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# NOvA Project Status

John Cooper & Ron Ray  
Working Group Meeting  
December 7, 2005



# R&D, PED, LLP, Construction Table

## NOvA Funding Profile

( in FY05 \$)

Fund Type	Year							Sum
	FY06	FY07	FY08	FY09	FY11	FY12	FY13	
R&D M&S (\$M)	1.93 <sup>a</sup>	2.00 <sup>b</sup>	0.50 <sup>c</sup>	-	-	-	-	4.43
R&D SWF (\$M)				-	-	-	-	-
PED (\$M)	-	5.00 <sup>d</sup>	2.50 <sup>e</sup>	-	-	-	-	7.50
LLP (\$M)	-	7.00 <sup>f</sup>	- <sup>g</sup>	-	-	-	-	7.00
Construction (\$M)	-	-	20.00	50.00	50.00	50.00	10.00	180.00
<b>Total by FY:</b>	<b>1.93</b>	<b>14.00</b>	<b>23.00</b>	<b>50.00</b>	<b>50.00</b>	<b>50.00</b>	<b>10.00</b>	<b>Total: 198.93</b>

### Notes:

**a R&D funds in FY06 used for \_\_\_\_\_  
need to get estimates of SWF**

**b R&D funds in FY07 used for \_\_\_\_\_**

**c R&D funds in FY08 used to complete Integration Prototype Near Detector**

**d PED funds in FY07 are used for final building design and value management studies**

Final Site Access Road design effort estimate at \$ M

Final Building design effort estimated at \$ M

Value Management Studies estimated at \$ M from list below

Study #1:

Study #2:

Study #3:

**e PED funds in FY08 are used for**

**f LLP funds in FY07 are used for access road construction & site clearing starting ~ April, 2007**

This builds a 3.6 mile access road from the Ash River Trail to the NOvA site.

These funds would be in the form of a grant/cooperative agreement to the University of Minnesota

**g no LLP possible in FY08, correct?**



# Requirements Documents Status

- Not the specification, just a simple document saying what a particular part has to do
  - Typically a page or few pages of bullets
- 44 documents identified, have a first draft on 20
  - Red means new since the Nov 16 Working Group meeting

## Status of NOVA Requirements Documents

WBS	2-Nov	9-Nov	16-Nov	23-Nov	30-Nov
<b>Site and Buildings</b>					
Site Work Technical Requirements (Steve Dixon)	doc 152				
Site Logistics Technical Requirements (Steve Dixon)		doc 156	doc 156	doc 156	doc 156
Building and Detector Enclosure (Steve Dixon)			doc 173	doc 173	doc 173
Outfitting Technical Requirements (Steve Dixon)		doc 158	doc 158	doc 158	doc 158
<b>Scintillator</b>					
Scintillator requirements					
Scintillator QA tools requirements					
<b>Fiber</b>					
Fiber requirements					
Fiber QA tools requirements					
<b>Extrusions</b>					
Extrusion requirements					
Extrusion QA tools requirements					
<b>Extrusion Modules</b>					
NOVA Module Requirements (K. Heller et al.)				doc 182	doc 182
Requirements for machines & fixtures to construct extrusion modules				doc 183	doc 183
<b>Electronics</b>					
Front End Electronics Requirements ( John Oliver)	doc 147				
APD Module Requirements (Roger Rusack and Jon Urheim)			doc 170	doc 170	doc 170
<b>DAQ</b>					



# Requirements Documents Status, cont.

– Red means new since Nov 16

<b>Near Assembly</b>						
	Near Detector support structure (Guarino & Plunkett)					
	Near Detector Muon steel section (Guarino & Plunkett)					
	Systems for transporting Near Detector down the shaft					
	Systems for moving Near Detector along the tunnel					
	Near Detector segment assembly tables and fixtures					
	Near Detector adhesive dispensation system					
	Near Detector Scintillator Supply Infrastructure (Jim Musser)	doc 138				
	Near Detector scintillator filling equipment					
	Near Detector Assembly and installation procedure					
	Near Detector systems for installing and checking readout					
	Near Detector electronics & DAQ infrastructure					
<b>Far Assembly</b>						
	Far Detector north bookend					
	Far Detector south bookend					
	Far Detector base					
	Far Detector material moving equipment					
	Assembly Tables (Vic Guarino)	doc 146				
	Structural Adhesive (Vic Guarino)	doc 145				
	Glue Machine (Vic Guarino)	doc 144				
	Block Raiser [Dave Pushka]	doc 113				
	Far Detector alignment system					
	Far Detector scintillator supply infrastructure					
	Liquid Scintillator Filling Machine	doc142	doc142	doc142	doc142	doc142
	Far Detector material handling systems				doc 184	doc 184
	Far Detector materials storage	doc 132				
	Far Detector assembly and installation procedure				doc 166	doc 166
	Far Detector systems for installing and checking readout hardware					
	Far Detector electronics and DAQ infrastructure					
	Block Stability (Vic Guarino)	doc 143				
	Full Scale Prototype (Karen Kephart)	doc 141				



