

**First Executive Session  
Director's Preliminary Review  
of the  
Super NuMI (SNUMI) Plan**

November 14-16, 2006

L. Edward Temple, Jr.

# Agenda for Exec Session

- Charge to Reviewers
- Review Agenda
- Campaign vs. Project
- Cost/Schedule Review Guidance
- Report Outline and Reviewer Assignments
- Reporting Out Structure
  - Findings, Comments, and Recommendations
- Discussion

# Charge

Fermilab has prepared a “Super NuMI” (SNUMI) Plan for upgrading the proton accelerator complex in support of our neutrino-based research program following the cessation of Tevatron operations at the end of this decade. The goal for the SNUMI era is the delivery of at least 1 MW beam power onto the neutrino production target, based on effective utilization of accelerator facilities that will become available after the end of collider Run II.

The primary purpose of this Director's Review is to establish a preliminary baseline for Phase I of the plan (aimed at 700 kW), and to establish a viable strategy for Phase II (aimed beyond 1 MW). Within this context the committee will be asked to assess all aspects of the SNUMI Plan: technical performance goals and implementation strategy, cost estimate, schedule, and management structure.

The Phase 1 of the SNUMI effort is considered a “campaign” in the sense of the Run II Luminosity Upgrade and Proton Plan campaigns. That is the Phase 1 of SNUMI is not a “project” in the formal sense of a DOE project. However, selected project management techniques will be used in managing the campaign.

# Charge (continued)

Phase II maybe considered a “project” in the formal sense of a DOE project. It is recognized that this review is being conducted at a very early stage of Phase II of the SNuMI project, thus it is a “preliminary” review and material presented will not be developed to the level of sophistication or detail of a more mature project.

As part of this assessment the questions listed in Attachment 1 of this charge should be addressed. The Director’s Review Committee is asked to present findings, comments, and recommendations in a closeout session with the SNuMI team, AD Management, and Fermilab Management at the end of the review and in a written report soon thereafter.

# Charge Attachment 1

## Phase I Questions:

### Technical

- Are the physics requirements that SNuMI addresses appropriately stated?
- Have these physics requirements been translated into accelerator technical performance requirements / specifications?
- Are the design features of the defined elements of SNuMI documented in a Conceptual Design Report, Design Handbook, or other appropriate manner?
- Are the prototype plans and decision paths appropriate for the less well-developed elements?
- Do the elements of SNuMI address the performance requirements / specifications? Are the designs of these elements reasonable?

### Cost

- Has a Work Breakdown Structure (WBS) been developed?
- Do the cost estimates for each WBS element have a sound basis and are they reasonable?

# Charge Attachment 1 (continued)

## Schedule

- Is there a schedule for the project?
- Are the activity durations reasonable for the assumed resources?
- Has the schedule been “resource loaded?”
- Has the schedule been developed with contingency or slack included?
- For the less well-developed technical elements have decision milestones been included in the schedule?

## Management

- Is there an appropriate management organizational structure in place or proposed to accomplish the design and construction?
- Have responsibilities been assigned or have they been proposed?
- Is there a Project Management Plan outlining the organizational structure, summarizing the technical, cost and schedule (including milestones) baselines, and setting forth the change control procedures and reporting processes that will be used?
- 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 SNUMI?

# Charge Attachment 1 (continued)

## Phase II Questions:

- Does the design concept for Phase II support the objective of delivering at least 1 MW beam power onto the neutrino production target?
- Is the strategy for Phase II viable and does it support the implementation of Phase II in the timeframe presented?

# Agenda

## Tuesday, November 14 – Comitium (WH2SE)

8:00 – 8:45 AM	45'	Executive Session (Comitium - WH2SE)	Ed Temple
8:45 – 8:55 AM	10'	Introduction	Steve Holmes
8:55 – 9:10 AM	15'	NOvA Beam Requirements	Mark Messier
9:10 – 9:35 AM	25'	SNuMI Plan Overview	Alberto Marchionni
9:35 – 9:55 AM	20'	SNuMI Beam Physics	Robert Zwaska
9:55 - 10:10 AM	15'	<b>BREAK</b>	
10:10 - 10:30 AM	20'	Booster present performance and upgrades	Eric Prebys
10:30 - 11:05 AM	35'	Recycler Upgrades	Paul Derwent
11:05 - 11:25 AM	20'	Main Injector present performance and upgrades	Ioanis Kourbanis
11:25 – 12:00 AM	35'	NuMI Upgrades	Mike Martens
12:00 - 1:00 PM	60'	<b>Lunch (2<sup>nd</sup> Floor Crossover)</b>	
1:00 - 1:40 PM	40'	Overview of Phase II	Nancy Grossman
1:40 - 2:00 PM	20'	Civil Construction (Phase I & II)	Dixon Bogert
2:00 - 2:20 PM	20'	Accelerator Complex Radiation Safety	Anthony Leveling
2:20 - 2:40 PM	20'	NuMI Beamline Radiation Safety	Kamran Vaziri
2:40 - 3:05 PM	25'	Strategy, Cost and Schedule (Phase I & II)	Nancy Grossman
3:05 - 3:15 PM	10'	Proton projections	Robert Zwaska
3:15 - 3:30 PM	15'	<b>BREAK</b>	
3:30 – 4:30 PM	60'	Breakouts Sessions 1-4 (See Breakout Details for Room Assignments)	
4:30 – 6:30 PM		Executive Session (Comitium WH2SE)	Ed Temple



