

First Executive Session  
Director's CD-1 Review of the  
NOvA Project

February 28 – March 2, 2005

L. Edward Temple, Jr.

# Agenda for Exec Session

- Charge to Reviewers
- DOE's Review Charge and Expectations for a Successful CD-1 Review
- Review Agenda
- NOvA's Timeline for Critical Decisions
- DOE O 413.3 Attachment 4
- Cost/Schedule Review Guidance
- Report Structure
  - Table of Contents
    - Findings, Comments, and Recommendations
- Assignments
  - Technical Reviewer Assignments
  - Breakout Groupings
- Cost / Contingency Table
- Discussion

# Charge

This charge is for the Committee to conduct a Director's CD-1 Review of the proposed NOvA project at Fermilab. The review is to assess the project's efforts at meeting the requirements for DOE to approve CD-1. CD-1 is defined as "Approve Alternative Selection and Cost Range". As part of this assessment the questions listed in Attachment 1 of this charge should be addressed. Additionally the committee is to review and comment on Project's response and actions taken on the recommendations from the Director's Preliminary Review of NOvA on July 18-20, 2005. Constructive comments on presentation content, format, and style are also requested.

Approval of CD-1 by DOE officials is based on a Conceptual Design documented in Conceptual Design Report (CDR) for the project. The project scope and preliminary baseline range for the cost and schedule are to be defined at this point in the project. Some additional documents that support the CD-1 determination are a Preliminary Project Execution Plan (PEP), a Preliminary Project Management Plan (PMP) and the Preliminary Hazard Analysis report. The technical part of the review will focus on the conceptual designs for the Detector and Building/Site. It will answer the questions, will these designs meet the requirements and specifications and are the designs sound. The cost, schedule and scope ranges are usually based on an initial set of documentation such as the following: WBS – Work Breakdown Structure, WBS Dictionary, BOE – Basis of Estimate documentation, risk and contingency analyses, RLS – Resource Loaded Schedule, and time phased funding and cost profiles. The committee is asked to review each of these items, for quality, completeness, and accuracy. Furthermore, the committee is asked to review and assess the quality of and comment on the additional formal project management documentation required for CD-1 approval.

# Charge (continued)

Fermilab and NOvA are planning for CD-3 approval to allow construction to start the first quarter of FY2008. To achieve this goal NOvA will need a DOE CD-2 Review by the fall of 2006. To advance the development of NOvA's Preliminary & Final Design effort and Value Management activities, PED (Project Engineering and Design) Funds are being requested to start in FY2007. Therefore, the committee is asked to comment as appropriate on NOvA's status regarding plans for utilizing PED Funding. Again, appropriate constructive comments on what remains to be done are requested.

Finally, the committee should present findings, comments, and conclusions at a closeout meeting with NOvA's and Fermilab's management and provide a written report soon after the review.

# Charge - Attachment 1

## Technical

- Are the requirements that form the basis for the design and engineering phase of the project clearly documented?
- Does the conceptual design satisfy the performance requirements?
- Has a Conceptual Design Report (CDR) been developed that includes a clear and concise description of the alternatives analyzed, the basis for the alternative selected, how the alternative meets the approved mission need?
- Has the Project employed value management as early as possible in the project development and design process so recommendations can be included in the planning and implemented without delaying the progress of the project or causing significant rework of completed designs?
- Has the Project identified specific standards which include codes, standards, regulations, and needed discipline (electrical, mechanical, nuclear, fire, radiation control, etc.) requirements to procure, fabricate, construct, inspect, and test the components, subsystems, and systems?
- Can the conceptual design be built? Does the design meet the technical specifications? Is it a reasonable design?

# Charge - Attachment 1 (continued)

## Cost

- Does the conceptual design report and supporting documentation adequately justify the stated cost range and project duration?
- Has the project developed a life-cycle cost estimate that includes costs for research and development, construction, operations and decommissioning?
- Do the cost estimates for each WBS (or cost) element have a sound documented basis and are they reasonable?
- Does an obligation profile exist?
- Has the project established a realistic cost estimate for the work associated with performing Preliminary Design, Final Design and Value Management activities to request an appropriate level of PED (Project Engineering and Design) Funds?

