01-Oct-2009
Fermi National Accelerator Laboratory		NOvA Project	TO 31-Oct-2009

8. PERFORMANCE DATA

WBS[2]	CURRENT PERIOD Sci Hrs					CUMULATIVE TO DATE from Oct 2009				
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE	
ITEM (1)	WORK SCHEDULED (2)	WORK PERFORMED (3)	WORK PERFORMED (4)	SCHEDULE (5)	COST (6)	WORK SCHEDULED (7)	WORK PERFORMED (8)	WORK PERFORMED (9)	SCHEDULE (10)	COST (11)
1.0 ANU R&D	405	352	193	(53)	159	405	352	193	(53)	159
1.2 Liquid Scintillator R&D	0	0	0	0	0	0	0	0	0	0
1.3 WLS Fiber R&D	0	9	0	9	9	0	9	0	9	9
1.4 PVC Extrusion R&D	0	0	40	0	(40)	0	0	40	0	(40)
1.5 PVC Module R&D	96	45	291	(51)	(246)	96	45	291	(51)	(246)
1.6 Electronics R&D	0	0	212	0	(212)	0	0	212	0	(212)
1.7 DAQ R&D	120	0	118	(120)	(118)	120	0	118	(120)	(118)
1.8 Detector Assembly R&D	0	0	59	0	(59)	0	0	59	0	(59)
1.9 Project Management R&D	0	0	0	0	0	0	0	0	0	0
2.0 ANU Construction	399	393	51	(6)	342	399	393	51	(6)	342
2.10 Project Management - Nova Project -	0	0	139	0	(139)	0	0	139	0	(139)
2.2 Liquid Scintillator	54	54	123	0	(69)	54	54	123	0	(69)
2.3 WLS Fiber	35	7	0	(28)	7	35	7	0	(28)	7
2.4 PVC Extrusions	56	53	0	(3)	53	56	53	0	(3)	53
2.5 PVC Modules	40	34	0	(7)	34	40	34	0	(7)	34
2.6 Electronics	18	18	0	0	18	18	18	0	0	18
2.7 DAQ	194	18	116	(176)	(98)	194	18	116	(176)	(98)
2.8 Near Detector Assembly	31	11	0	(20)	11	31	11	0	(20)	11
2.9 Far Detector Assembly	0	0	0	0	0	0	0	0	0	0
Undist. Budget										
Total	1,448	992	1,342	(456)	(350)	1,448	992	1,342	(456)	(350)

The December 11 version of this report mistakenly had a version with the hours scaled to 40 hour work weeks for each individual (shown below).

CONTRACT PERFORMANCE REPORT
FORMAT 1 - WORK BREAKDOWN STRUCTURE

1. CONTRACTOR	2. CONTRACT	PROGRAM	4. REPORT PERIOD
a. NAME	a. NAME	NAME	FROM 01-Oct-2009
Fermi National Accelerator Laboratory		NOvA Project	TO 31-Oct-2009

8. PERFORMANCE DATA

WBS[2]	CURRENT PERIOD (Hours)					CUMULATIVE TO DATE (Hours)				
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE	
ITEM (1)	WORK SCHEDULED (2)	WORK PERFORMED (3)	WORK PERFORMED (4)	SCHEDULE (5)	COST (6)	WORK SCHEDULED (7)	WORK PERFORMED (8)	WORK PERFORMED (9)	SCHEDULE (10)	COST (11)
1.0 ANU R&D	405	352	190	(53)	161	405	352	190	(53)	161
1.2 Liquid Scintillator R&D	0	0	0	0	0	0	0	0	0	0
1.3 WLS Fiber R&D	0	9	0	9	9	0	9	0	9	9
1.4 PVC Extrusion R&D	0	0	40	0	(40)	0	0	40	0	(40)
1.5 PVC Module R&D	96	45	291	(51)	(246)	96	45	291	(51)	(246)
1.6 Electronics R&D	0	0	212	0	(212)	0	0	212	0	(212)
1.7 DAQ R&D	120	0	118	(120)	(118)	120	0	118	(120)	(118)
1.8 Detector Assembly R&D	0	0	58	0	(58)	0	0	58	0	(58)
1.9 Project Management R&D	0	0	0	0	0	0	0	0	0	0
2.0 ANU Construction	399	393	64	(6)	329	399	393	64	(6)	329
2.10 Project Management - NOvA - Constr	0	0	122	0	(122)	0	0	122	0	(122)
2.2 Liquid Scintillator	54	54	123	0	(69)	54	54	123	0	(69)
2.3 WLS Fiber	35	7	0	(28)	7	35	7	0	(28)	7
2.4 PVC Extrusions	56	53	0	(3)	53	56	53	0	(3)	53
2.5 PVC Modules	40	34	0	(7)	34	40	34	0	(7)	34
2.6 Electronics	18	18	0	0	18	18	18	0	0	18
2.7 DAQ	194	18	110	(176)	(92)	194	18	110	(176)	(92)
2.8 Near Detector Assembly	31	11	0	(20)	11	31	11	0	(20)	11
2.9 Far Detector Assembly	0	0	0	0	0	0	0	0	0	0
Undist. Budget										
Total	1,448	992	1,328	(456)	(336)	1,448	992	1,328	(456)	(336)