# Agenda

(continued)

## Wednesday, November 15, 2006

8:00–8:30 AM	Cost and Schedule Executive Session (Comitium WH2SE)	Ed Temple
8:30–10:30 AM	Breakouts Sessions 5-7 (See Breakout Details for Room Assignments)	
10:30–10:45 AM	<b>BREAK</b> (Outside of Comitium)	
10:45 – 12:45 AM	Breakouts Sessions 8-10 (See Breakout Details for Room Assignments)	
12:45–1:45 PM	<b>LUNCH</b> (2 <sup>nd</sup> Floor Crossover)	
1:45–2:45 PM	SNuMI's Responses to Committee Questions (Comitium, WH2SE)	Nancy Grossman Alberto Marchionni
2::45 PM-6:30+ (Break at 3:45)	Executive Session and Report Writing (Comitium, WH2SE)	Ed Temple

## Thursday November 16, 2006

8:30–2:00 PM	Closeout Dry Run with working lunch (Comitium - WH2SE) Breaks taken as necessary.
2:00 PM	Closeout (Curia II - WH2SW)

# Agenda

(continued)

## Breakout Session Details

### Tuesday, November 14

3:30 – 4:30 PM	<b>1) Booster and Main Injector</b> (One North – WH1W)	Ioanis Kourbanis
	<b>2) Recycler: injection line, extraction line</b> (Black Hole – WH2NW)	Paul Derwent
	<b>3) NuMI: primary proton line, decay pipe &amp; hadron absorber</b> (Snake Pit – WH2NE)	Mike Martens
	<b>4) Management/Cost/Schedule/Strategy (Phase I &amp; II)</b> (Comitium - WH2SE)	Nancy Grossman

### Wednesday, November 15

8:30 - 10:30 AM	<b>5) Recycler: Kickers, Slip-Stacking Scheme, RF Systems</b> (Black Hole – WH2NW)	Paul Derwent
	<b>6) NuMI: target chase cooling, target and horns</b> (Snake Pit – WH2NE)	Mike Martens
	<b>7) Management/Cost/Schedule/Strategy (Phase I &amp; II)</b> (Comitium - WH2SE)	Nancy Grossman
10:45 – 12:45 AM	<b>8) Overview of Phase II</b> (Black Hole – WH2NW)	Ioanis Kourbanis
	<b>9) Civil Construction (Phase I &amp; II)</b> (One North – WH1W)	Dixon Bogert
	<b>10) Radiation safety/shielding (Phase I &amp; II)</b> (Snake Pit – WH2NE)	Anthony Leveling Kamran Vaziri

\* Indicates attending via video conference.

# How will SNuMI be Managed?

- Phase I (700kW)
  - To be managed as a Campaign.
- Phase II (beyond 1 MW)
  - May be a Campaign, MIE Project or Line Item Project.

# Excerpts from DOE O 413.3A (V. 7-28-08)

- “... the approach to meeting the requirements should be tailored consistent with the risk, complexity, visibility, cost, safety, security, and schedule of the project.”

# Excerpts from DOE O 413.3A (V. 7-28-08)

## Project Management Principles.

Fundamental project management principles provide a framework for successful project execution. The requirements set forth in this Order are established to ensure adherence to the following principles:

- 1) Line management accountability
- 2) Sound disciplined up-front planning
- 3) Development and implementation of sound acquisition strategies
- 4) Well-defined and managed performance baselines
- 5) Effective project management systems (e.g., quality assurance, risk management, change control, performance management)
- 6) Implementation of an Integrated Safety Management System
- 7) Effective communication among all project stakeholders

# Run II Luminosity Improvements

- Run II is not a construction project
- Run II is a complex campaign of operations, maintenance, upgrades, R&D and studies

Quote from Dan Lehman report to HEPAP  
following a Run II Luminosity Lehman  
Review

# SNuMI Phase I Plan is a “Campaign”

- As such we apply an appropriately tailored selection of project management tools
  - Design Documentation
  - Work Breakdown Structure
  - Cost Estimate
  - Resource Loaded Schedule
  - Change Control
  - Monthly Management Review / Report

