



# NOvA Project Status

John Cooper & Ron Ray

December 5, 2006



# Interactions with DOE

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- Nov 28, Mike Procario budget questions for internal DOE planning
  - Provided him with NOvA August 15 attempt to match funding profile
  - And some details from the NOvA Collaboration meeting of Nov 17-19, page after next
- Nov 30, First Integrated Project Team meeting
  - Pepin Carolan, Mike Procario, Steve Webster, John Cooper, Ron Ray
  - Agenda:
    - CD-1 status. Might make 3<sup>rd</sup> or 4<sup>th</sup> week in January if all goes perfectly
    - Status of Project preparations for reviews
      - Cooperative Agreement status, see next page....
      - Discussed charge, concept of cost/kt and Far Detector scope vs. “usual” committee attempt to estimate cost. “Usual” not compatible with \$200M. Aug C&S indicated 18.7 kt.
    - Status of EA, 1<sup>st</sup> draft aim is Dec 15
    - EIR, trying to follow Temple suggestion to overlap with Lehman
- Nov 30 emails Marvin → Mike, me: Minnesota CA proposal sent
  - Dec 5, Mike Procario says Unsolicited Proposal Office has determined it should go to Office of Science
    - Mike is trying to ramp up the proposal review
- Dec 3, Mike Procario asks about Near Detector operating costs
  - 3% of Far Detector channels
  - We agree to use 5% of Far Detector operations costs as the estimate



# Marvin Marshak and Cooperative Agreement

- Proposal submitted to DOE on Nov 30.
  - Raised enough hackles at the Vice President level that the Univ. President decided to submit it.
  - Lots of language about making sure U of Minn doesn't get stuck for any costs if DOE backs out along the way
- Proposal does not say U of Minn will be the Responsible Government Unit (RGU) for the EAW
  - In my mind this complicates the EA
    - No other obvious official document to say who it is
    - Final EA counts on existence of submitted EAW
    - Marvin's plan is to use final draft EAW as the lever to see if he can get the U of Minn to agree to be the RGU
    - Discussed at a "pre-cooperative agreement" meeting between NOvA Project and U of Minn people on Monday, Dec 4
    - Other options are St. Louis County, Environmental Quality Board, each with drawbacks
- Proposal used a NOvA budget from sometime in November, but the Project Office was iterating it constantly and we don't have a copy of what they were looking at.
  - Ken Heller will get a copy back to Bill Miller
  - Needed since Mike Procaro indicates he will refer questions on costs back to me
    - I had asked that U of Minn use the CD-1 Cost & Schedule so we would avoid this.
- We will jump-start "cooperation" by getting \$ 75 K of R&D funds to U of Minn to hire a project management consultant for the site and building
  - This funds perhaps 6 months, one person
  - We agree that selection of the person will be by consensus between U of Minn and NOvA Project
  - Looks like a good start