# Charge - Attachment 1 (continued)

## Schedule

- Does the Project's Work Breakdown Structure (WBS) define the total scope of the project as a product-oriented family tree composed of hardware, software, services, data, facilities and other components?
- Is a schedule developed and resource loaded?
- Are the activity durations reasonable for the assumed resources?
- Is the schedule duration feasible for the resources assigned to accomplish the tasks?
- Does the schedule contain appropriate levels of milestones, sufficient quantity of milestones for tracking progress and do they appear to be achievable?
- Does the schedule include activities for design reviews, which include assessment of the designs readiness for procuring prototypes and preproduction materials?
- Has the activities associated with the Preliminary Design, Final Design and Value Management activities been appropriated identified in the schedule so they can be properly tracked if PED funds are used?

# Charge - Attachment 1 (continued)

## Management

- Is there an appropriate management organization structure in place with the responsibilities defined and documented for the scope of work?
- Does the proposed project team have adequate management experience, design skills, and laboratory support to produce a credible technical, cost, and schedule baseline?
- Are ES&H aspects being properly addressed and are future plans sufficient given the project's current stage of development?
- Is the documentation required by DOE O 413.3 in order and ready for Approval of CD-1?
- Are there adequate staffing resources available or planned for this effort?
- Is there a funding plan available or proposed to meet the resource requirements to realize the project?
- Has Risk Management been performed which includes risks assessments on each potential design alternative as a factor in selecting which alternative is to be pursued?

Jan. 24, 2006  
Robin Staffin  
Charge Memo  
to Dan Lehman

The NuMI Off-Axis Neutrino Appearance (NOvA) Experiment is one of the proposals for the Electron Neutrino Appearance (EvA) Detector. I would like to request that you conduct a CD-1 Review of the NOvA proposal on April 4-6, 2006 at Fermi National Accelerator Laboratory. The purpose of this review is to validate the conceptual design and the cost range, which are needed for Critical Decision 1, Approval of Alternative Selection and Cost Range.

The NOvA project proposes to utilize the existing NuMI beamline and construct two new detectors optimized to detect electron neutrino interactions in order to observe the oscillation of muon neutrinos into the electron neutrinos and measure the parameters of that oscillation. One detector would be located on the Fermilab site and one would be approximately 800 kilometers away in a site to be determined in northern Minnesota.

In performance of a general assessment of progress, current status, and the identification of potential issues, the committee should address the following specific items:

1. Does the conceptual design satisfy the performance requirements?
2. Does the conceptual design report and supporting documentation adequately justify the stated cost range and project duration?
3. Does the proposed project team have adequate management experience, design skills, and laboratory support to produce a credible technical, cost, and schedule baseline?
4. Are ES&H aspects being properly addressed and are future plans sufficient given the projects current stage of development?
5. Is the documentation required by DOE O 413.3 in order and ready for Approval of CD-1?

Michael Procaro is the program manager for the EvA Detector Project in this office and will serve as the Office of High Energy Physics (OHEP) contact person for the review.

We appreciate your assistance in this matter. As you know, these reviews play an important role in our program. I look forward to receiving your Committee's report. You are asked to submit a formal report to OHEP within 60 days of the review.

# DOE's Expectations for a Successful CD-1 Review

- Completed Conceptual Design Report: It should
  - document the physics requirements to be met.
  - describe technical solutions that are likely to meet the physics requirements.
  - provide a credible estimate of the cost range and associated supporting information to justify the cost range.
  - present a credible schedule duration which shows how long it will take to complete design and construction.
- Project team in place: The team should be capable of carrying the design forward to a baseline.
  - A qualified project management team should be in place.
  - The physicists, engineers, and other personnel needed to complete the design have been identified and made available.
  - There is a plan to complete the R&D needed for the design and resources to implement the plan have been identified.
- Other required documentation for CD-1:
  - Preliminary Project Execution Plan (PPEP) which addresses all required elements of the PEP at a preliminary level.
    - Details can be completed at CD-2 when the final PEP is approved.
    - If a Project Management Plan (PMP) will be used to supplement the PEP then a draft should also exist at a similar level of detail.
  - Preliminary Hazards Analysis Report which identifies major safety issues and conceptual solutions to mitigate these issues.

