



NOvA Project Status

John Cooper & Ron Ray

October 4, 2006



Interactions with DOE

- Sept 28, Oct 3 with Mike Procaro
 - Mike still looking at, “is it \$ 200M or \$ 203 M?”
 - I’m worried about a late (= President’s FY08 Budget time) change in the funding profile between our Director’s CD-2 and DOE CD-2
 - Exchanges on (R&D + Cooperative Agreement) funding needs in FY07 ongoing



Interactions with Marvin Marshak

- Sept 27 Marvin Marshak, Ken Heller, Ron Poling met with U of Minn VPs:
 - VP for Research
 - VP for Finance
 - VP for Facilities
 - In charge of their construction group
 - Wants more information on costs, risks, permitting, spill control, ...
 - Object is to educate VPs, get them on board, get them to tell “the P” to sign proposal.
- Sept 27 Marvin says first draft of proposal perhaps by Oct 6.
- Sept 27 Marvin and Ken also discussed Forward Funding, report “excitement” (not the good kind) from VP for Finance. Just the first shot at it....
- Sept 28 Steve Dixon, John Cooper, Bill Freeman supply:
 - Year by year Cooperative Agreement task words
 - Year by year base costs from CD-1
 - Year by year contingencies from CD-1
- Sept 28 Steve Dixon supplied a summary of studies and tasks completed on the building to help answer VP for Facilities.
 - And Steve offered to go speak with staff in Minneapolis if it would help.



What we need for CD-2 Review

NOvA Work List for CD-2

(red means new since last version)

		Original Estimated Finish Date	Current Estimate of Finish Date	Actual Finish Date	comments
Cooperative Agreement					
	U of M proposal draft	30-Sep-06	6-Oct-06		
	U of M final draft	15-Oct-06			
	U of M submits proposal	31-Oct-06			
	Recipient Selected = Site Selection	1-Nov-06	15-Dec-06		Assumes UM proposal 10/31, DOE evaluation 11/30, Orbach acceptance 12/15
	Negotiations concluded	15-Jan-07	1-Mar-07		Maybe this can be done in ~ 2 months?
NEPA					
Scoping Meeting					
	Environmental Impacts Analysis Plan and 5 point timeline	22-Jun-06		22-Jun-06	
		29-Jun-06		20-Jul-06	after iterations on schedule with Sally Arnold
NEPA timeline in Envir. Impacts Analysis Plan					
	Determine EA route	22-Jun-07		22-Jun-06	Siebach to Livengood
	Notify Illinois, Wisconsin, Minnesota of EA intent	15-Jul-06		1-Aug-06	letters from Livengood
	draft EA completed	1-Nov-06			
	final EA ready	1-Dec-06	15-Jan-07		requires CA Recipient
	State / Public Comment period	1-Jan-07	15-Feb-07		
	FONSI drafted	1-Apr-07			not required for CD-2 REVIEW
	FONSI issued	1-Jun-07			not required for CD-2 REVIEW
Minnesota Part					
	RGU (Responsible Government Unit) in place	15-Jan-07	15-Dec-06		see Coop Agreement line above
	Minnesota EAW (site specific)	15-Jan-07	1-Mar-07		This is after the 30 day comment period
	Wetland Permit Processing by USACE	1-Apr-07	1-Dec-07		Need for construction, not for CD-2 review
Fermilab NOvA Part					
	draft Version Ch 3 Proposed Action: description, alternative				
	Integration Prototype on surface	31-Aug-06		31-Aug-06	containment, FP
	Near Detector in MINOS access tunnel	31-Aug-06		31-Aug-06	containment, FP, access issues
	Scintillator Blending & Storage	31-Aug-06		31-Aug-06	containment, transportation
	Module Factory	31-Aug-06		31-Aug-06	construction activity, adhesive ventilation
	Block Raiser construction & tests with load	31-Aug-06		31-Aug-06	construction activity
	Full scale prototype construction & test	31-Aug-06		31-Aug-06	construction activity
	Full flat prototype for time & motion study	31-Aug-06		31-Aug-06	construction activity at ANL
	Final Version (ties to date in NEPA timeline above)				
	Integration Prototype on surface	1-Nov-06			containment, FP
	Near Detector in MINOS access tunnel	1-Nov-06			containment, FP, access issues
	Scintillator Blending & Storage	1-Nov-06			containment, transportation
Fermilab Tritium Part					
	Water Task Force report	21-Sep-06	15-Oct-06		date revision via Keith Schuh