Variance Summary for NOvA Control Accounts at WBS Level 2

The FRA EVMS required reporting thresholds to DOE at WBS Level 2 were changed in October 2009 to reflect the new reporting requirement on 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: Oct-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	147,854.9	167,296.0	173,265.2	19,441.1	13%	(5,969.2)	-4%	5,016,789.8	3,796,581.1	3,434,971.1	(1,220,208.7)	-24%	361,610.0	10%
1.1 Site and Building R&D	17,419.5	7,012.0	0.0	(10,407.5)	-60%	7,012.0	100%	2,302,028.9	2,296,936.5	1,627,048.8	(5,092.4)	0%	669,887.7	29%
1.2 Liquid Scintillator R&D	2,481.9	2,059.2	3,499.0	(422.7)	-17%	(1,439.8)	-70%	280,899.1	273,320.0	266,381.1	(7,579.0)	-3%	6,938.9	3%
1.3 WLS Fiber R&D	329.2	2,009.4	0.0	1,680.2	510%	2,009.4	100%	340,909.0	315,158.0	301,955.8	(25,751.0)	-8%	13,202.3	4%
1.4 PVC Extrusion R&D	6,211.8	2,531.7	55,255.8	(3,680.1)	-59%	(52,724.1)	-2083%	1,365,618.1	1,164,790.1	1,577,985.0	(200,828.0)	-15%	(413,194.9)	-35%
1.5 PVC Module R&D	94,617.9	267,555.4	44,480.8	172,937.4	183%	223,074.6	83%	1,664,304.2	1,095,516.6	1,539,427.2	(568,787.6)	-34%	(443,910.6)	-41%
1.6 Electronics R&D	15,350.0	7,662.8	25,629.3	(7,687.2)	-50%	(17,966.5)	-234%	1,348,813.5	532,391.8	937,097.9	(816,421.7)	-61%	(404,706.1)	-76%
1.7 DAQ R&D	59,280.3	34,072.9	89,053.6	(25,207.3)	-43%	(54,980.6)	-161%	1,046,930.5	389,432.2	1,384,246.0	(657,498.3)	-63%	(994,813.8)	-255%
1.8 Detector Assembly R&D	0.0	16,453.5	152,786.2	16,453.5	100%	(136,332.6)	-829%	2,183,002.2	1,304,670.8	2,780,722.9	(878,331.4)	-40%	(1,476,052.0)	-113%
1.9 Project Management R&D	0.0	0.0	0.0	0.0	0%	0.0	0%	9,184,127.1	9,184,127.1	9,359,785.0	0.0	0%	(175,658.0)	-2%
Construction														
2.0 ANU Construction	264,951.2	473,310.9	265,114.2	208,359.7	79%	208,196.7	44%	3,036,632.5	2,407,139.4	1,811,647.4	(629,493.0)	-21%	595,492.0	25%
2.1 Site and Building	954,298.1	1,629,480.9	1,693,979.9	675,182.7	71%	(64,499.0)	-4%	6,268,585.3	9,823,346.7	8,811,278.9	3,554,761.4	57%	1,012,067.8	10%
2.10 Project Management - Nova Project - Construction	170,866.9	170,866.9	192,894.7	0.0	0%	(22,027.8)	-13%	1,409,777.2	1,409,777.2	1,166,245.4	0.0	0%	243,531.8	17%
2.2 Liquid Scintillator	524,224.3	522,265.7	523,682.5	(1,958.6)	0%	(1,416.8)	0%	977,601.2	975,642.6	957,616.3	(1,958.6)	0%	18,026.3	2%
2.3 WLS Fiber	1,377.7	855.2	0.0	(522.5)	-38%	855.2	100%	8,709.0	71,597.8	58,842.1	62,888.8	722%	12,755.7	18%
2.4 PVC Extrusions	93,604.2	82,874.1	0.0	(10,730.1)	-11%	82,874.1	100%	469,195.3	168,339.4	0.0	(300,855.9)	-64%	168,339.4	100%
2.5 PVC Modules	32,232.0	32,232.0	12,932.4	0.0	0%	19,299.5	60%	193,346.1	193,346.1	121,125.6	0.0	0%	72,220.5	37%
2.6 Electronics	843.8	843.8	0.0	0.0	0%	843.8	100%	7,230.0	7,230.0	4,033.5	0.0	0%	3,196.6	44%
2.7 DAQ	185,420.5	35,850.2	0.0	(149,570.3)	-81%	35,850.2	100%	187,232.5	62,667.0	0.0	(124,565.5)	-67%	62,667.0	100%
2.8 Near Detector Assembly	14,080.7	1,875.9	32,117.0	(12,204.8)	-87%	(30,241.2)	-1612%	115,491.8	91,197.4	78,294.9	(24,294.4)	-21%	12,902.5	14%
2.9 Far Detector Assembly	98,468.4	24,936.3	7,406.1	(73,532.1)	-75%	17,530.2	70%	429,353.4	299,495.7	182,476.5	(129,857.8)	-30%	117,019.2	39%
R&D SubTotal (WBS 1.0-1.9)	343,545	506,653	543,970	163,108	47%	(37,317)	-7%	24,733,422	20,352,924	23,209,621	(4,380,498)	-18%	(2,856,696)	-14%
Construction SubTotal (WBS 2.0-2.10)	2,340,368	2,975,392	2,728,127	635,024	27%	247,265	8%	13,103,154	15,509,779	13,191,561	2,406,625	18%	2,318,219	15%
Project Total	2,683,913	3,482,045	3,272,097	798,132	30%	209,948	6%	37,836,577	35,862,704	36,401,181	(1,973,873)	-5%	(538,478)	-2%

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 percentage thresholds here. In the overall

project roll-up (see bottom line in the table), the project is green on the Cumulative CV (-2%) and just barely yellow on the Cumulative SV (-5.2 %).