# Agenda

## Tuesday, Feb. 28

8:00 – 8:45 AM	45	Executive Session (Comitium, WH2SE)	Ed Temple
9:00 – 9:10 AM	10	Introduction (1 West for all Talks)	Hugh Montgomery
9:10 – 9:25 AM	15	Scientific Performance Requirements	Mark Messier
9:25 – 10:10 AM	45	Project Overview	John Cooper
10:10 – 10:40 AM	30	Project Cost Drivers	Ron Ray, Bob Cibic
10:40 – 10:55 AM	15	BREAK	
10:55 – 11:20 AM	25	Site and Building	Steve Dixon
11:20 – 11:50 AM	30	Scintillator	Stuart Mufson
11:50 – 12:05 PM	15	Fiber	Carl Bromberg
12:05 – 1:05 PM	60	LUNCH (WH2 Crossover)	
1:05 – 1:25 PM	20	PVC and Extrusions	Rich Talaga
1:25 – 1:55 PM	30	Extrusion Modules	Ken Heller
1:55 – 2:25 PM	30	Electronics and DAQ	Leon Mualem
2:25 – 2:55 PM	30	Near/Far Detector Assembly	Dave Ayres
2:55 – 3:10 PM	15	Then Year Costs and NOvA Cost Range	John Cooper
3:10 – 3:25 PM	15	BREAK	

# Agenda (continued)

- 3:25 – 4:25 PM 60 BREAKOUT SESSIONS
- 1) Site and Building (Blackhole – WH2NW)
  - 2) Commodities - Scintillator, Fiber, PVC (1 North, WH1NW)
  - 3) Extrusion Module Production (Snakepit, WH2NE)
  - 4) Electronics and DAQ (Racetrack, WH7X)
  - 5) Far and Near Detector Assembly (1 East, WH1NE)
- 4:30 – 6:00 PM Executive Session (Comitium, WH2SE)

# Agenda (continued)

## Wednesday, Mar. 1

8:00 – 8:30 AM

Cost and Schedule Executive Session  
(Comitium, WH2SE)

Ed Temple

8:30 – 10:30 AM

**BREAKOUT SESSIONS**

1) Site and Building (Blackhole –  
WH2NW)

2) Commodities - Scintillator, Fiber,  
PVC (1 North, WH1NW)

3) Extrusion Module Production  
(Snakepit, WH2NE)

4) Electronics and DAQ (Racetrack,  
WH7X)

5) Far and Near Detector Assembly (1  
East, WH1NE)

6) Management, Cost and Schedule  
(Comitium, WH2SE)

10:30 – 10:45 AM

BREAK (Outside Comitium, WH2SE)

10:45 – 12:30 PM

**BREAKOUT SESSIONS (Continued)**

# Agenda (continued)

12:30 – 1:30 PM	LUNCH (WH2 Crossover)
1:30 – 2:30 PM	NOvA Respond to Committee Questions from 1 <sup>st</sup> Day (Comitium, WH2SE)
2:30 – 4:00 PM	Executive Session (Comitium, WH2SE)
4:00 – 6:00 PM	Report Writing (Comitium, WH2SE)