What we need for CD-2 Review, page 2

NOVA Work List for CD-2 <small>(red means new since last version)</small>			Original Estimated Finish Date	Current Estimate of Finish Date	Actual Finish Date	comments
Site and Building						
Ash River Site						
		EAW update	1-Nov-06	1-Dec-06		
		Wetland Permit Application prepared	1-Dec-06			
Other Sites						
		EAW	1-Jul-07	30-Sep-07		no longer matters with unsolicited proposal
Building						
		Independent Cost & Schedule Review	15-Sep-06	1-Sep-06	14-Sep-06	
		Decide overburden construction method	15-Oct-06			related to overburden thickness
		Final conceptual design ready for 30% design effort	15-Oct-06			
		30% Drawings	15-Dec-06			P.O. in place for first \$ 260 K
Liquid Scintillator						
		Tests of commercial Tintometer	21-Jul-06		16-Aug-06	tagged, sent on to Indiana for tests, 7/17
		Fermilab blending model description & cost	15-Aug-06	15-Nov-06		Ron 8/15 draft, but we need a complete plan
		issue RFI for off-site blending	1-Aug-06	31-Oct-06		struggling with options, hired consultants
		RFI responses for off-site blending	1-Sep-06	30-Nov-06		6 wks for consultants to develop bid list
		evaluate waveshifter concentration	15-Aug-06		16-Aug-06	
		evaluate pseudocumene concentration	15-Aug-06		1-Apr-06	CDR likely has sufficient info
		decide waveshifter/pseudocumene to match fiber diameter	9-Aug-06	13-Oct-06		likely no scintillator change, only fiber & PVC
Wavelength Shifting Fiber						
		Updated Kuraray quote	1-Jun-06	1-Jul-06	6-Jul-06	
		evaluate fiber diameter	1-Aug-06	13-Oct-06		work in progress
		attenuation length of 0.7 mm fiber	15-Sep-06	30-Oct-06		need 16m fibers and APD readout
		attenuation length of 0.6 mm fiber	30-Sep-06	30-Oct-06		have fiber acceptance loss in hand
		decide fiber diameter	9-Aug-06	30-Oct-06		need PVC and fiber info