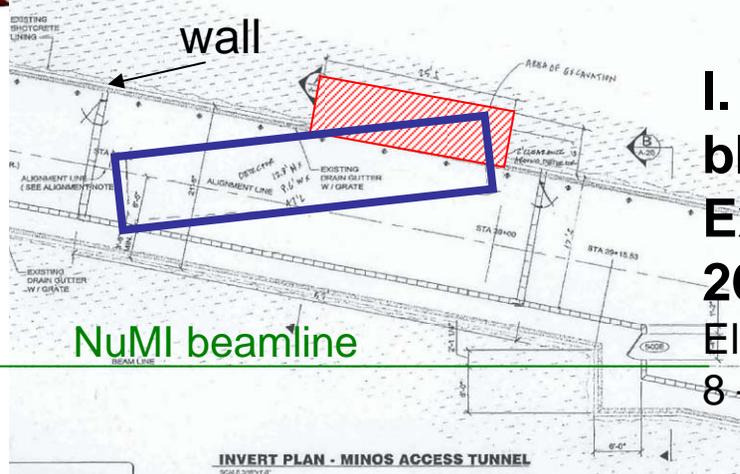


# A few items from the Nov 17-19 NOvA Collaboration meeting

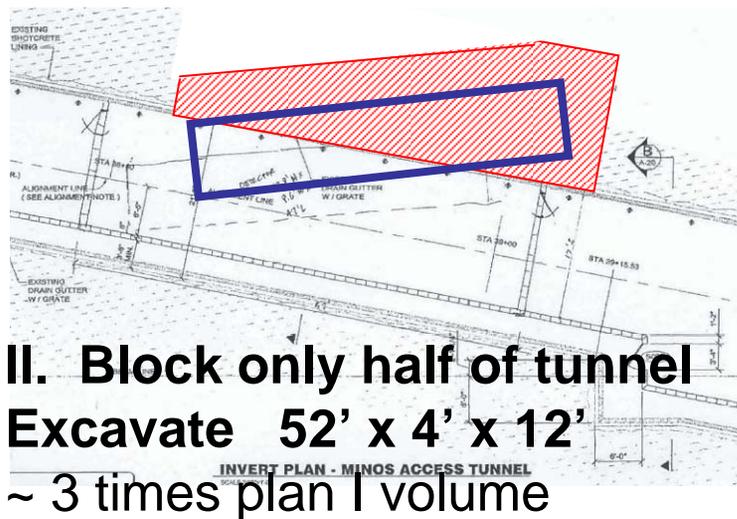
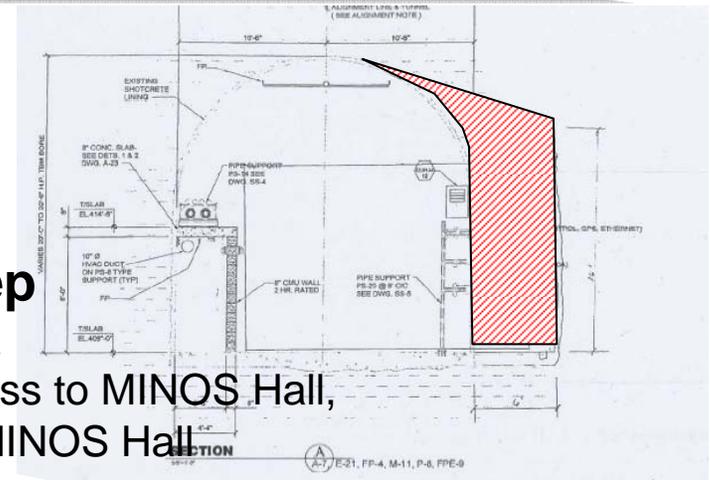
- **Italians will not join NOvA. INFN got a 20-25% budget cut.**
  - Need CD extended help now to build all Data Concentrators (~250)
  - Build on project, therefore pay (maybe that's why I haven't heard from Vicky?)
- **There will be a factory at Fermilab**
  - Takes incoming extrusions from vendor, QA, bond two 16 cell objects to make a 32 cell object, QA bond, cut to length, clean, bond edge seals, QA bond, package one horizontal plane and one vertical plane on one super-pallet for each truckload.
  - Minnesota does fiber, top and bottom seals, pressure test
  - 3.5 hours extruder to Fermilab, 6.5 hours Fermilab to U of Minn, 6.0 hours from U of Minn to Ash River. So we keep storage at Fermilab, minimize it elsewhere and try for one day delivery to each station
- **Higher intensity in Proton Plan II and SNuMI imply we need another ASIC for the Near Detector APD readout**
  - Less multiplexing, effectively smaller time samples
  - Small modification, John Oliver has talked with Tom Zimmerman
  - Yarema, DeMatt, Bock, Strait, Montgomery aware
- **Physics demands on the Near Detector require it sit at the proper angle relative to the beam (14 mrad)**
  - $\nu_\mu$  disappearance and MINOS experience
  - Requires excavation – next slide
    - Montgomery and PPD aware but we surprised Holmes