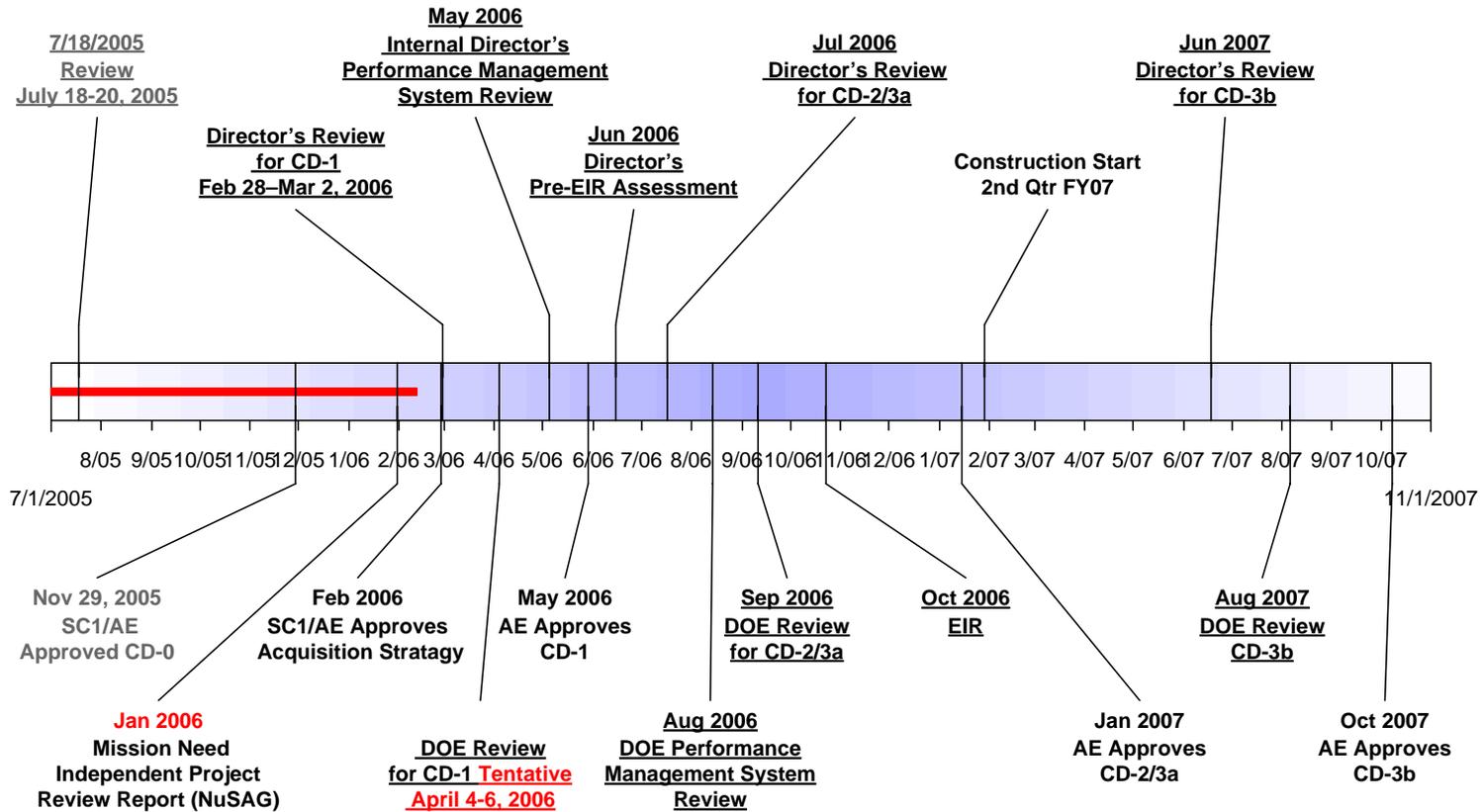
## **Thursday, Mar. 2**

9:00 – 2:00 PM	Closeout Dry Run with working lunch (Comitium, WH2SE)
2:00 PM	Closeout (1 West, WH1SW)