What we need for CD-2 Review, page 3

NOVA Work List for CD-2 (red means new since last version)		Original Estimated Finish Date	Current Estimate of Finish Date	Actual Finish Date	comments
PVC Extrusions					
	Choose die proof resin (NOVA-2 with rutile TiO2)	5-May-06		5-Jun-06	
	Proof 16 cell die at die manufacturer	26-Jun-06	31-Jul-06	24-Jul-06	done at Extrutech, not at die manufacturer
	Tune 16 cell die at extruder	14-Jul-06	18-Aug-06	25-Jul-06	got samples but NOVA-2 resin clogged die
	Rework die after initial tests	21-Aug-06		18-Sep-06	in progress
	2nd test with new rutile PVC resins and reworked die	1-Sep-06	18-Sep-06	18-Sep-06	NOVA-19 and NOVA-22 are rutile resin names
	Issue RFP for 70,000 lb test resin + full detector option	5-Jun-06		23-Jun-06	but will have to do best & final, NOVA-2 clog
	RFP responses for resin	5-Jun-06	21-Jul-06	21-Jul-06	able to update cost estimate with this info
	Order anatase versions of new PVC resins	25-Sep-06	15-Sep-06	18-Sep-06	need anatase analogs of NOVA-19 & -22
	First test of anatase TiO2	7-Sep-06	25-Sep-06	3-Oct-06	light output measurements show 15% gain
	Another resin tweak, order 1 rutile ASAP based on 9/28 tests	1-Oct-06			extruder parameters at temp/pressure limits
	Another resin tweak, order 1 anatase based on 9/28 tests, also light tests	8-Oct-06			extruder parameters at temp/pressure limits
	Extrude tweaked resins	23-Oct-06			
	React to measurements of 16-cell extrusions	31-Oct-06	15-Oct-06		2nd rework of die will be after tests with third set of resins
	Measure mechanical properties of NOVA-2 in 16 cells	30-Sep-06	15-Oct-06		in progress but will repeat for new formula
	Issue RFP for 70,000 lb resin, BEST and FINAL	1-Sep-06	23-Oct-06		hold, will update resin formula
	Order resin for 1500 m of 16 cell material in anatase	15-Aug-06	23-Oct-06		slipped 1 week
	Produce 3500 m of 16 cell material, horizontal, rutile	4-Aug-06	1-Dec-06		takes 8 days of production time, end 12/8
	Issue P.O. to modify existing die for vertical extrusions	1-Sep-06		24-Aug-06	4 month turn around on existing die
	Decide on TDR baseline resin: rutile or anatase	15-Oct-06	30-Oct-06		This is the one crucial to CD-2, slip 2 wk
	Still would not have final 16 vs 32 cell decision				But would have work around concept/tests
	Devcon adhesive tests of 32 cell from two 16 cell objects	21-Aug-06		21-Aug-06	still worries about Devcon volatiles, ES&H
	RF welding test to make a 32 cell from two 16 cell objects	1-Nov-06			expect proposal any second
	Die returns after modification for vertical extrusions	15-Jan-06	1-Feb-07		die not available during January
PVC Modules					
	evaluate 0.7 mm fiber fragility in Module Assembly	15-Sep-06		18-Sep-06	0.7 mm OK
	evaluate 0.6 mm fiber fragility in Module Assembly	22-Sep-06			
	test black PVC for conductivity	15-Sep-06			static charge issues in scintillator filling
	final endplate design	31-Aug-06	15-Oct-06		modifying design
	final manifold design	31-Aug-06	15-Oct-06		modifying design
	adhesive choice	30-Sep-06			
	adhesive vs. RF welding	1-Dec-06	1-Apr-07		
	factory stringing machine	1-Oct-06	1-Nov-06		have a prototypes but it needs tuning
	factory flycutting machine	1-Oct-06		15-Jul-06	MINOS flycutter tested successfully
	factory gluing machine	1-Nov-06			if glue, now injected so machine is simpler
	Time & Motion studies with 16 cell, 12 ft(early) & 53 ft(later) objects	15-Dec-06			



What we need for CD-2 Review, page 4

NOvA Work List for CD-2 <small>(red means new since last version)</small>		Original Estimated Finish Date	Current Estimate of Finish Date	Actual Finish Date	comments
Electronics					
	Receive 1st 10 APDs from Hamamatsu	1-Oct-06	1-Dec-06		9/28, new boards flat but not in horizontal plane, date very uncertain (again)
	Get updated "target price" of APDs from Hamamatsu	1-Nov-06	1-Jan-07		follows 1st working boards
	completed studies of front end ASIC	10-Aug-06		28-Aug-06	Fermilab tests done, packaging for user tests
	Front End Board prototype II testing	6-Oct-06			
	Cooling scheme choice for TDR: water or R-134a	1-Oct-06	1-Nov-06		still looking at options
	Cooling design for TDR	1-Nov-06			Tests of alternates likely continue past TDR
Data Acquisition					
	prototype Data Concentrator tests complete	15-Dec-06			
Near Assembly					
	Initial design of mechanical structure	19-Sep-06		19-Sep-06	have initial write-up, now revising
	Initial design of mechanical systems	19-Sep-06		19-Sep-06	have initial write-up, now revising
	Near design at TDR level	1-Nov-06			
Far Assembly					
	Validation of plane adhesive choice	16-May-06		11-Jul-06	3M-2216 is the choice
	Tests of 3 plane assemblies with 3M2216 and 16-cell extrusions	22-Sep-06	6-Oct-06		several successive tests for peel and shear
	RF welding, plane to plane, 4 plane test at Ashland	31-Oct-06	1-Dec-06		P.O. out on 9/27
	settle baseline installation procedures	27-Jul-06	5-Oct-06		2 day delay from last time
	Validation of structural design	17-Aug-06	7-Nov-06		2 week delay
	Initial design of access system for top of detector	30-Sep-06			linked to building design
	Initial design of light tightening scheme	3-Oct-06			linked to installation procedures
	Initial design of scintillator filling scheme	26-Sep-06		26-Sep-06	have initial write-up, now revising
	final scintillator overflow tank design				task moved from modules to assembly
	Block Raiser design review	5-Dec-06			internal engineering review of design & cost
	Designs of mechanical systems & tooling	8-Jan-07			