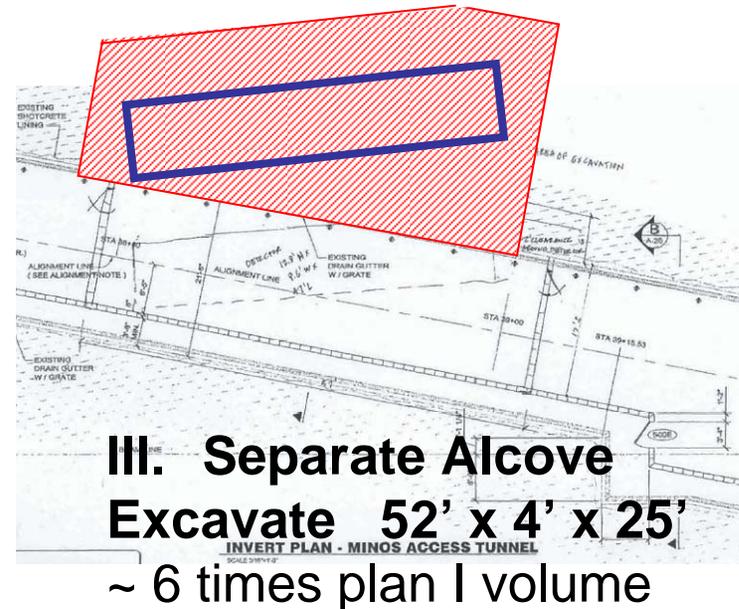
# Excavation details, Mont asks for 3 scenarios (Steve Dixon to cost, NOvA prefers not to pay!)



**I. NOvA blocks tunnel**  
**Excavate 26' x 16' x 6' deep**  
 Elaine says ~ \$ 200 K  
 8 – 12 weeks no access to MINOS Hall,  
 & no power to MINOS Hall



**II. Block only half of tunnel**  
**Excavate 52' x 4' x 12'**  
 ~ 3 times plan I volume



**III. Separate Alcove**  
**Excavate 52' x 4' x 25'**  
 ~ 6 times plan I volume



# Sufficient Project Personnel?

- **Administrative support high level full time**
  - Selected candidate Nov 15
  - Lab Services set salary before Thanksgiving
  - PPD agreed to salary last week
  - Waiting for Lab Services to negotiate start date (internal transfer)
  - PPD promises Judy Rippel (Astro) to help prepare for reviews
- **Help for monthly report startup**
  - Could be admin person?
  - Certainly true for the selected candidate.
- **PPD has a new mechanical engineer, placed under Dave Pushka's wing**
  - Therefore will help on NOvA for at least a while
- **Exempt / non-exempt changes have reduced our design / drafting support by 20%**
  - Need to check with PPD if NOvA can authorize OT from our continuing resolution budget allocation.
- **No other changes since October 18.**

# 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
<b>Cooperative Agreement</b>					
	U of M proposal draft	30-Sep-06	6-Oct-06	30-Oct-06	
	U of M final draft	15-Oct-06	17-Nov-06	20-Nov-06	
	U of M submits proposal	31-Oct-06	1-Dec-06	1-Dec-06	RGU not stipulated
	Recipient Selected = Site Selection	1-Nov-06	15-Jan-06		Assumes UM proposal, 4 wks DOE evaluation, 2 wks to Orbach acceptance
	Negotiations concluded	15-Jan-07	15-Apr-07		Can this be done in ~ 2-3 months?
					(not needed for CD-2 review)
					(but do need for CD-2 itself)
<b>NEPA</b>					
	<b>Scoping Meeting</b>	22-Jun-06		22-Jun-06	
	Environmental Impacts Analysis Plan and 5 point timeline	29-Jun-06		20-Jul-06	after iterations on schedule with Sally Arnold
	<b>NEPA timeline in Envir. Impacts Analysis Plan</b>				
	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	15-Dec-06		should have draft EAW, NOVA info, water report(?)
	final EA ready	1-Dec-06	15-Jan-06		since requires CA Recipient
	State / Public Comment period	1-Jan-07	15-Feb-07		Not required for CD-2 REVIEW ?
	FONSI drafted	1-Apr-07			not required for CD-2 REVIEW
	FONSI issued	1-Jun-07			not required for CD-2 REVIEW
	<b>Minnesota Part</b>				
	RGU (Responsible Government Unit) in place	15-Jan-07	15-Jan-07		date unknown, Jan 15 matches "final EA ready", Marshak to push U Minn with SEH document, see below (shaded yellow)
	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
	<b>Fermilab NOVA Part</b>				
	<b>draft Version Ch 3 Proposed Action: description, alternative</b>				
	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
	<b>Final Version (ties to date in NEPA timeline above)</b>				
	Integration Prototype on surface	1-Nov-06	15-Dec-06		containment, FP
	Near Detector in MINOS access tunnel	1-Nov-06	15-Dec-06		containment, FP, access issues
	Scintillator Blending & Storage	1-Nov-06	15-Dec-06		containment, transportation
	<b>Fermilab Tritium Part</b>				
	Water Task Force report	21-Sep-06	15-Dec-06		2nd draft from Mike Martens on 11/28



# What we need for CD-2 Review, page 2

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
<b>Site and Building</b>						
<b>Ash River Site</b>						
		EAW update, draft from SEH	1-Nov-06	1-Dec-06	4-Dec-06	Just got SEH consultant draft, will iterate
		final EAW	2-Jan-07			
		Wetland Permit Application prepared	1-Dec-06			needed for CD-3a ?
<b>Other Sites</b>						
		EAW	1-Jul-07	30-Sep-07		no longer matters with unsolicited proposal
<b>Building</b>						
		Independent Cost & Schedule Review	15-Sep-06	1-Sep-06	14-Sep-06	
		Decide overburden construction method	15-Oct-06		31-Oct-06	related to overburden thickness
		Final conceptual design ready for 30% design effort	15-Oct-06		31-Oct-06	
		30% Drawings	15-Dec-06	1-Apr-07		P.O. in place for first \$ 260 K in FY06, and for \$ 486 K in FY07, expect preliminary output for CD-2 review
<b>Liquid Scintillator</b>						
		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	29-Nov-06	have "Fermilab response" to blending RFI
		issue RFI for off-site blending	1-Aug-06	31-Oct-06	10-Nov-06	following 11/3 consultant advice on bid list
		RFI responses for off-site blending	1-Sep-06	30-Nov-06	30-Nov-06	8 responses, meeting tomorrow to sort it out
		Decide on TDR and C&S blending model	14-Dec-06			first meeting this week, decide next week
		evaluate waveshifter concentration	15-Aug-06		16-Aug-06	light output vs. concentration
		evaluate pseudocumene concentration	15-Aug-06		1-Apr-06	CDR info good, additional meas in progress
		decide waveshifter/pseudocumene to match fiber diameter	9-Aug-06	13-Oct-06	26-Oct-06	No scintillator change, only fiber & PVC
					30-Nov-06	Have final test for plot in TDR
<b>Wavelength Shifting Fiber</b>						
		Updated Kuraray quote	1-Jun-06	1-Jul-06	6-Jul-06	
		evaluate fiber diameter	1-Aug-06	13-Oct-06		
		attenuation length of 0.7 mm fiber	15-Sep-06	30-Oct-06	24-Oct-06	OK, 17% acceptance loss, 1-2% atten. loss
		attenuation length of 0.6 mm fiber	30-Sep-06	30-Oct-06	24-Oct-06	not OK, 34% accept loss, 10% atten. Loss
		decide fiber diameter	9-Aug-06	30-Oct-06	26-Oct-06	anatase PVC should be adequate
					30-Nov-06	Have final test for plot in TDR



# 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
<b>PVC Extrusions</b>					
	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		16-Oct-06	P.O. Date, delivered 10/30 to extruder
	Another resin tweak, order 1 anatase based on 9/28 tests, also light tests	8-Oct-06		16-Oct-06	P.O. Date, delivered 10/30 to extruder
	Extrude tweaked resins	23-Oct-06	1-Nov-06	1-Nov-06	needs another run
	Yet another run		21-Nov-06	21-Nov-06	This finally "tunes the initial die" with N-24
	React to measurements of 16-cell extrusions	31-Oct-06	18-Dec-06		die being reworked, next tests in Dec
	Measure mechanical properties of NOVA mixture in 16 cells	30-Sep-06	31-Dec-06		in progress but will repeat for new formula
	Issue RFP for 70,000 lb resin, BEST and FINAL	1-Sep-06	11-Dec-06		N-24
	Order resin for 1500 m of 16 cell material in anatase	15-Aug-06	23-Dec-06		N-25 failed, N-23 choice depends on 12/18 test
	Produce 3500 m of 16 cell material, horizontal, rutile	4-Aug-06	15-Jan-07		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	26-Oct-06	Anatase, but actual mix still unresolved
				30-Nov-06	Have final test for plot in TDR
	Still would not have final 16 vs 32 cell decision			28-Sep-06	Plan is 16+16 = 32, only adhesive in question
	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		27-Oct-06	got first sample
	Die returns after modification for vertical extrusions	15-Jan-06	1-Mar-07		die not available during February



# What we need for CD-2 Review, page 4

## 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
<b>PVC Modules</b>				
evaluate 0.7 mm fiber fragility in Module Assembly	15-Sep-06		18-Sep-06	quantitative evaluation says OK on 10/24/06
evaluate 0.6 mm fiber fragility in Module Assembly	22-Sep-06		5-Oct-06	
test black PVC for conductivity	15-Sep-06		5-Dec-06	not conductive enough, looking at more carbon but worry about PVC strength. May have to go to a wire.
final endplate design	31-Aug-06	15-Oct-06	18-Oct-06	
final manifold design	31-Aug-06	15-Oct-06	18-Oct-06	
adhesive choice	30-Sep-06	15-Dec-06		testing
adhesive vs. RF welding	1-Dec-06	1-Apr-07	20-Nov-06	adhesive in TDR, Devcon or 3M2216, perhaps both
factory stringing machine	1-Oct-06	1-Nov-06	14-Nov-06	internal review approved design
factory flycutting machine	1-Oct-06		15-Jul-06	MINOS flycutter tested successfully
factory gluing machine	1-Nov-06	15-Dec-06		if glue, now injected so machine is simpler, but does depend on glue choice
Time & Motion studies with 16 cell, 12 ft(early) & 53 ft(later) objects	15-Dec-06			waiting for glue choice, machines
<b>Electronics</b>				
Receive 1st 10 APDs from Hamamatsu	1-Oct-06	9-Dec-06		Mualem, Rusak, Oliver met with chief Hamamatsu Tech Director at IEEE San Diego Nov 2 Stick with Au bump bonding on PC substrate Will try smaller PC board, symmetric layout, thicker substrate if necessary Expect 1st bonded APDs by early-mid Dec.
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 complete	6-Oct-06	1-Feb-07		Uses packaged front end ASIC, board sent for fabrication on 11/30, expect testing complete in Jan
Cooling scheme choice for TDR: water or R-134a	1-Oct-06	1-Nov-06	26-Oct-06	Water chosen. Value engineering will continue on R-134a on the Integration Prototype.
Cooling design for TDR	1-Nov-06		26-Oct-06	decision included design
<b>Data Acquisition</b>				
prototype Data Concentrator tests complete	15-Dec-06	1-Feb-07		boards out for production Nov 30, parts in hand, testing in Jan