The current period CV is positive (+6 %) and the SV is positive (+30%), showing continuing improvement towards less negative cumulative numbers during October.

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 > +15%. The current period SV is positive (+27 %) 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 October.

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 (-18%, but with a slight improvement over the level in September). The Cumulative CV is also in the red (-14%, but the downward trend through September has slowed).

The R&D current month SV is positive (47 %) and the current month CV is in yellow (-7 %)). 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 as the technical delays are being overcome by application of additional resources over a longer period.

Starting in October 2009, FRA EVMS requires a similar WBS Level 2 Contract Performance Report 1 for non-costed scientific effort. This is shown in the table below where the units are hours.

Report Period: Oct-09														
	Current Period							Cumulative from 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	405	352	193	(53)	-13%	159	45%	405	352	193	(53)	-13%	159	45%
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	9	0	9	100%	9	100%	0	9	0	9	100%	9	100%
1.4 PVC Extrusion R&D	0	0	40	0	0%	(40)	-100%	0	0	40	0	0%	(40)	-100%
1.5 PVC Module R&D	96	45	291	(51)	-53%	(246)	-554%	96	45	291	(51)	-53%	(246)	-554%
1.6 Electronics R&D	0	0	212	0	0%	(212)	-100%	0	0	212	0	0%	(212)	-100%
1.7 DAQ R&D	120	0	118	(120)	-100%	(118)	-100%	120	0	118	(120)	-100%	(118)	-100%
1.8 Detector Assembly R&D	0	0	59	0	0%	(59)	-100%	0	0	59	0	0%	(59)	-100%
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	399	393	51	(6)	-2%	342	87%	399	393	51	(6)	-2%	342	87%
2.10 Project Management - Nova Proj	0	0	139	0	0%	(139)	-100%	0	0	139	0	0%	(139)	-100%
2.2 Liquid Scintillator	54	54	123	0	0%	(69)	-127%	54	54	123	0	0%	(69)	-127%
2.3 WLS Fiber	35	7	0	(28)	-80%	7	100%	35	7	0	(28)	-80%	7	100%
2.4 PVC Extrusions	56	53	0	(3)	-6%	53	100%	56	53	0	(3)	-6%	53	100%
2.5 PVC Modules	40	34	0	(7)	-17%	34	100%	40	34	0	(7)	-17%	34	100%
2.6 Electronics	18	18	0	0	0%	18	100%	18	18	0	0	0%	18	100%
2.7 DAQ	194	18	116	(176)	-91%	(98)	-559%	194	18	116	(176)	-91%	(98)	-559%
2.8 Near Detector Assembly	31	11	0	(20)	-65%	11	100%	31	11	0	(20)	-65%	11	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-	621	405	913	(215)	-35%	(507)	-125%	621	405	913	(215)	-35%	(507)	-125%
Construction SubTotal (W	827	586	429	(241)	-29%	157	27%	827	586	429	(241)	-29%	157	27%
Project Total	1,448	992	1,342	(456)	-31%	(350)	-35%	1,448	992	1,342	(456)	-31%	(350)	-35%

Based on a single month's data, no summary is meaningful.

Variance Analysis

At the Control Account Level, FRA EVMS variance analysis thresholds were also changed to reflect the new reporting requirement on non-costed scientific effort (in hours) 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 September, 42 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. 20 of the active Control Accounts required a written variance analysis based on the $ thresholds in September. These were written by the CAMs and approved by the Project Manager.

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$/ month. In August and September this monthly SV dropped to zero as people began to return to NOvA tasks when the Fermilab Summer 2009 Accelerator Shutdown began to wind to a close. October marks the first POSITIVE SV since January 2009. The cumulative SV has now improved from a low of -2.1 M$ in July, Aug & Sept to -1.85 M$ in October.

The cumulative CV remains positive at 1.0 M$, up a little from 0.8M$ in September.

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$, but work actually did finally begin in June and by September we had recovered the lost ground and more to reach an SV of positive 2.7 M$. In October the SV rose again to a positive 3.5 M$.

The CV is positive at 0.4 M$, down a little from 0.5 M$ in September.

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 are still unresolved with the latest schedule still indicating all parts should be available in mid-October 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$. As we complete the tasks, we will regain the lost ground. Both September and now October have shown positive current month SVs and the cumulative SV in October is -3.2 M$.

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 – 3.2 M$ in October) to grow for this 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 -0.4 M$ on 4.6 M$ of scheduled work.

Contingency Analysis

Beginning in October 2009, 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 beginning in October 2009 detail 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 October are summarized below.

Note that CR79 is in both lists. We added an assistant factory manager for the Module Factory in WBS 2.5, but reduce the assigned contingency on the first factory manager since we now have a more realistic plan. However the reduction in assigned contingency was not enough to cover the extra person, so we also used available contingency in this CR.