What we need for CD-2 Review, page 5

NOvA Work List for CD-2 (red means new since last version)				Original Estimated Finish Date	Current Estimate of Finish Date	Actual Finish Date	comments
Project Management							
	final	Project Execution Plan		1-Aug-06	12-Jan-07		just needs final costs and milestones, text settled with Lutha and Webster on July 12
	final	Project Management Plan		12-Jan-07			needs EVMS appendix, look at QA plan re:CFR 830 & DOE 414.1c
	final	Configuration Management Document					
	final	Risk Management Plan					
		draft Procurement Plan (partial)		1-Aug-06		29-Aug-06	request from Lutha
	final	Procurement Plan		21-Jan-07			will have for Director's CD-2
		draft Performance Management System Document (EVMS)		21-Jul-06		23-Aug-06	NOvA docdb #1084 (lab-wide plan)
	final	Performance Management System Document (EVMS)					
	draft	PSAD		1-Apr-06	1-Jan-07		had at CD-1 but not shown, needs update?
		draft Security Vulnerability Assessment Report		18-Sep-06		18-Sep-06	
	final	Security Vulnerability Assessment Report					
		draft doc on High Performance Sustainable Bldg considerations		13-Sep-06		13-Sep-06	FESS Sustainable Design Review Procedure
	final	doc on High Performance Sustainable Bldg considerations					LEED checklist evaluation by project team
		update initial Cyber Security Plan					
		Outside Review Mechanical Structure: Creep Mitigation		1-Sep-06	1-Nov-06		may drop this review
		begin monthly reports		1-May-06		27-Jun-06	May report finished June 27
	1st draft	Technical Design Report (blanks identified)		1-Oct-06	6-Oct-06		Project Office produces draft 1 have 1st 9 chapters, Ch 10-17 to go
	2nd draft	Technical Design Report (50% blanks filled)		1-Nov-06			updates from L2 Managers
	final	Technical Design Report		15-Dec-06			final updates, final edit by Project Office
	draft	construction 20 kt Cost & Schedule matching funding profile		10-Aug-06		15-Aug-06	"match" is approximate
	update R&D	portion of C&S		30-Sep-06	15-Oct-06		track starting Oct Monthly Report, might be final for CD-2
	2nd draft construction	20 kt C & S following technical decisions		1-Nov-06			follows update of R&D, parallel TDR 2nd draft
	nearly final	C&S		5-Dec-06			
	final	Cost & Schedule		15-Dec-06	12-Jan-07		this would include full BOE & notes



TDR draft



NOvA

NuMI Off-Axis ν_e Appearance Experiment

DRAFT

Technical Design Report

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October, 2006



Preface

This Technical Design Report (TDR) describes the preliminary design of the NOvA detectors, detector halls and detector sites. Compared to the March 2006 NOvA Conceptual Design Report (CDR), critical value engineering studies have been completed and the alternatives still active in the CDR have been narrowed to achieve a preliminary technical design ready for a Critical Decision 2 review.

Many aspects of NOvA described in this TDR are complete to a level far beyond a preliminary design. In particular, the access road to the NOvA Far Detector site in Minnesota has a final design and has been characterized to a level appropriate for a Critical Decision 3a review.

Chapter 1 is an Executive Summary with a short description of the NOvA project.

Chapter 2 describes how the Fermilab NuMI beam will provide a narrow band beam of neutrinos for NOvA.

Chapter 3 gives an updated overview of the scientific basis for the NOvA experiment, focusing on the primary goal to measure the $\sin^2(2\theta_{13})$ parameter in neutrino oscillations. This parameter has not been measured in any previous experiment. A secondary goal is to measure the dominant mode oscillation parameters, $\sin^2(2\theta_{23})$ and Δm^2_{32} to a more precise level than previous experiments. Additional physics goals for NOvA are also discussed.

Chapter 4 describes the Scientific Design Criteria which the NOvA detectors and sites must satisfy to meet the physics goals discussed in Chapter 3.