# SNuMI's Cost Estimate (Phase 1)

## PHASE I: Base Costs, no G&A (indirects) or contingency, FY06\$k

WBS	Name	Cont %	Labor	M&S	Total
1	SNuMI Phase I	41%	\$13,136	\$20,307	\$33,443
1.1	Booster Upgrades	30%	\$139	\$518	\$657
1.2	Recycler Upgrades	36%	\$4,540	\$11,697	\$16,236
1.3	Main Injector Upgrades	31%	\$571	\$1,091	\$1,662
1.4	NuMI Upgrades	62%	\$2,665	\$6,101	\$8,766
1.5	Beam Physics	37%	\$463	\$35	\$498
1.6	Project Management	30%	\$4,759	\$865	\$5,624



# SNuMI's Cost Estimate (Phase II)

<b>PHASE II: Base Costs, no G&amp;A (indirects) or contingency, FY06\$k</b>				
<b>WBS</b>	<b>Task Name</b>	<b>M&amp;S Cost</b>	<b>Labor</b>	<b>Total</b>
1	SNuMI Phase II	\$31,428	\$22,240	\$53,668
1.1	Booster	\$0	\$0	\$0
1.2	Recycler	\$1,500	\$1,500	\$3,000
1.3	Main Injector	\$6,979	\$2,200	\$9,179
1.4	NuMI	\$4,800	\$4,800	\$9,600
1.5	Beam Physics	\$100	\$500	\$600
1.6	Accumulator	\$5,835	\$5,840	\$11,675
1.7	Civil (includes 20% overhead)	\$11,214	\$0	\$11,214
1.8	Radiation Safety	\$0	\$500	\$500
1.9	Project Management	\$1,000	\$6,900	\$7,900

# Cost/Schedule Review Guidance

*These are Baseline Requirements.*

*The cost/schedule reviews are key elements of the Performance (Technical, Cost, Schedule) Baseline Reviews.*

## 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

BOE – Bases of Estimate

# Cost/Schedule Review Guidance

(Continued)

## **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.

# Project's Cost & Contingency Estimate

Executive Summary	<u>Ed Temple</u>
1.0 Introduction	<u>Dean Hoffer</u>
2.0 Phase I	
2.1 Technical	
2.1.1 Booster Upgrades	<u>Stuart Henderson</u> Erk Jensen
2.1.2 Recycler Upgrades	<u>Erk Jensen</u> Mike Brennan Phil Martin
2.1.3 Main Injector Upgrades	<u>Mike Brennan</u> Stuart Henderson Erk Jensen
2.1.4 NuMI Upgrades	<u>Sayed Rokni</u> Thomas Roser Yoshi Yamazaki
2.2 Civil Construction	<u>Karen Hellman</u> Phil Martin
2.3 Project Management	
2.3.1 Cost	<u>Dean Hoffer</u> All
2.3.2 Schedule	<u>Dean Hoffer</u> All
2.3.3 Management	<u>Greg Bock</u> Karen Hellman

# Report Outline and Reviewer Assignments

(continued)

2.4 Charge Questions	
2.4.1 Are the physics requirements that SNUMI addresses appropriately stated?	<u>Stuart Henderson</u> Thomas Roser
2.4.2 Have these physics requirements been translated into accelerator technical performance requirements / specifications?	
2.4.3 Are the design features of the defined elements of SNUMI documented in a Conceptual Design Report, Design Handbook, or other appropriate manner?	
2.4.4 Are the prototype plans and decision paths appropriate for the less well-developed elements?	
2.4.5 Do the elements of SNUMI address the performance requirements / specifications? Are the designs of these elements reasonable?	
2.4.6 Has a Work Breakdown Structure (WBS) been developed?	<u>Dean Hoffer</u>
2.4.7 Do the cost estimates for each WBS element have a sound basis and are they reasonable?	
2.4.8 Is there a schedule for the project?	
2.4.9 Are the activity durations reasonable for the assumed resources?	
2.4.10 Has the schedule been “resource loaded?”	
2.4.11 Has the schedule been developed with contingency or slack included?	
2.4.12 For the less well-developed technical elements have decision milestones been included in the schedule?	