# DRAFT NOvA Project Timeline for Critical Decisions & Reviews

Updated 31-Jan-06



Note:  
Text in Red indicates change from prior version

# DOE O 413.3 Attachment 4

PROJECT ACQUISITION PROCESS AND CRITICAL DECISIONS					
Project Planning Phase		Project Execution Phase			Mission
Preconceptual Planning	Conceptual Design	Preliminary Design	Final Design	Construction	Operations
• <b>CD-0</b> Approve Mission Need	• <b>CD-1</b> Approve Preliminary Baseline Range	• <b>CD-2</b> Approve Performance Baseline	• <b>CD-3</b> Approve Start of Construction	• <b>CD-4</b> Approve Start of Operations or Project Closeout	
<i>See Page 2 for CDs on Environmental Restoration and Facility Disposition Projects</i>					
CD-0	CD-1	CD-2	CD-3	CD-4	
<b>Actions Authorized by Critical Decision Approval</b>					
<ul style="list-style-type: none"> <li>Proceed with conceptual design using program funds</li> <li>Request PED funding</li> </ul>	<ul style="list-style-type: none"> <li>Allow expenditure of PED funds for design</li> </ul>	<ul style="list-style-type: none"> <li>Establish baseline budget for construction</li> <li>Continue design</li> <li>Request construction funding</li> </ul>	<ul style="list-style-type: none"> <li>Approve expenditure of funds for construction</li> </ul>	<ul style="list-style-type: none"> <li>Allow start of operations or project closeout</li> </ul>	
<b>Critical Decision Prerequisites</b>					
<ul style="list-style-type: none"> <li>Justification of mission need document</li> <li>Acquisition Strategy</li> <li>Preconceptual planning</li> <li>Mission Need Independent Project Review</li> </ul>	<ul style="list-style-type: none"> <li>Acquisition Plan</li> <li>Conceptual Design Report</li> <li>Preliminary Project Execution Plan and baseline range</li> <li>Project Data Sheet for design</li> <li>Verification of mission need</li> <li>Preliminary Hazard Analysis Report</li> </ul>	<ul style="list-style-type: none"> <li>Preliminary design</li> <li>Review of contractor project management system</li> <li>Final Project Execution Plan and performance baseline</li> <li>Independent cost estimate</li> <li>National Environmental Policy Act documentation</li> <li>Project Data Sheet for construction</li> <li>Draft Preliminary Safety Analysis Report</li> <li>Performance Baseline External Independent Review</li> </ul>	<ul style="list-style-type: none"> <li>Update Project Execution Plan and performance baseline</li> <li>Final design and procurement packages (**)</li> <li>Verification of mission need</li> <li>Budget and congressional authorization and appropriation enacted</li> <li>Approval of Safety documentation</li> <li>Execution Readiness Independent Review</li> </ul>	<ul style="list-style-type: none"> <li>Operational Readiness Review and acceptance report</li> <li>Project transition to operations report</li> <li>Final Safety Analysis Report</li> </ul> <hr/> <p><b>After CD-4</b></p> <p><b>Closeout</b></p> <ul style="list-style-type: none"> <li>Project closeout report</li> </ul>	

(\*\*) To the degree appropriate to initiate construction as scheduled.

*These are CD-2  
Requirements.*

*Now at CD-1.*

*We should use as  
a guide for  
assessing a  
baseline “range”  
or appropriate  
contingency.*

## Cost / Schedule Review Guidance

### Project Technical, Cost, and Schedule Baseline Development

#### To Succeed in Cost / Schedule Arena

Estimate must be

##### **Complete**

Scope well understood and defined

Technical goal must be clear

Technology to be used to meet this goal known

Designate how technical systems will be acquired

I.e. buy, have fabricated, self fabricated

Buy parts / fabricate / assemble

How will this be accomplished

Self fabricate / assemble – lab or university(ies)

How will person power requirements be met

And paid for

All tasks defined and specified in a work breakdown structure

WBS dictionary

##### **Documented** at lowest level of WBS and include

M&S – materials and services

SWF – salaries, wages, & fringes

Accompanied by schedule showing appropriate durations

Adders – overheads / G&A (general & administrative)

