

External Independent Review NOvA Project

Out-Brief
November 30, 2007

LMI

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Agenda

- Executive Summary
- EIR Scope - Key Areas of Review
- Preliminary Results



Executive Summary

- It is likely that the project can be successfully executed once the baseline is validated
 - Qualified and capable project team in place
 - Extensive experience with the technology
 - Project is planned with significant detail
- The proposed cost, scope, and schedule baseline can be validated after:
 - The EVMS system is functioning
 - TPC definition issues are resolved
 - KPP/CD-4 deliverables are identified



Baseline Summary Table

Description	FY07 (\$000)	FY08 – 13 (\$000)	Total (\$000)
Design (PED Funds)	-	-	-
Construction	17	180,197	180,214
TEC	17	180,197	180,214
OPCs	3,981	75,805	79,786
Total Project Cost	3,998*	256,002	260,000

* The project's TPC does not include costs between CD-0 (2006) and CD-1 (5/11/2007), per HQ instructions.



Baseline Summary Table - 2

Description	FY07 \$(000)	FY08 – 13 \$(000)	Total \$(000)
Performance Measurement Baseline	3,998	195,201	199,199
Management Reserve (MR)	-	696	696
Fee	-	-	-
Non-Contract/DOE Direct Costs	-	-	-
Contingency	-	60,105	60,105
Performance Baseline (Total Project Cost)	3,998*	256,002	260,000



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- Executive Summary
- EIR Scope - Key Areas of Review
- Preliminary Results



EIR Scope - Key Review Elements

1. **WBS**
2. **Project Costs and Resource Loaded Schedule**
3. **Project Schedule and Critical Path**
4. **Risk Management**
5. **Funding Profile**
6. **Key Project Cost, Schedule, Technical & Programmatic Assumptions**
7. **System Functions & Requirements**
8. **Basis of Design**
9. **Preliminary Design, Design Comments, and Comment Resolution**
10. **Value Management/Engineering**
11. **Start Up Test Plan**
12. **Acquisition Strategy**
13. **Hazards Analysis**
14. **Sustainability**
15. **Project Execution Plan**
16. **IPT**
17. **Project Execution**



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- Executive Summary
- EIR Scope - Key Areas of Review
- **Preliminary Results**



EIR Results

- Major Finding
 - Must be resolved before baseline validation
 - Impacts cost, scope, or schedule baseline
- Finding
 - Resolution process and status must be approved before validation
 - May impact cost, scope, or schedule baseline
 - Resolved before validation if impact confirmed
- Observations with Recommendations
 - Recommendations should be considered
- Observations
 - Provided for coverage



1. Work Breakdown Structure

- The WBS represents a reasonable breakdown of the project work scope, incorporates all the major work activities, and is product oriented
- The WBS aligns with the RLS
- A well-defined WBS dictionary is not apparent
 - The Technical Design Report contains only summary work scope descriptions by WBS



2. Costs and Resource Loaded Schedule

- Extremely detailed and well-conceived plans support most cost and schedule estimates
 - Costs are generally based on previous site experience, recent vendor quotations, time and motion studies, etc.
 - Far detector building costs are supported by reasonably close independent estimates from 3 contractors
 - Basis of estimate (cost and schedule) is generally well documented at low levels of WBS
- An overall BOE summary document that fully describes all key assumptions has not been prepared
 - Can hinder effective management of the baseline, including identifying causes of changes and variances



2. Costs and Resource Loaded Schedule (continued)

- The RLS appears reasonable and complete
 - Includes all anticipated work for the project, and is believed more than adequate for successful project execution
 - Schedule durations are adequate, and are based on available funding, vendor production capacities, or past experience.
 - There appears to be conservatism incorporated into some cost and schedule estimates, even before the addition of contingency allowances



WBS Elements for Detailed Review

WBS (Activity)	Descriptions	Estimate (M\$)	Duration
2.0.1.1.1	Beam Lines	4.5	12Dec07-05Jul11
2.1.2	Far Detector Building	32.4	30Oct07-30Apr10
2.2.1	Mineral Oil	12.3	01Oct08-28Sep12
2.3.2.1	WLS Fiber – Vendor Production and Delivery	8.9	12Feb09-30Mar12
2.4.3.2	Far Detector	21.1	04Nov09-26Jun12
2.5.3.3	Module Assembly	3.0	21Apr10-24Aug12
2.6.1.2	APD Arrays	5.6	22Jan09-24Feb11
2.8.1	Near Detector Site Prep	3.2	08Feb08-20Jan12
2.9.4	Block Assembly & Installation	6.8	08Jan10-01Feb13
2.10	Project Management	4.1	N/A
1.0.1.2	Recycler Kicker Systems	4.5	01Dec06-22Sep10
1.0.3.3	NuMI Target hall Infrastructure	1.1	01May07-10Nov10



WBS Elements for Detailed Review

- WBS 2.8.1 – Near Detector Site Prep
 - Only conceptual design at present but there are plans to expedite design and cost estimating in FY08 to mitigate risks
- WBS 2.10 – Project Management
 - