# Executive Session
# Director's Conceptual Design Review of Mu2e Project
# May 3-5, 2011

Jim Yeck

# Agenda for Exec Session

- Charge and Review Focus
- Review Agenda
- Subcommittee Assignments
- Reviewer Writing Assignments
- Subcommittee Executive Sessions
- Reporting Structure
- Discussion

# Charge

The Committee is to conduct a Director's Conceptual Design Review of the Muon to Electron Conversion Experiment (Mu2e) Project to assess the status and adequacy of the overall Mu2e conceptual design effort. Mu2e received CD-0 on November 25, 2009. This is an independent review to verify that Mu2e's design is at the state for a DOE Critical Decision 1 (CD-1) "Approve Alternative Selection & Cost Range" Review. This is not a cost, schedule, or management review. These aspects of the project will be assessed during a separate Director's Review.

The Mu2e Project will construct a new facility to enable the world's most sensitive search for charged lepton flavor violation by searching for the conversion of a muon to an electron in the field of a nucleus. Mu2e will be ~10,000 more sensitive than the world's current best limit. The project consists of modifications to the existing Fermilab accelerator complex, construction of a new external beamline, construction of a new detector hall on the Fermilab site and construction of a new detector to search for muon conversion. The detector includes a complex system of superconducting solenoids, a collimation and charge selection scheme for producing the world's most intense muon beam, a low mass tracking detector operating in vacuum, a crystal calorimeter and a cosmic ray veto. Many aspects of the project will be executed by other collaborating National Laboratories and universities.

# Charge (Continued)

The review team is asked to address the following questions:

1. Is the design technically adequate? Is the design likely to meet the technical requirements? Are the physics requirements clearly stated and documented? Have these requirements been translated into technical performance requirements and specifications?
2. Can the design be constructed, inspected, tested, installed, operated and maintained in a satisfactory way?
3. Is there adequate supporting documentation to support the conceptual design and the transition to developing the preliminary design?
4. Are the risks (on technical, cost, and schedule basis) of the selected base design approach and alternatives understood and are appropriate steps being taken to manage and mitigate these risks? Have areas been identified where value engineering should be done? If value engineering has been performed is it documented?

# Charge (Continued)

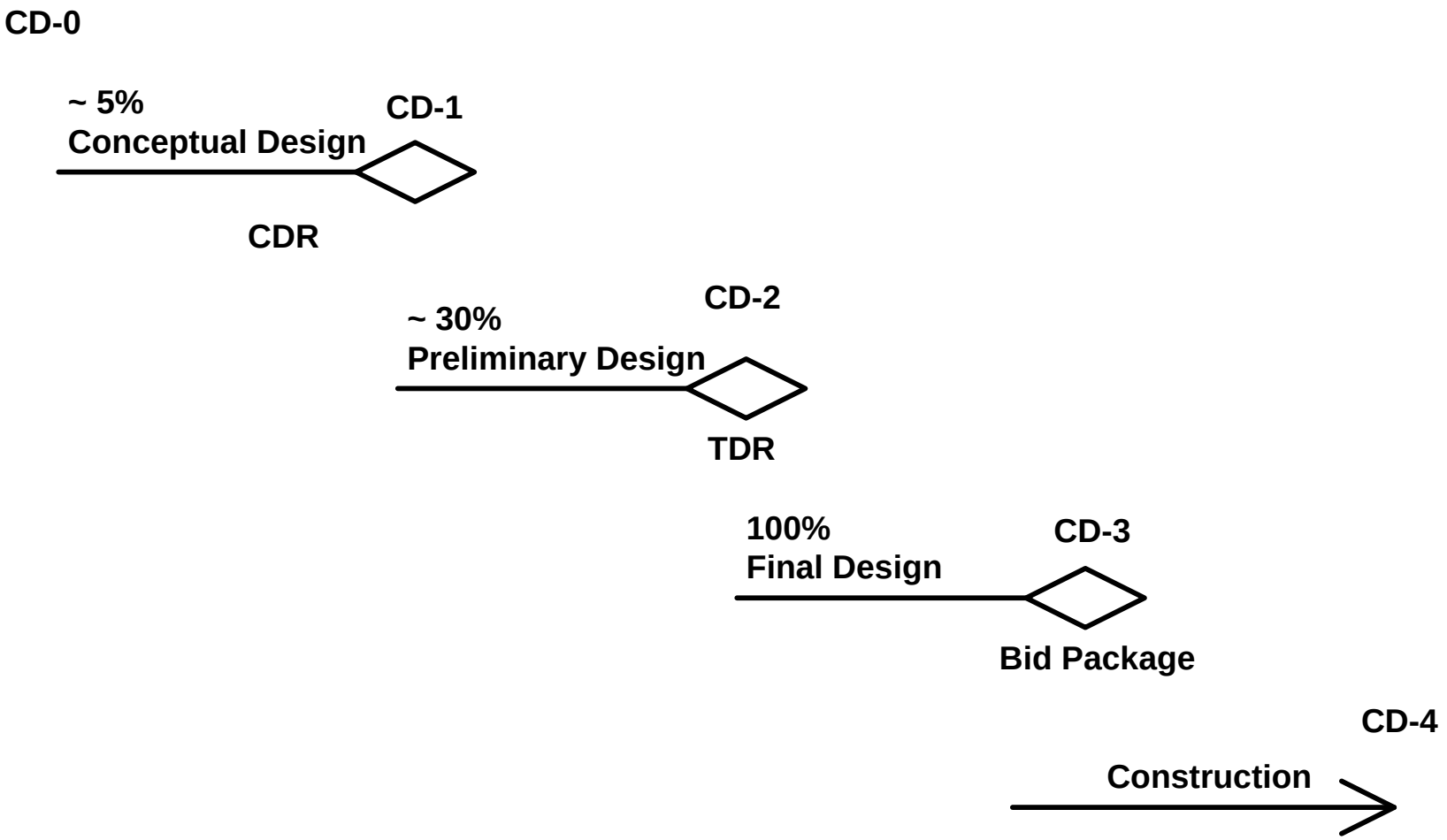
5. Are the project organization and lines of responsibility clearly defined and sufficient to ensure the successful engineering and design of the project? Are the design interfaces between the Accelerator Systems, Experimental Facilities, and Conventional Facilities groups understood and well enough defined to ensure a coordinated effort and an integrated design? Is there a reasonable plan in place for implementing configuration management to ensure changes to the technical requirements/specifications are controlled and communicated to all affected groups?