Change Request Log 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**					
79	new task 2.1.2.4.2.1.4, existing tasks in 2.5.4 and 2.9.5	Contingency: Add Minnesota Admin Assistant and Asst Factory Module Manager	11/2/2009	L3 (Directorate)	$343,575.00	none	Approved by Directora
101	2.0.1.2, various tasks	Kicker Magnet Cooling Skid and Piping Changes	11/4/2009	L4 (NOVA PM)	($113,845.68)	none	Approved by PM
104	1.5, 2.5, 2.8	Revise ND/IPND Module Labor and Shipping	11/3/2009	L3 (Directorate)	$379,519.74	L3 milestone	Approved by Directora
107	new tasks 2.0.1.2.1.1.17 - 20	Procure Vacuum Oven for Beamtubes	11/5/2009	L4 (NOVA PM)	$46,304.23	none	Approved by PM
109	Various	Update Cobra Rates to FY10 Fermilab OH and FESS Chargeback Rates	11/2/2009	L2 (DOE Fermi)	($1,027,183.62)	none	Approved by DOE FP
110	2.7.1.1 and 2.7.1.2	Schedule Adjustment DAQ Software	11/4/2009	L4 (NOVA PM)	$13,313.49	none	Approved by PM
112	1.5.5.18 new task	Create Full Length Functional Test Modules	11/4/2009	L4 (NOVA PM)	$6,961.11	none	Approved by PM
113	1.8, 2.9	Reschedule Several Detector Assembly Tasks	11/10/2009	L2 (DOE Fermi)	$3,374.75	L2 Milestone	Approved by PM
				TOTAL =	($347,980.98)		

CR#	WBS #'s	CR Title	Approval Date	Level of Change	Final Cost Impact	Final Schedule Im	Status
Contingency/Management Reserve Use:		**Management Reserve**					
79	new task 2.1.2.4.2.1.4, existing tasks in 2.5.4 and 2.9.5	MR: Add Minnesota Admin Assistant and Asst Factory Module Manager	11/2/2009	L3 (Directorate)	$334,974.00	none	Approved by Directora
97	2.10.4.3	Factory Machines Engineering Review	10/30/2009	L4 (NOVA PM)	$25,686.64	none	Approved by PM
108	2.1.1.5	Increase A/E Site Prep Package Fee for Rock Issues	11/5/2009	L4 (NOVA PM)	$247,000.30	none	Approved by PM
				TOTAL =	$607,660.94		

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.

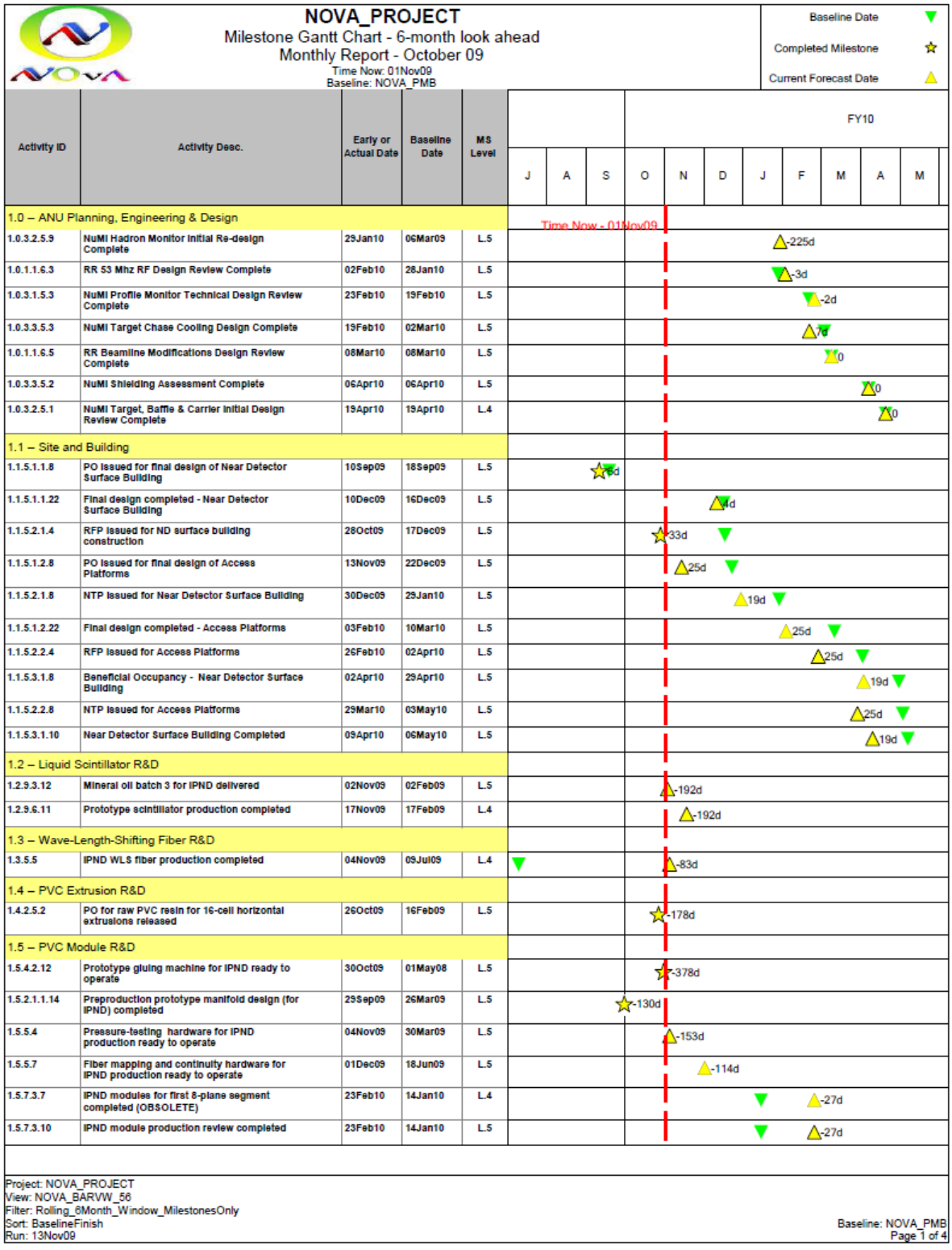
The results for October are shown in the table below.

NOvA Contingency Status for October 2009	($M)
Assigned Contingency	65.3
Available Contingency	2.4
Total Contingency	**67.7**
EAC from CPR1	**210.3**
TPC	**278.0**

Milestone Analysis

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

8 milestones were completed this month.



NOVA_PROJECT
Milestone Gantt Chart - 6-month look ahead
Monthly Report - October 09
Time Now: 01Nov09
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	29Jan10	06Mar09	L5
1.0.1.1.6.3	RR 53 Mhz RF Design Review Complete	02Feb10	28Jan10	L5
1.0.3.1.5.3	NuMI Profile Monitor Technical Design Review Complete	23Feb10	19Feb10	L5
1.0.3.3.5.3	NuMI Target Chase Cooling Design Complete	19Feb10	02Mar10	L5
1.0.1.1.6.5	RR Beamline Modifications Design Review Complete	08Mar10	08Mar10	L5
1.0.3.3.5.2	NuMI Shielding Assessment Complete	06Apr10	06Apr10	L5
1.0.3.2.5.1	NuMI Target, Baffle & Carrier Initial Design Review Complete	19Apr10	19Apr10	L4
1.1 – Site and Building				
1.1.5.1.1.8	PO Issued for final design of Near Detector Surface Building	10Sep09	16Sep09	L5
1.1.5.1.1.22	Final design completed - Near Detector Surface Building	10Dec09	16Dec09	L5
1.1.5.2.1.4	RFP issued for ND surface building construction	28Oct09	17Dec09	L5
1.1.5.1.2.8	PO Issued for final design of Access Platforms	13Nov09	22Dec09	L5
1.1.5.2.1.8	NTP Issued for Near Detector Surface Building	30Dec09	29Jan10	L5
1.1.5.1.2.22	Final design completed - Access Platforms	03Feb10	10Mar10	L5
1.1.5.2.2.4	RFP Issued for Access Platforms	26Feb10	02Apr10	L5
1.1.5.3.1.8	Beneficial Occupancy - Near Detector Surface Building	02Apr10	29Apr10	L5
1.1.5.2.2.8	NTP Issued for Access Platforms	29Mar10	03May10	L5
1.1.5.3.1.10	Near Detector Surface Building Completed	09Apr10	06May10	L5
1.2 – Liquid Scintillator R&D				
1.2.9.3.12	Mineral oil batch 3 for IPND delivered	02Nov09	02Feb09	L5
1.2.9.6.11	Prototype scintillator production completed	17Nov09	17Feb09	L4
1.3 – Wave-Length-Shifting Fiber R&D				
1.3.5.5	IPND WLS fiber production completed	04Nov09	09Jul09	L4
1.4 – PVC Extrusion R&D				
1.4.2.5.2	PO for raw PVC resin for 16-cell horizontal extrusions released	26Oct09	16Feb09	L5
1.5 – PVC Module R&D				
1.5.4.2.12	Prototype gluing machine for IPND ready to operate	30Oct09	01May08	L5
1.5.2.1.1.14	Preproduction prototype manifold design (for IPND) completed	29Sep09	26Mar09	L5
1.5.5.4	Pressure-testing hardware for IPND production ready to operate	04Nov09	30Mar09	L5
1.5.5.7	Fiber mapping and continuity hardware for IPND production ready to operate	01Dec09	18Jun09	L5
1.5.7.3.7	IPND modules for first 8-plane segment completed (OBSOLETE)	23Feb10	14Jan10	L4
1.5.7.3.10	IPND module production review completed	23Feb10	14Jan10	L5

Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 13Nov09

Baseline: NOVA_PMB
Page 1 of 4

NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead

Monthly Report - October 09

Time Now: 01Nov09

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)	09Mar10	29Jan10	L4
1.5.7.3.9	IPND module production completed (4 blks)	20Apr10	12Mar10	L3
1.6 – Electronics R&D				
1.6.2.4.12	FEB prototype III released to DAQ	02Dec09	16Jun09	L5
1.6.2.5.1	FEB modules for IPND started	03Dec09	29Jun09	L5
1.6.1.2.8	QA/QC station ready	03Mar10	20Jul09	L5
1.6.1.6.1.7	APD modules for 8-plane segment completed	15Sep09	27Jul09	L5
1.6.1.6.1.9	APD modules for IPND completed	07Jun10	23Oct09	L4
1.6.3.5.8	IPND power distribution system online	01Jul10	17Nov09	L5
1.6.2.5.13	FEB modules for ND/S completed	03Jun10	23Mar10	L5
1.7 – DAQ System R&D				
1.7.1.4.4.7	Run control system for software first release	03Dec09	03Mar09	L5
1.7.2.3.1.3	Requirements approved	24Nov09	05Mar09	L5
1.7.2.3.4	Evaluation components received	28Dec09	02Apr09	L5
1.7.2.1.6.2	IPND data concentrator PCBs and components received	04Dec09	14Apr09	L5
1.7.1.8.3.6	Global trigger system for software first release	13Jan10	13May09	L5
1.7.1.6.4.1.6	Event buffer farm server for software first release	20Jan10	15May09	L5
1.7.2.2.3.5	Prototype PCBs and components received for control and timing system	16Nov09	20May09	L5
1.7.2.4.1.3	Requirements approved	22Feb10	05Jun09	L5
1.7.4.11	Detector control system released	19Mar10	12Jun09	L5
1.7.1.6.3.1.13	Event buffer farm core software for software first release	23Feb10	16Jun09	L5
1.7.2.4.3	Evaluation components received	22Mar10	06Jul09	L5
1.7.1.8.4.8	Global trigger system for software second release	16Mar10	15Jul09	L5
1.7.1.11	DAQ software ready for IPND	16Mar10	15Jul09	L4
1.7.2.1.8	IPND data concentrators ready for installation	28Apr10	21Aug09	L4
1.7.2.5.1.3	Requirements approved	10Jun10	06Oct09	L5
1.7.2.5.3	Evaluation components received	05Jul10	03Nov09	L5
1.7.2.2.4.4	Control and timing prototype tests completed	12Mar10	30Dec09	L5
1.7.2.6.1.3	Requirements approved	31Aug10	13Jan10	L5
1.7.2.6.3	Evaluation components received	29Sep10	11Feb10	L5
1.7.2.7.1.3	Requirements approved	10Nov10	25Mar10	L5
1.7.2.7.3	Evaluation components received	10Dec10	22Apr10	L5
1.8 – Detector Assembly R&D				
1.8.5.2.12	IPND systems designs completed	26Jan10	21Apr09	L5
1.8.6.4	30% design of far detector mechanical systems and tooling completed	04Feb10	28Apr09	L5

Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 13Nov09

Baseline: NOVA_PMB
Page 2 of 4

NOVA_PROJECT

Milestone Gantt Chart - 6-month look ahead

Monthly Report - October 09

Time Now: 01Nov09

Baseline: NOVA_PMB

Baseline Date ▼

Completed Milestone ☆

Current Forecast Date △

Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level
1.8.8.2.6	Select site for block installation at FNAL	01Oct09	05May09	L5
1.8.5.4.5	IPND block assembly facility completed	19Mar10	11Jun09	L6
1.8.5.6.1.4	Notice to proceed on Phase 1 of IPND infrastructure in MSB (OBSOLETE)	04Sep09	18Jun09	L6
1.8.8.1.13	Full-scale block assembly prototype testing completed	25Aug09	23Jul09	L4
1.8.5.6.1.6	Notice to proceed on Phase 2 of IPND infrastructure in MSB (OBSOLETE)	01Sep09	01Sep09	L6
1.8.5.6.1.11	Infrastructure contract work completed (OBSOLETE)	04Sep09	04Sep09	L5
1.8.5.6.2.4	Notice to proceed - Phase 1 of IPND containment (OBSOLETE)	08Sep09	08Sep09	L6
1.8.5.6.2.6	Notice to proceed - Phase 2 of IPND containment (OBSOLETE)	09Sep09	09Sep09	L6
1.8.5.6.3.5	Beneficial occupancy of IPND enclosure (OBSOLETE)	10Sep09	10Sep09	L4
2.0 – ANU Construction				
2.0.1.2.8.1	Gap Clearing/RR Inj Kicker Magnet Design Complete	02Nov09	01Sep09	L3
2.0.4.3.22	ANU Schedule Contingency Milestone	01Oct09	01Oct09	L5
2.0.1.1.5.3	RR Orders Placed for Copper for 53 Mhz RF	24Feb10	19Feb10	L5
2.0.2.2.5.2	MI RF Cavities Fabrication of Ferrite Bias Supplies Complete	15Apr10	13Oct10	L5
2.1 – Site and Building				
2.1.2.1.21	Far Detector Building Title 2 completed	11Mar09	26Aug09	L5
2.1.2.2.4	Issue RFP for Far Detector Building	09Mar09	14Sep09	L5
2.1.2.5.1	Notice to proceed - far detector building-phase II	25Aug09	16Oct09	L4
2.1.2.2.7	Purchase order released - far detector building	25Aug09	16Nov09	L5
2.2 – Liquid Scintillator				
2.2.3.5.4	Waveshifter production 15% completed	30Sep09	23Sep09	L5
2.3 – Wave-Length-Shifting Fiber				
2.3.1.5	WLS fiber PO issued	01Sep09	02Nov09	L2
2.3.2.1.6	WLS fiber production begins	05Jan10	09Feb10	L3
2.3.2.1.7	WLS fiber production 3% complete	04Feb10	08Jun10	L5
2.4 – PVC Extrusions				
2.4.1.2.3.2	Vendor Samples POs issued	17Feb10	25Sep09	L5
2.4.1.1.5	Extrusion PO issued	02Nov09	01Oct09	L2
2.4.1.2.5	Raw material POs issued	10Jun10	01Feb10	L5
2.4.3.1.1.5	Near detector horizontal extrusions completed	03Feb10	11Nov10	L5
2.4.3.1.2.5	Near detector vertical extrusions completed	01Sep09	13Dec10	L5
2.5 – PVC Modules				
2.5.3.3.3.2	Near detector module fabrication started	03Feb10	13Jul12	L5
2.7 – Data Acquisition System				
2.7.1.10.2.3	Release integration database servers for use	20Nov09	21Oct09	L5

Project: NOVA_PROJECT
View: NOVA_BARVW_56
Filter: Rolling_6Month_Window_MilestonesOnly
Sort: BaselineFinish
Run: 13Nov09

Baseline: NOVA_PMB
Page 3 of 4

Missed Milestones

38 milestones should be finished by now but are not yet completed. See below.

This number decreased in October from 39 to 38. 27 of these missed milestones are associated with the detector R&D (down from 30 in September), and 9 of these are Data Acquisition software milestones where the team is still recovering from the FY08 shutdown of NOvA.