# Request for Quotes

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- To establish the cost basis of estimate, our philosophy is to get real quotes
  - Part A: for all or part of what is needed for the Integration Prototype Near Detector
    - Really buy it NOW, so must treat us seriously for ~ \$ few 100 K orders
  - Part B: Option for the full detector, \$Ms
    - Exercise date is Nov 1, 2007
    - For delivery in 2009, 2010,...
    - Expect / request bids that are indexed to some reputable source, Producer Price Index, Crude Oil, Lube Report,...



# Request for Quote Status

## Status of NOVA RFPs

12/2/2005

Subject	vendor discussions	draft RFP	req in system	final approved RFP	RFPs sent	# sent to	Date for Response	# Responses	Evaluation Board
<b>Extrusions</b> (we provide resin)	PET, Sept 15 Extrutech, June Itasca, Sept 6	12-Aug	~ Aug 1	vers 1, Aug vers 2, Oct 7	26-Aug 10-Oct	10 11	23-Sep 16-Nov	3 3	26-Sep 21-Nov
<b>raw PVC</b>	Prime, Oct 17 Ashland (Georgia-Gulf), Sept 8, Nov 7 Aurora, Clairiant, Aug 23								
<b>mixed scintillator</b>	Bicron, Nov 7 Eljen, Nov 8	17-Oct	21-Oct						
<b>scintillator fluor mix</b> (must mix with mineral oil, perhaps also with more pseudocumene)	Bicron, Nov 7 Eljen, Nov 8 Curtis Labs, Aug 25	20-Oct	21-Oct						
<b>mineral oil (Technical grade)</b>	Penreco, Oct 25	6-Oct	21-Oct	10-Nov	11-Nov	10	14-Dec		
<b>mineral oil (Industrial NF)</b>		18-Nov	28-Nov						
<b>pseudocumene</b>	Dixie Chemical, long ago but... Flint Hills, Nov 10 but ...	17-Oct	21-Oct	next					
<b>waveshifters</b>	Curtis Labs, Aug 25	20-Oct	21-Oct	18-Nov	28-Nov	9	29-Dec		
<b>ISO tanks, mixing</b>	EXSIF, Nov 15								
<b>waveshifting fiber</b>	Kuraray, Oct 31 Bicron, Nov 3 Polhitech, no longer exists -- Protvino, no contact	17-Oct	21-Oct	18-Nov	22-Nov	2	23-Dec		

## Status of RFIs

<b>APDs</b>	Hamamatsu, Aug 9	11-Nov	xxx	17-Nov	17-Nov	1	16-Dec	1 "guess" on 11/29	
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# BOE (basis of estimate) status

Status of NOVA Basis of Estimate Documentation

12/2/2005

	List of documents?	DRAFT document to Project Office?	Documents in binder?
<b>WBS</b>			
<b>Site and Buildings</b>	X		
Excavation in Soil unit cost			
Excavation in Rock unit cost			
Concrete unit costs			
Structural steel unit costs			
Metal siding unit costs			
Elevator			
Bridge Crane			
Electrical Service Upgrade			
<b>Scintillator</b>	X		
Write-up of mixed scintillator RFP results			
Write-up of Fluor concentrate RFP results			
Write-up of mineral oil RFP results			
Write-up of pseudocumene RFP results			
Write-up of waveshifter chemical RFP results			
<b>Fiber</b>	X		
Write-up of fiber RFP results			
<b>Extrusions</b>	X		
Write-up of extrusion vendor RFP results			
Write-up on raw PVC resin costs			
<b>Extrusion Modules</b>			
<b>Electronics</b>	x		
Copy of RFI result from Hamamatsu		X	
<b>DAQ</b>			
<b>Near Assembly</b>			
<b>Far Assembly</b>			



# Where are we on Cost & Schedule?

## Status of NOvA Cost & Schedule

red= changes in last 2 weeks

12/6/2005

	Initial talks with Bill?	List of Tasks	Durations of Tasks	Relationships among tasks	Assign labor resources	Assign M&S \$ Resources	Add contingency	Provide L3 descriptions	Provide Task Notes
<b>WBS</b>									
Site and Buildings	X	X	X	x	x	x		X	x
Scintillator	X	x	x	x				X	
Fiber	X	x						X	
Extrusions	X	x	x	/				X	
Extrusion Modules	X	x	x	x	x	x		X	
Electronics	X	x	x	x				X	x
DAQ	X	x	x	x				X	x
Near Assembly	X	X						X	
Far Assembly	X	X	x	x	x			X	

Lots of Work yet to do – “maybe” 25% done

at least a start in > 50% of the boxes



# Status of Hazard Analysis

- Just a simple list of common & special hazards for each Level 2 Task

	First pass to Harry Ferguson	L2 manager completed HA sheet?	Harry Ferguson & ES&H meet to review lists	Prelim Hazard Analysis complete
<b>WBS</b>				
<b>Site and Buildings</b>	X	X		
<b>Scintillator</b>	x			
<b>Fiber</b>	x			
<b>Extrusions</b>	x			
<b>Extrusion Modules</b>	x			
<b>Electronics</b>	X	X		
<b>DAQ</b>	X	X		
<b>Near Assembly</b>	X	x		
<b>Far Assembly</b>	X	x		

Also have August 25 letter from MPCOA



# Conceptual Design Report

1st draft  
(missing  
figures,  
incomplete  
text)

2nd draft  
(after TB  
reading)

Chapter	Author	outline	1st draft (missing figures, incomplete text)	2nd draft (after TB reading)	Final
i		X			
ii		X			
iii		X			
iv		X			
1	John	X			
2	Gary	X			
3	John	X	X		
4	John	X	X		
5	John	X	x		
6	John	X			
7	John	X			
8	John	X			
9	Ron	X	x		
10		X			
11	Ron	X	X		
12	Ron	X	X		
13	Ron	X	X		
14	Ron	X	X		
15	Ron	X	x		
16		X			
17		x			
18	Ron	x			
19					
20					
21	John	X	X		
A1?	Ron +L2	X	x		



# Conceptual Design Report

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- Expect to ask some people in this room to read our draft next week before we send it in.
- I think we need a minimum of
  - Gary's performance requirements
  - John's overview responding to the requirements
  - John's alternatives analysis
  - John's optimization / cost,risk,performance study
  - Ron's L3 WBS
  - As many chapter as in hand (mostly Ron's)



# Status of other required documents

	Critical Decision Prerequisites	Draft Start Date	Draft Completion Date	Target Completion Date	Date Completed	Date Approved	Current Status	Notes
CD-0	Justification of mission need document					29-Nov-05		DONE
	Preconceptual Planning							
	Mission Need Independent Project Review (?)							OECM
CD-1	Conceptual Design Report (Detector CDR)		Dec-05	Jan-05				Outline done. Drafts of several chapters done
	Acquisition Strategy	Aug-05	Sep-05	Sep-05			Done	Draft complete. Several iterations with M. Procaro.
	Baseline range & Cost Estimates and Resource Loaded Schedule			Dec-05				In progress
	Draft Configuration Management Document	Aug-05	Sep-05	Dec-05	Nov-05		Done	More work needed for final CM document
	Preliminary Project Management Plan (PMP)	Aug-05	Aug-05	Oct-05			Review	Needs input from cost and schedule
	Preliminary Hazard Analysis Report & NEPA	Aug-05		Dec-05				Waiting for input from L2 managers
	Preliminary Project Execution Plan (PEP)	Aug-05	Sep-05	Sep-05				Iterating with Procaro
	WBS Dictionary	Nov-05	Nov-05	Nov-05	Nov-05			Uploaded to docdb
	Preliminary Risk Management Plan	Nov-05	Nov-05	Dec-05	Nov-05		Done	Uploaded to docdb
	Project Data Sheet for design							?
	Verification of mission need (NuSAG?)							NuSAG reports by end of year?
	PARS Reporting							determine content of monthly reports



# Other Items

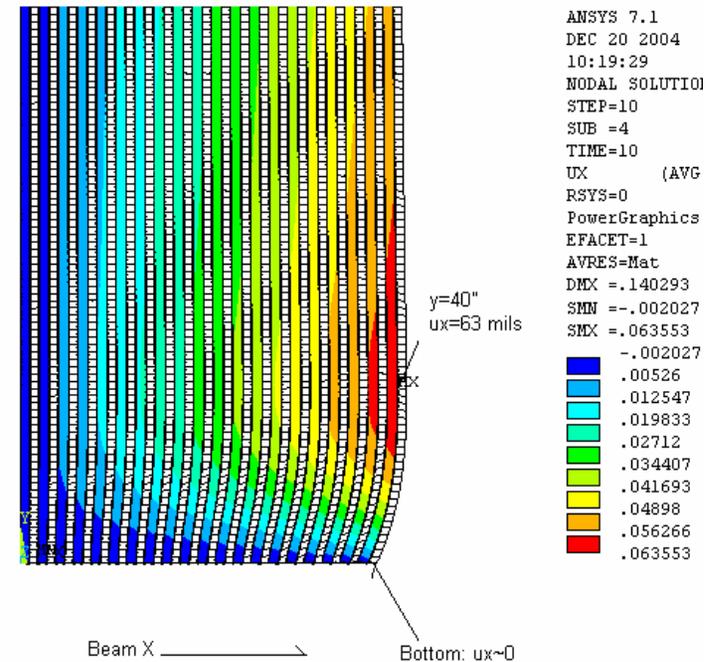
- I've asked Marvin
  - To push settling RGU (Responsible Government Unit)
    - He's conferred with Univ real estate lawyer
    - Candidates are  
St. Louis County, Environmental Quality Board, U of Minn.
  - To get document from Univ saying they will be happy to own the site, obtain the site, negotiate the access, own the building, operate the building, ...
    - He will draft letter for Mulcahy saying they will do all this (regardless of the ongoing funding model search)
  - To think about the MOU between the Univ. entity and the Fermilab Project
    - We are thinking a draft late in January may suffice



# AND, we have some problems

- **ONE NEW ONE**

- It looks like the Proposal PVC structure has a flaw
- Recall swells when filled
- New FEA on adhesive shear stress shows safety factor of 1 – 1.5
- Pursuing work-arounds
  - All horizontal modules surrounded on both sides with verticals
  - Bottom horizontals not suspended from verticals?
  - Thicker PVC (50%)
    - So 70% active, not 80%
    - Maybe 75% if thicker verticals only
  - Stronger adhesives
  - Sand PVC for better bonding
  - Possibly a shorter (but longer) detector





# AND, we have some problems #2

## • ONE OLD HAUNTING ONE

- Detector cost higher than in the Prelim Director's Review
  - Price of oil + a contingency to cover the potential price of oil
  - \$ 53 – 56 per barrel on Tuesday Nov 29
  - historically was \$ 90.39 in 1980 (inflated to 2005 \$)
    - That's a 65% contingency...
    - Suggestion that we take 3 yr average of historical prices, search for worst case
      - » since we would procure over that many years, investigating....
- **Collaboration discussed cheaper scintillator = less light**
- **We have decided light from 517P (5% pseudocumene) is adequate compared to 517L (10% pseudocumene)**
  - 517L gives 28 pe from far end in our most reflective PVC to date
  - 517P gives 23 pe, in same setup -- 82% of L
  - **Cost savings of order \$ 15 M when fully loaded, slightly fewer  $\nu_e$  events, but no difference in FoM**



# Status of our request for more help

- Gina Rameika took over from John Cooper as Fermilab Institution representative
- Gina Rameika will handle the collaboration mailing list and Fermilab group grid authorizations
  - removed 35 emails from my active & not yet dealt with list
- Keith Schuh will start to ramp up on ES&H
- Suzanne Pasek (suggested by Ellie Arroyo, M.A. in information technology) will take on cleaning up docdb
- We talk to Leon Beverly tomorrow AM
- PPD Electrical Dept. looking for low voltage, controls engineer
- Dave Pushka will get Bob Wands to double check Ang Lee's FEA (critical ) results
- Dave Pushka adding additional engineering from his group
  - Ernie Villegas, Ed Chi,
- Initial contact with C. Div. – hoping to clarify support there