Escalated – shown both with and without escalation with funding

profile based on laboratory/DOE/Federal

budget/appropriation guidance

##### **Reviewable**

Estimate must “roll-up” from the lowest level to the total and

reviewers must be able to drill down from the top to the lowest level

##### **Credible**

Basis of estimate must be specified

Catalog prices

Similar work, where cost is documented

Engineering estimates

WAG – wild ass guess

This material forms basis for DOE approving a baseline, for Fermilab/Collaboration Project Management to measure performance and take appropriate corrective actions during execution and for Laboratory Management and DOE to monitor progress.

# Reviewer Assignments

Executive Summary	<u>Ed Temple</u>
1.0 Introduction	<u>Dean Hoffer</u>
2.0 Science	<u>Heidi Schellman,</u> and All
3.0 Site and Building (WBS 1/2.1)	<u>Karen Hellman,</u> <u>Elaine McCluskey</u>
4.0 Commodities – Scintillator/Fiber/PVC (WBS 1/2.2, 1/2.3 & 1/2.4)	<u>Linda Stutte,</u> <u>Joe Ingraffia</u>
5.0 Extrusion Module Production (WBS 1/2.5)	<u>Dmitri Denisov,</u> <u>Heidi Schellman</u>
6.0 Electronics, Trigger DAQ (WBS 1/2.6 & 1/2.7)	<u>Jonathan Lewis,</u> <u>Erik Gottschalk</u>
7.0 Far and Near Detector Assembly (WBS 1/2.8 & 2.9)	<u>Richard Boyce,</u> <u>Charlie Cooper</u>
8.0 Project Management (WBS 1.9 & 2.10)	<u>Mike Lindgren,</u> <u>Ed Temple</u>
9.0 Cost and Schedule	<u>Jeff Sims,</u> <u>Dean Hoffer,</u>

- Note underlined names are the primary writer.

# Reviewer Assignments

## (continued)

10.0 Charge Questions	
<u>TECHNICAL</u>	
10.1 Are the requirements that form the basis for the design and engineering phase of the project clearly documented?	<u>Heidi Schellman</u>
10.2 Does the conceptual design satisfy the performance requirements?	
10.3 Has a Conceptual Design Report (CDR) been developed that includes a clear and concise description of the alternatives analyzed, the basis for the alternative selected, how the alternative meets the approved mission need?	<u>Mike Lindgren</u>
10.4 Has the Project employed value management as early as possible in the project development and design process so recommendations can be included in the planning and implemented without delaying the progress of the project or causing significant rework of completed designs?	
10.5 Has the Project identified specific standards which include codes, standards, regulations, and needed discipline (electrical, mechanical, nuclear, fire, radiation control, etc.) requirements to procure, fabricate, construct, inspect, and test the components, subsystems, and systems?	<u>Elaine McCluskey</u>
10.6 Can the conceptual design be built? Does the design meet the technical specifications? Is it a reasonable design?	<u>Richard Boyce/ All</u>

- Note underlined names are the primary writer.

# Reviewer Assignments

(continued)

<u>COST</u>	
10.7 Does the conceptual design report and supporting documentation adequately justify the stated cost range and project duration?	<u>Jeff Sims/ All</u>
10.8 Has the project developed a life-cycle cost estimate that includes costs for research and development, construction, operations and decommissioning?	
10.9 Do the cost estimates for each WBS (or cost) element have a sound documented basis and are they reasonable?	
10.10 Does an obligation profile exist?	<u>Mike Lindgren</u>
10.11 Has the project established a realistic cost estimate for the work associated with performing Preliminary Design, Final Design and Value Management activities to request an appropriate level of PED (Project Engineering and Design) Funds?	<u>Jeff Sims/ All</u>

- Note underlined names are the primary writer.