NOVA_PROJECT
Milestone Gantt Chart - Missed milestones
Monthly Report - October 09
Time Now: 01Nov09
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	29Jan10	06Mar09	L.5
1.2 – Liquid Scintillator R&D				
1.2.9.3.12	Mineral oil batch 3 for IPND delivered	02Nov09	02Feb09	L.5
1.2.9.6.11	Prototype scintillator production completed	17Nov09	17Feb09	L.4
1.3 – Wave-Length-Shifting Fiber R&D				
1.3.5.5	IPND WLS fiber production completed	04Nov09	03Jul09	L.4
1.5 – PVC Module R&D				
1.5.5.4	Pressure-testing hardware for IPND production ready to operate	04Nov09	30Mar09	L.5
1.5.5.7	Fiber mapping and continuity hardware for IPND production ready to operate	01Dec09	18Jun09	L.5
1.6 – Electronics R&D				
1.6.2.4.12	FEB prototype III released to DAQ	02Dec09	16Jun09	L.5
1.6.2.5.1	FEB modules for IPND started	03Dec09	29Jun09	L.5
1.6.1.2.8	QA/QC station ready	03Mar10	20Jul09	L.5
1.6.1.6.1.9	APD modules for IPND completed	07Jun10	23Oct09	L.4
1.7 – DAQ System R&D				
1.7.1.4.4.7	Run control system for software first release	03Dec09	03Mar09	L.5
1.7.2.3.1.3	Requirements approved	24Nov09	05Mar09	L.5
1.7.2.3.4	Evaluation components received	28Dec09	02Apr09	L.5
1.7.2.1.6.2	IPND data concentrator PCBs and components received	04Dec09	14Apr09	L.5
1.7.1.8.3.6	Global trigger system for software first release	13Jan10	13May09	L.5
1.7.1.6.4.1.6	Event buffer farm server for software first release	20Jan10	15May09	L.5
1.7.2.2.3.5	Prototype PCBs and components received for control and timing system	18Nov09	20May09	L.5
1.7.2.4.1.3	Requirements approved	22Feb10	05Jun09	L.5
1.7.4.11	Detector control system released	19Mar10	12Jun09	L.5
1.7.1.6.3.1.13	Event buffer farm core software for software first release	23Feb10	16Jun09	L.5
1.7.2.4.3	Evaluation components received	22Mar10	06Jul09	L.5
1.7.1.8.4.8	Global trigger system for software second release	16Mar10	15Jul09	L.5
1.7.1.11	DAQ software ready for IPND	16Mar10	15Jul09	L.4
1.7.2.1.8	IPND data concentrators ready for installation	28Apr10	21Aug09	L.4
1.7.2.5.1.3	Requirements approved	10Jun10	06Oct09	L.5
1.8 – Detector Assembly R&D				
1.8.5.2.12	IPND systems designs completed	28Jan10	21Apr09	L.5
1.8.6.4	30% design of far detector mechanical systems and tooling completed	04Feb10	28Apr09	L.5
1.8.5.4.5	IPND block assembly facility completed	19Mar10	11Jun09	L.6

FY09: F M A M J J A S
FY10: O N D J F M A M J

Time Now - 01Nov09

-225d -192d -192d -83d -153d -114d -117d -109d -154d -153d -192d -185d -185d -163d -166d -168d -126d -177d -191d -171d -177d -166d -166d -170d -169 -192d -192d -192d

Project: NOVA_PROJECT
View: NOVA_BARVW_59
Filter: Milestone = [BOOL.T] and C3 <> 'O' and COMPSTAT <> [ACTS.2] and BFDATE < {11/01/09}
Sort: BaselineFinish
Run: 13Nov09