Chapter 5 is an overview of the NOvA project. The changes in the design relative to the NOvA CDR are discussed.

Chapter 6 summarizes the NOvA design performance relative to the Design Criteria set out in Chapter 4.

Chapter 7 presents the Work Breakdown Structure dictionary at Level 3.

Chapters 8 through 16 then take each Level 2 WBS element of the NOvA project and present each part of the design in more detail than the overview given in Chapter 5. Specific technical design criteria are delineated for each part of the project in addition to the scientific design criteria outlined in Chapter 4. Changes in the design since the NOvA CDR are discussed in detail. The work remaining to bring each part of this preliminary design to a final design is outlined.

Chapter 17 presents the Scope, Cost and Schedule for the NOvA Project.

Appendix A is a guide to other NOvA Project documentation with links to those documents.

TDR
draft



TDR draft

- **Standard Level 2 Chapter headings**
 - Introduction
 - Technical Design Criteria
 - In addition to the Scientific Design Criteria in Ch 4
 - Overview of this Level 2
 - Design Changes since the CDR
 - Work Remaining to Complete the _____ Design
 - Meant to indicate a small fraction to go....
 - References



TDR draft

- **Chapter 17 Cost, Schedule, and Scope (NO ranges)**
 - Key Performance Parameters
 - Far bldg
 - Far detector
 - Near detector
 - Cost
 - R&D
 - Coop Agree
 - MIE
 - Scope
 - Schedule



TDR draft

- **Appendix A: Guide and Links to Other NOvA Project Documents**
 - Department of Energy Documents
 - CD-0
 - NuSAG
 -
 - NOvA Project Office Documents
 - Project Management Plan
 - Cost & Schedule
 -



Sufficient Project Personnel?

- **Administrative support high level full time**
 - Req is in the system -- Elaine Phillips: 4 interviews scheduled in next 2 weeks, 1st this morning
- **Help for monthly report startup**
 - Could be admin person?
- **More engineering on Block Raiser**
 - Final design, staged design allowing test phase?
 - Dave Pushka & Vic Guarino go back to basics before proceeding
 - Have agreed to go with a “pivoter” design vs. “raiser” for TDR / CD-2
 - Will look at raiser again as we go from 30% design to 100%.
 - **Need FEA help, proposal to PPD on Sept 27 (~ 4 wks FEA between now and Dec 1)**
 - PPD will accommodate request
- **More engineering & help on Near Detector**
 - Have Karen Kephart, Peter Lucas, have ANL engineers (Guarino)
 - Issue with design/drafting, lack of access to Don Friend, first reported to PPD Eng Resource Mtg on July 17, PPD and Project continue to watch this
 - Leon Beverly? John Voirin? Both familiar with shaft & tunnel.
 - Installation transport, containment, fire protection, mobility
 - Leon toured MINOS access tunnel with Peter Lucas on August 30
 - Will help on a cost estimate to move utilities
 - Have FESS & Chris Laughton help on crude excavation costs in access tunnel
 - **First estimate from Elaine McCluskey, Sept 22**



Sufficient Project Personnel? Continued

(no red, so no change)

- **Scintillator Blending**
 - Off-site: have CCC consultants to develop bid list, then we do an RFI
 - On-site:
 - Getting budgetary quote to hold mineral oil off-site, draw only small amounts at a time for blending
 - Need to understand leased railcars next for possible use as “modest” storage at railhead
 - Still would do prototype blending for spring 2007 on-site
 - Involve PPD process control group?
- **QA person, part time probably OK for now.....**
 - No progress
- **Electronics infrastructure and Slow Controls**
 - Craig Dukes (Univ of Virginia) as new L3, understands Italians will join eventually
 - Asked John Oliver & Dave Pushka to look harder at the power & cooling issues across L2 boundaries – led to proposal of new cooling model:
 - Dave Pushka has suggested changing our design from water cooling of the TEC hot side to R-134a cooling with one cooling unit per detector block
 - Still in initial discussions within NOvA
 - Might need PPD Process Control group help for design
 - John Oliver spearheading NOvA meetings to recommend a baseline for the TDR
 - We will chose a baseline by Nov 1.....