# Reviewer Assignments

(continued)

<u>SCHEDULE</u>	
10.12 Does the Project's Work Breakdown Structure (WBS) define the total scope of the project as a product-oriented family tree composed of hardware, software, services, data, facilities and other components?	<u>Dean Hoffer/ All</u>
10.13 Is a schedule developed and resource loaded?	
10.14 Are the activity durations reasonable for the assumed resources?	
10.15 Is the schedule duration feasible for the resources assigned to accomplish the tasks?	
10.16 Does the schedule contain appropriate levels of milestones, sufficient quantity of milestones for tracking progress and do they appear to be achievable?	
10.17 Does the schedule include activities for design reviews, which include assessment of the designs readiness for procuring prototypes and preproduction materials?	
10.18 Has the activities associated with the Preliminary Design, Final Design and Value Management activities been appropriated identified in the schedule so they can be properly tracked if PED funds are used?	

- Note underlined names are the primary writer.

# Reviewer Assignments

(continued)

<u>MANAGEMENT</u>	
10.19 Is there an appropriate management organization structure in place with the responsibilities defined and documented for the scope of work?	<u>Mike Lindgren</u>
10.20 Does the proposed project team have adequate management experience, design skills, and laboratory support to produce a credible technical, cost, and schedule baseline?	<u>Mike Lindgren</u> / Ed Temple
10.21 Are ES&H aspects being properly addressed and are future plans sufficient given the projects current stage of development?	<u>Elaine McCluskey</u> / Richard Boyce
10.22 Is the documentation required by DOE O 413.3 in order and ready for Approval of CD-1?	<u>Mike Lindgren</u>
10.23 Are there adequate staffing resources available or planned for this effort?	
10.24 Is there a funding plan available or proposed to meet the resource requirements to realize the project?	
10.25 Has Risk Management been performed which includes risks assessments on each potential design alternative as a factor in selecting which alternative is to be pursued?	

- Note underlined names are the primary writer.

# Reviewer Assignments for Breakouts

<b>1) Site and Building</b> (Blake Hole, WH2NW)	Karen Hellman, Elaine McCluskey
<b>2) Commodities – Scintillator/Fiber/PVC</b> (1 North, WH1NW)	Linda Stutte, Joe Ingraffia,
<b>3) Extrusion Module Production</b> (Snakepit, WH2NE)	Dmitri Denisov, Heidi Schellman
<b>4) Electronics and DAQ</b> (Racetrack, WH7X)	Jonathan Lewis, Erik Gottschalk
<b>5) Far and Near Detector Assembly</b> (1 East, WH1NE)	Richard Boyce, Charlie Cooper
<b>6) Management, Cost and Schedule</b> (Comitium, WH2SE)	Mike Lindgren, Jeff Sims, Dean Hoffer, Ed Temple,

## Reporting Out & Report Structure

- Review findings, assessments, and recommendations should be presented in writing at a closeout with the Collaborations and Fermilab management.
- Section for each “Level 2” WBS plus Cost and Schedule sections.
- Written with
  - Findings
  - Comments and
  - Recommendations

# Findings, Comments, and Recommendations

- Findings
  - Findings are statements of fact that summarize noteworthy information presented during the review.
- Comments
  - Comments are judgment statements about the facts presented during the review. The reviewers' comments are based on their experiences and expertise.
  - The comments are to be evaluated by the project team and actions taken as deemed appropriate.
- Recommendations
  - Recommendations are statements of actions that should be addressed by the project team.
  - A response to the recommendation is expected and that the actions taken would be reported on during future reviews.