# Report Outline and Reviewer Assignments

(continued)

2.4.13 Is there an appropriate management organizational structure in place or proposed to accomplish the design and construction?	<u>Greg Bock</u>
2.4.14 Have responsibilities been assigned or have they been proposed?	
2.4.15 Is there a Project Management Plan outlining the organizational structure, summarizing the technical, cost and schedule (including milestones) baselines, and setting forth the change control procedures and reporting processes that will be used?	
2.4.16 Are there adequate staffing resources available or planned for this effort?	
2.4.17 Is there a funding plan available or proposed to meet the resource requirements to realize SNuMI?	
3.0 Phase II	
3.1 Technical	<u>Thomas Roser</u> All
3.2 Civil Construction	<u>Karen Hellman</u> Phil Martin
3.3 Project Management (Cost, Schedule and Management)	<u>Greg Bock</u> All
3.4 Charge Questions	
3.4.1 Does the design concept for Phase II support the objective of delivering at least 1 MW beam power onto the neutrino production target?	<u>Thomas Roser</u> Stuart Henderson
3.4.2 Is the strategy for Phase II viable and does it support the implementation of Phase II in the timeframe presented?	<u>Greg Bock</u> Karen Hellman

# Reviewer Breakout Assignments

<b>November 14, (3:30 – 4:30 PM)</b>	
<b>1) Booster and Main</b> (One North – WH1W)	<b>Mike Brennan Stuart Henderson Erk Jensen</b>
<b>2) Recycler: injection line, extraction line</b> (Black Hole – WH2NW)	<b>Phil Martin Thomas Roser</b>
<b>3) NuMI: primary proton line, decay pipe &amp; hadron absorber (phase I + II)</b> (Snake Pit – WH2NE)	<b>Sayed Rokni Yoshi Yamazaki</b>
<b>4) Management/Cost/Schedule/Strategy (Phase I &amp; II)</b> (Comitium - WH2SE)	<b>Greg Bock Karen Hellman Dean Hoffer Ed Temple</b>
<b>November 15, (8:30 – 10:30 AM)</b>	
<b>5) Recycler: kickers, slip-stacking scheme, RF systems</b> (Black Hole – WH2NW)	<b>Mike Brennan Stuart Henderson Erk Jensen Phil Martin</b>
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<b>7) Management/Cost/Schedule/Strategy (Phase I &amp; II)</b> (Comitium - WH2SE)	<b>Greg Bock Karen Hellman Dean Hoffer Ed Temple</b>

# Reviewer Breakout Assignments (continued)

<b>November 15, (10:45 – 12:45 PM)</b>	
<b>8) Overview of Phase II (Black Hole – WH2NW)</b>	<b>Mike Brennan Stuart Henderson Erk Jensen Thomas Roser Yoshi Yamazaki</b>
<b>9) Civil Construction (Phase I &amp; II) (One North – WH1W)</b>	<b>Karen Hellman Dean Hoffer Phil Martin</b>
<b>10) Radiation safety/shielding (Phase I &amp; II) (Snake Pit – WH2NE)</b>	<b>Greg Bock Sayed Rokni Ed Temple</b>



## Reporting Structure

- Review findings, comments, and recommendations should be presented in writing at a closeout with the Collaboration and Fermilab management.
- Section for Phase I & II that cover Technical, Cost, Schedule and Management.

# 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.

# Examples of Findings, Comments, and Recommendations

[NOvA CD-1 Director's Review @ Fermilab]

## Findings

- Adhesive choice has an impact on work schedule and ventilation system design. The baseline adhesive was listed as 3M2216 and was said to have a safety factor of 5 for buckling. However a Devcon adhesive was discussed a great deal also. The Devcon adhesive has a sheer strength which was approximately 150% better but it contained a toxic solvent which the 3M2216 did not.
- An adhesive dispenser will be used to apply the adhesive to attach the modules together and to attach the blocks together. The adhesive dispenser can't be defined until the adhesive is chosen.

# Examples of Findings, Comments, and Recommendations (continued)

[NOvA CD-1 Director's Review @ Fermilab]

## Comment

- Adhesive needs to be determined as quickly as possible to meet timelines. If the 3M2216 meets the design SF of 5 for buckling and over a SF of 4 for shear stress between the planes it seems like it should be used over the Devcon adhesive which has toxic solvent vapors. Adhesive choice will affect assembly and the building (exhaust required) requirements.

## Recommendation

1. Determine which adhesive to use as soon as possible. This affects building design and assembly time.

# Reviewer Write-ups

- Closeout Presentation write-up template is posted on Director's Review Webpage.  
[http://www.fnal.gov/directorate/OPMO/Projects/SNuMI/DirRev/2006/11\\_14/CloseoutPresentationsSNuMI011-16-06.doc](http://www.fnal.gov/directorate/OPMO/Projects/SNuMI/DirRev/2006/11_14/CloseoutPresentationsSNuMI011-16-06.doc)
- Write-ups are to be sent to Terry Erickson at [terickson@fnal.gov](mailto:terickson@fnal.gov) prior to 9:30 AM on Thursday, November 16 for the Closeout Dry Run
- A final report will be issued within 2 weeks after the closeout.

# Discussion

- Questions and Answers