Finally, the committee should present findings, comments, recommendations, and answers to the above questions at a closeout meeting with Mu2e and Fermilab's management. A written report will be provided soon after the review.

# Review Focus

- This is NOT a Cost, Schedule, or Management Review.
- This is a technical review of the Conceptual Design.
- This review will satisfy the requirement of a Independent Design Review for CD-1

# Project Design Phases



# Agenda

Tuesday, May 3

**EXECUTIVE SESSION – One North (WH1NE)**

| | | | |
|---|---|---|---|
| 8:00 – 9:00 AM | 60 min. | Executive Session | Jim Yeck |

**OVERVIEW PLENARY SESSION – One West (WH1W)**

| | | | |
|---|---|---|---|
| 9:00 – 9:10 AM | 10 min. | Welcome | Bruce Chrisman |
| 9:10 – 10:20 AM | 70 min. | Project Overview | Ron Ray |
| 10:20 – 10:50 AM | 30 min. | Experimental Technique | Jim Miller |
| 10:50 | 20 min. | BREAK | |

**PARALLEL BREAKOUT SESSIONS**

11:10 – 12:15 PM 65 min. Parallel Breakout Sessions

***(Note that sessions 1 and 2 to start as a combined session in One West)***

1. Accelerator I –One West (WH1W) – Werkema/Nagaslaev
   (Recycler, Pbar rings, external beamline, extinction, extraction)
2. Accelerator II – Snake Pit (WH2NE) - Werkema/Nagaslaev
   Production target, Heat shield, Radiation shielding
3. Conventional Construction – Confessional (WH5E) - Lackowski
4. Solenoids – One North (WH1NE) - Lamm
5. Muon Channel – Comitium (WH2SE) - Feher
6. Tracker – Hornet's Nest (WH8XO) - Mukherjee
7. Calorimeter, Cosmic Ray Veto – Black Hole (WH2NW) – Miscetti/Dukes
8. DAQ – Fish Tank (WH13XO) - Bowden

# Agenda continued

12:15 – 1:30 PM 75 min. WORKING COMMITTEE LUNCH

**PARALLEL BREAKOUT SESSIONS**

1:30 – 4:30 PM 180 min. Parallel Breakout Sessions

1. Accelerator I –One West (WH1W) – Werkema/Nagaslaev
   (Recycler, Pbar rings, external beamline, extinction, extraction)
2. Accelerator II – Snake Pit (WH2NE) - Werkema/Nagaslaev
   Production target, Heat shield, Radiation shielding
3. Conventional Construction – Confessional (WH5E) - Lackowski
4. Solenoids – One North (WH1NE) - Lamm
5. Muon Channel – Comitium (WH2SE) - Feher
6. Tracker – Hornet's Nest (WH8XO) - Mukherjee
7. Calorimeter, Cosmic Ray Veto – Black Hole (WH2NW) – Miscetti/Dukes
8. DAQ – Fish Tank (WH13XO) - Bowden

3:15 PM 15 min. BREAK

3:15 – 4:30 PARALLEL SESSIONS CONTINUE

**EXECUTIVE SESSION – One North (WH1NE)**

4:30 – 5:45 PM 75 min. Subcommittee Exec. Session – in Breakout Rooms

5:45 – 6:30 PM 45 min. Full Committee Executive Session – One North

# Agenda continued

Wednesday, May 4

**PARALLEL BREAKOUT SESSIONS**

8:30 – 12:00 PM 210 min. Parallel Breakout Sessions

1. Accelerator I –One West (WH1W) – Werkema/Nagaslaev
   (Recycler, Pbar rings, external beamline, extinction, extraction)
2. Accelerator II – Snake Pit (WH2NE) (Until 1:30 only) - Werkema/Nagaslaev
   Production target, Heat shield, Radiation shielding
3. Conventional Construction – Racetrack (WH7XO) (Until 2:00 only) - Lackowski
4. Solenoids – One North (WH1NE) - Lamm
5. Muon Channel – Comitium (WH2SE) - Feher
6. Tracker – Hornet's Nest (WH8XO) - Mukherjee
7. Calorimeter, Cosmic Ray Veto – Black Hole (WH2NW) – Miscetti/Dukes
8. DAQ – Small Dining Room (WH1SW) - Bowden

10:15-10:35 PM 20 min. BREAK

12:00 – 1:00 PM 60 min. WORKING COMMITTEE LUNCH

# Agenda continued

**EXECUTIVE SESSION – One North (WH1NE)**

| | | |
|---|---|---|
| 1:00 – 2:30 PM | 90 min. | Subcommittee Executive Session/Write-ups – In Breakout Rooms |
| 2:30 – 3:00 PM | 30 min. | Full Committee Executive Session – One North |
| 3:00 – 3:15 PM | 15 min. | BREAK |
| 3:15 – 4:00 PM | 45 min. | Full Committee Executive Session continues - |
| 4:00 PM | | Committee Continue Write-ups |

Thursday, May 5

| | |
|---|---|
| 8:00 AM | Full Committee Executive Dry Run – One North (WH1NE) |
| **11:00 AM** | **Closeout Presentations – Curia II (WH2SW)** |
| 12:00 PM | Adjourn |

# Reviewer Subcommittee Breakout Assignments

| Subcommittee | Members |
|---|---|
| 1. Accelerator I – Recycler, Pbar rings, external beamline, extinction, extraction | Paul Derwent - FNAL*<br>Kevin Brown n- BNL<br>Mike Church - FNAL<br>Keith Gollwitzer – FNAL |
| 2. Accelerator II – Production target, Heat shield, Radiation shielding | Nancy Grossman - FNAL*<br>Salman Tariq – FNAL<br>Andy Stefanik - FNAL<br>Wayne Schmitt - FNAL |
| 3. Conventional Construction | Jesse Adams - ANL*<br>Elaine McCluskey – FNAL |
| 4. Solenoids | Jim Kerby – FNAL*<br>Alain Herve – UW (Madison)<br>Pasquale Fabricatore - INFN<br>Joel Fuerst - ANL<br>Herman Ten Kate - CERN<br>Akira Yamamoto - KEK |

* Indicates Subcommittee Lead

# Reviewer Subcommittee Breakout Assignments (continued)

| | |
|---|---|
| 5. Muon Channel | Joe Howell – FNAL*<br>Peter Limon - Consultant<br>Rich Andrews - FNAL |
| 6. Tracker | Peter Wilson – FNAL*<br>Richard Kadel - LBNL<br>Alan Hahn - FNAL |
| 7. Calorimeter, Cosmic Ray Veto | Jeff Nelson - W&M*<br>Julie Whitmore – FNAL<br>Rainer Novotny - PANDA |
| 8. DAQ | Leon Mualem – Caltech*<br>Eric James – FNAL<br>Jonathan Lewis - FNAL |

* Indicates Subcommittee Lead

# Reviewer Writing Assignments

| | |
|---|---|
| Executive Summary | Jim Yeck |
| 1.0 Introduction | |
| 2.0 Accelerator I | Paul Derwent* |
| 2.1 Recycler | TBD |
| 2.2 Pbar Rings | TBD |
| 2.3 External Beamline | TBD |
| 2.4 Extinction | TBD |
| 2.5 Extraction | TBD |
| 3.0 Accelerator II | Nancy Grossman* |
| 3.1 Production Target | Salman Tariq |
| 3.2 Heat Shield | Andy Stefanik |
| 3.3 Radiation Shielding | Wayne Schmitt |
| 4.0 Conventional Construction | Jesse Adams*<br>Elaine McCluskey |
| 5.0 Solenoids | Jim Kerby*<br>Alain Herve<br>Pasquale Fabricatore<br>Joel Fuerst<br>Herman Ten Kate<br>Akira Yamamoto |

Note: * Indicates Subcommittee Lead and integrator of write-ups
Underlined names are the primary writer.

# Reviewer Writing Assignments (continued)

| | |
|---|---|
| 6.0 Muon Channel | Joe Howell*<br>Peter Limon<br>Rich Andrews |
| 7.0 Tracker | Peter Wilson*<br>Richard Kadel<br>Alan Hahn |
| 8.0 Calorimeter, Cosmic Ray Veto | Jeff Nelson* |
| 8.1 Calorimeter | TBD |
| 8.2 Cosmic Ray Veto | TBD |
| 9.0 DAQ | Leon Mualem<br>Eric James<br>Jonathan Lewis |
| 9.0 Charge Questions | |
| 9.1 Is the design technically adequate? Is the design likely to meet the technical requirements? Are the physics requirements clearly stated and documented? Have these requirements been translated into technical performance requirements and specifications? | Jim Kerby<br>All |

Note: * Indicates Subcommittee Lead and integrator of write-ups
Underlined names are the primary writer.

# Reviewer Writing Assignments (continued)

| | |
|---|---|
| 9.2 Can the design be constructed, inspected, tested, installed, operated and maintained in a satisfactory way? | Akira Yamamoto/ Rich Andrews<br>All |
| 9.3 Is there adequate supporting documentation to support the conceptual design and the transition to developing the preliminary design? | Peter Limon<br>All |
| 9.4 Are the risks (on technical, cost, and schedule basis) of the selected base design approach and alternatives understood and are appropriate steps being taken to manage and mitigate these risks? Have areas been identified where value engineering should be done? If value engineering has been performed is it documented? | Richard Kadel<br>All |
| 9.5 Are the project organization and lines of responsibility clearly defined and sufficient to ensure the successful engineering and design of the project? Are the design interfaces between the Accelerator Systems, Experimental Facilities, and Conventional Facilities groups understood and well enough defined to ensure a coordinated effort and an integrated design? Is there a reasonable plan in place for implementing configuration management to ensure changes to the technical requirements/specifications are controlled and communicated to all affected groups? | Jim Yeck<br>All |

# Subcommittee Executive Sessions

- First Subcommittee Executive Session
  - Tuesday, at 4:30 PM for 45 minutes (can stay in breakout room)
  - Consolidate thought and potential issues
  - Identify questions for the project or documentation needed for Wednesday morning breakout
- Second Subcommittee Executive Session
  - Wednesday at 1:00 PM for 90 minutes
  - Subcommittee to identify and consolidate potential recommendations
  - Start writing subcommittees portion of closeout presentation

# Reporting Structure

- Results of the review are to be documented as findings, comments, and recommendations.
- The answers to the charge questions are to be a consolidation of feedback from all subcommittees. Answers should be an assessment of the overall project design.
- Findings, Comments , Recommendations and answers to the questions are to be presented in writing at a closeout with Mu2e and Fermilab's management.
- **Recommendations should not include a detailed list of items to be addressed, but be a summary of the issues. The detailed list of actions should be documented by each subcommittee and will be collected and given to the project separately from the Closeout/Final Report.**

# 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.

# Reviewer Write-ups

- Write-up template (Review Closeout Presentation Format) is posted on Director's Review Webpage. http://www.fnal.gov/directorate/OPMO/Projects/Mu2e/DirRev/2011/05_03/Closeout_Presentation_Mu2e_2011-05-03.docx
- Write-ups (including answers to charge questions) are to be sent to Terry Erickson at terickson@fnal.gov prior to 7:00 AM on Thursday, May 5 for the Closeout Dry Run starting at 8:00 AM in One North
- Detailed list of items to be addressed by the project to be sent separately to Terry also.
- A final report will be issued within 2 weeks after the closeout.

# Discussion

- Questions and Answers