# Project's Cost & Contingency Estimate

WBS	Items	NOvA 's Cost Estimate AY06 \$M									
		Estimated Cost (with indirects)			Contingency Estimate			Contingency %			Total Project Cost
		M&S	Labor	Total	M&S	Labor	Total	M&S	Labor	Total	
2.1	Far Detector Site and Buildings	\$ 27.2	\$ 2.6	\$ 29.8	\$ 5.9	\$ 0.7	\$ 6.6	22%	29%	22%	\$ 36.4
2.1	Liquid Scintillator	\$ 36.4	\$ 0.9	\$ 37.3	\$ 10.8	\$ 0.4	\$ 11.2	30%	42%	30%	\$ 48.5
2.3	Wave-Length-Shifting Fiber	\$ 24.7	\$ 0.0	\$ 24.7	\$ 6.9	\$ 0.0	\$ 6.9	28%	50%	28%	\$ 31.6
2.4	PVC Extrusions	\$ 39.3	\$ 0.2	\$ 39.5	\$ 15.6	\$ 0.1	\$ 15.7	40%	50%	40%	\$ 55.2
2.5	PVC Modules	\$ 6.8	\$ 2.8	\$ 9.5	\$ 2.2	\$ 2.0	\$ 4.3	33%	74%	45%	\$ 13.8
2.6	Electronics Production	\$ 16.7	\$ 0.5	\$ 17.2	\$ 8.2	\$ 0.3	\$ 8.5	49%	51%	49%	\$ 25.6
2.7	Data Acquisition System	\$ 1.2	\$ 0.6	\$ 1.8	\$ 0.6	\$ 0.3	\$ 0.9	50%	50%	50%	\$ 2.7
2.8	Near Detector Assembly	\$ 0.2	\$ 0.6	\$ 0.8	\$ 0.2	\$ 0.6	\$ 0.8	100%	100%	100%	\$ 1.6
2.9	Far Detector Assembly	\$ 7.1	\$ 7.3	\$ 14.5	\$ 7.1	\$ 7.3	\$ 14.5	100%	100%	100%	\$ 28.9
2.10	Project Management	\$ 0.6	\$ 4.3	\$ 4.9	\$ -	\$ -	\$ -	0%	0%	0%	\$ 4.9
<b>Subtotal Construction</b>		<b>\$ 160.1</b>	<b>\$ 19.8</b>	<b>\$ 179.9</b>	<b>\$ 57.6</b>	<b>\$ 11.7</b>	<b>\$ 69.3</b>	<b>36%</b>	<b>59%</b>	<b>39%</b>	<b>\$ 249.2</b>
<b>PED*</b>		<b>\$ 7.2</b>	<b>\$ 1.4</b>	<b>\$ 8.7</b>	<b>\$ 1.6</b>	<b>\$ 0.4</b>	<b>\$ 2.0</b>	<b>22%</b>	<b>29%</b>	<b>23%</b>	<b>\$ 10.6</b>
<b>Total TEC:</b>		<b>\$ 167.4</b>	<b>\$ 21.2</b>	<b>\$ 188.6</b>	<b>\$ 59.1</b>	<b>\$ 12.1</b>	<b>\$ 71.3</b>	<b>35%</b>	<b>57%</b>	<b>38%</b>	<b>\$ 259.8</b>
<b>OPC</b>	<b>R&amp;D</b>	<b>\$ 5.8</b>	<b>\$ 6.5</b>	<b>\$ 12.3</b>	<b>\$ 0.7</b>	<b>\$ 0.6</b>	<b>\$ 1.3</b>	<b>12%</b>	<b>9%</b>	<b>10%</b>	<b>\$ 13.6</b>
<b>Total OPC:</b>		<b>\$ 5.8</b>	<b>\$ 6.5</b>	<b>\$ 12.3</b>	<b>\$ 0.7</b>	<b>\$ 0.6</b>	<b>\$ 1.3</b>	<b>12%</b>	<b>9%</b>	<b>10%</b>	<b>\$ 13.6</b>

TPC: \$ 173.2 \$ 27.7 \$ 200.9 \$ 59.8 \$ 12.7 \$ 72.5 35% 46% 36% \$ 273.4

Note: \*PED activities in the schedule are not currently segregated from construction activities.

# Reviewer Write-ups

- Write-ups are to be sent to Terry Erickson at [terickson@fnal.gov](mailto:terickson@fnal.gov) prior to 8:30 AM on Thursday, March 2 for the Closeout Dry Run

# Discussion

- Questions and Answers