# 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
<b>Near Assembly</b>					
	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		22-Nov-06	have 2nd draft of TDR chapter 15
<b>Far Assembly</b>					
	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	19-Oct-06	Held at 80 psi
	Tests of 3 plane assemblies with Devcon Plastic Welder and 16-cell extrusions	22-Sep-06	10-Nov-06		in progress
	RF welding, plane to plane, 4 plane test at Ashland	31-Oct-06	1-Dec-06	27-Oct-06	have first sample
	RF welding, 3 plane assembly to compare			9-Nov-06	RF welding eliminated, Emabond withdraws
	settle baseline installation procedures	27-Jul-06	5-Oct-06	5-Oct-06	have initial write-up, now revising
	Validation of structural design	17-Aug-06	7-Nov-06		ongoing internal review in progress
	Initial design of access system for top of detector	30-Sep-06	19-Oct-06	31-Oct-06	linked to building design. Concrete ==> rolling platforms, now the baseline.
	Initial design of light tightening scheme	3-Oct-06	15-Dec-06		OK except for top of horizontal modules which are thinner (3mm PVC). Looking at paints, thinking of using vertical module on top horizontal spot.
	Initial design of scintillator filling scheme	26-Sep-06		26-Sep-06	linked to building design. Concrete ==> rolling platforms, now the baseline.
	final scintillator overflow tank design	5-Dec-06		5-Dec-06	task moved from modules to assembly
	Block Raiser design review	5-Dec-06	12-Dec-06		internal engineering review of design & cost
	Designs of mechanical systems & tooling	8-Jan-07			



# What we need for CD-2 Review, page 6

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
<b>Project Management</b>					
	<b>final</b> Project Execution Plan	1-Aug-06	12-Jan-07		needs CA description, final costs and milestones
	<b>final</b> Project Management Plan	12-Jan-07			needs CA description, EVMS appendix, look at QA plan re:CFR 830 & DOE 414.1c
	<b>final</b> Configuration Management Document	12-Jan-07			
	<b>final</b> Risk Management Plan	12-Jan-07			
	draft Procurement Plan (partial)	1-Aug-06		29-Aug-06	request from Lutha
	<b>final</b> Procurement Plan	21-Jan-07			(have good draft in hand 12/5)
	draft Performance Management System Document (EVMS)	21-Jul-06		23-Aug-06	NOvA-doc-1084 (lab-wide plan)
	<b>final</b> Performance Management System Document (EVMS)				
	draft PSAD	1-Apr-06	19-Jan-07		had at CD-1 but not shown, update after EA
	draft Security Vulnerability Assessment Report	18-Sep-06		18-Sep-06	Steve Webster: just for nuclear facilities.
	draft doc on High Performance Sustainable Bldg considerations	13-Sep-06		13-Sep-06	FESS Sustainable Design Review Procedure
	<b>final</b> doc on High Performance Sustainable Bldg considerations				LEED checklist by project team @ CD-3
	update initial Cyber Security Plan			16-Oct-06	Steve Webster: not needed if not IT project
	Begin monthly reports	1-May-06		27-Jun-06	May report finished June 27
	<b>1st draft</b> Technical Design Report (blanks identified)	1-Oct-06	6-Oct-06	17-Oct-06	
	<b>2nd draft</b> Technical Design Report (50% blanks filled)	1-Nov-06	9-Nov-06		have 5 of 12 expected from L2s as of 12/4
	<b>final</b> Technical Design Report	15-Dec-06	19-Jan-07		final updates, final edit by Project Office
	<b>draft</b> construction 20 kt Cost & Schedule matching funding profile	10-Aug-06		15-Aug-06	"match" is approximate
	<b>update</b> R&D portion of C&S	30-Sep-06	11-Dec-06		track starting November Monthly Report, will be final for CD-2
					L2 managers claim this will be easier than R&D, but follows some technical decisions, several are done, 3 big ones to go: blending, block pivoter, assembly of structure
	<b>2nd draft construction</b> 20 kt C & S following technical decisions	1-Nov-06	22-Dec-06		One attempt to match funding once we see the roll-up in second draft
	<b>nearly final</b> C&S	5-Dec-06	5-Jan-07		
	<b>final</b> Cost & Schedule	15-Dec-06	19-Jan-07		this would include full BOE & notes



# Summary

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- We are skating very close to the edge in preparations for the Director's Review and may need a backup plan