Baseline: NOVA_PMB
Page 1 of 2

NOVA_PROJECT

Milestone Gantt Chart - Missed milestones

Monthly Report - October 09

Time Now: 01Nov09

Baseline: NOVA_PMB

Baseline Date ▼

Completed Milestone ☆

Current Forecast Date △

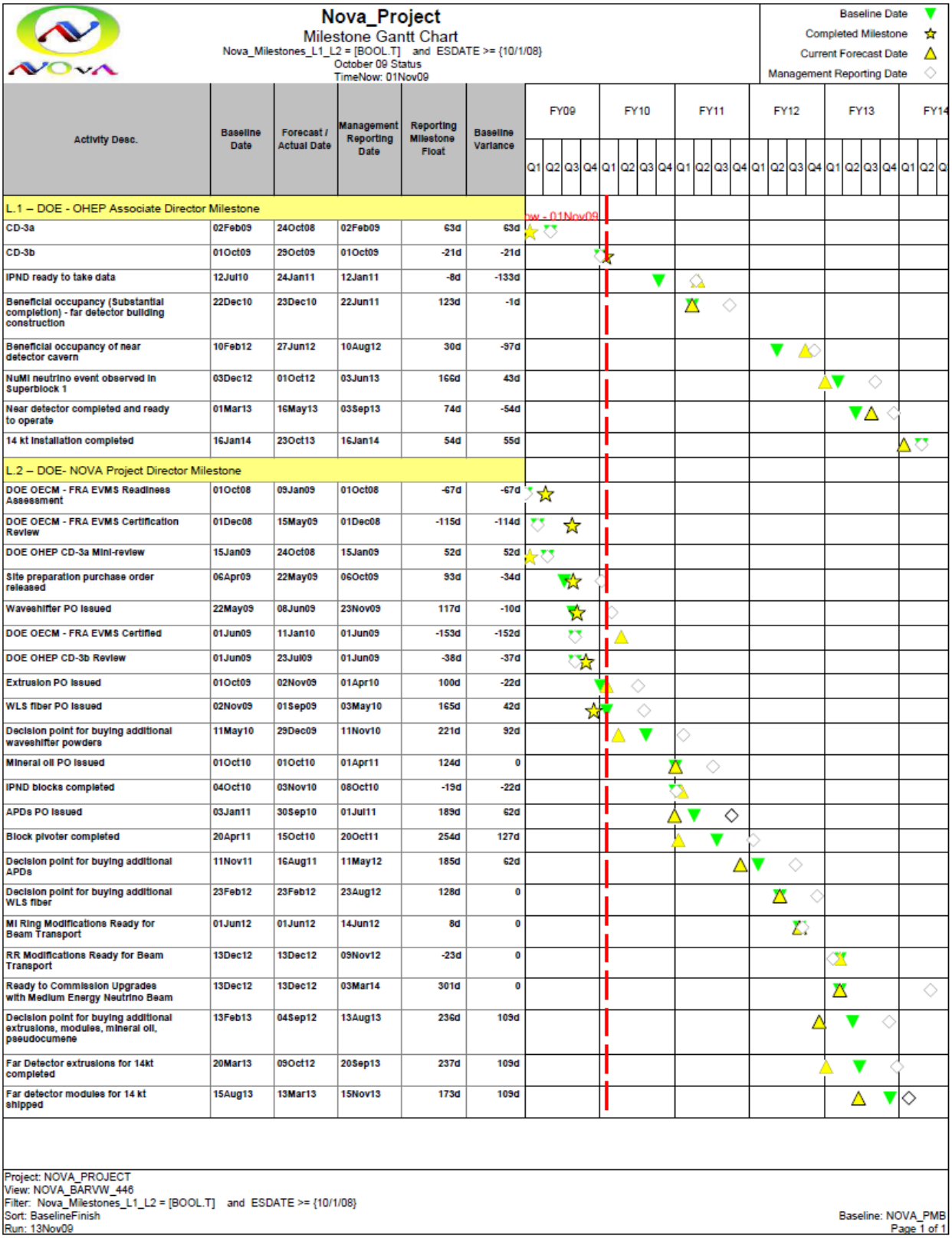
Activity ID	Activity Desc.	Early or Actual Date	Baseline Date	MS Level
2.0 – ANU Construction				
2.0.1.2.8.1	Gap Clearing/RR Inj Kicker Magnet Design Complete	02Nov09	01Sep09	L.3
2.4 – PVC Extrusions				
2.4.1.2.3.2	Vendor Samples POs Issued	17Feb10	25Sep09	L.5
2.4.1.1.5	Extrusion PO Issued	02Nov09	01Oct09	L.2
2.7 – Data Acquisition System				
2.7.1.10.2.3	Release integration database servers for use	20Nov09	21Oct09	L.5
2.8 – Near Detector Assembly				
2.8.1.1.6	Administrative and safety signoffs on near detector cavern excavation design	15Jan10	08May09	L.6
2.9 – Far Detector Assembly				
2.9.2.2.21.3	Final design approved-south bookend	20Nov09	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	22Jan10	05Mar09	L.5
2.9.2.2.22.3	Final design approved- north bookend	15Dec09	13Mar09	L.5
2.10 -- Project Management - Construction				
2.10.9.23	DOE OECM - FRA EVMS Certified	11Jan10	01Jun09	L.2

Project: NOVA_PROJECT
View: NOVA_BARVW_59
Filter: Milestone = [BOOL.T] and C3 <> 'O' and COMPSTAT <> [ACTS.2] and BFDATE < {11/01/09}
Sort: BaselineFinish
Run: 13Nov09

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}
October 09 Status
TimeNow: 01Nov09

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	24Jan11	12Jan11	-8d	-133d
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	01Oct12	03Jun13	166d	43d
Near detector completed and ready to operate	01Mar13	16May13	03Sep13	74d	-54d
14 kt installation completed	16Jan14	23Oct13	16Jan14	54d	55d
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	11Jan10	01Jun09	-153d	-152d
DOE OHEP CD-3b Review	01Jun09	23Jul09	01Jun09	-38d	-37d
Extrusion PO issued	01Oct09	02Nov09	01Apr10	100d	-22d
WLS fiber PO issued	02Nov09	01Sep09	03May10	165d	42d
Decision point for buying additional waveshifter powders	11May10	29Dec09	11Nov10	221d	92d
Mineral oil PO issued	01Oct10	01Oct10	01Apr11	124d	0
IPND blocks completed	04Oct10	03Nov10	08Oct10	-19d	-22d
APDs PO issued	03Jan11	30Sep10	01Jul11	189d	62d
Block pivoter completed	20Apr11	15Oct10	20Oct11	254d	127d
Decision point for buying additional APDs	11Nov11	16Aug11	11May12	185d	62d
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	04Sep12	13Aug13	236d	109d
Far Detector extrusions for 14kt completed	20Mar13	09Oct12	20Sep13	237d	109d
Far detector modules for 14 kt shipped	15Aug13	13Mar13	15Nov13	173d	109d

Project: NOVA_PROJECT
View: NOVA_BARVW_446
Filter: Nova_Milestones_L1_L2 = [BOOL.T] and ESDATE >= {10/1/08}
Sort: BaselineFinish
Run: 13Nov09

Baseline: NOVA_PMB
Page 1 of 1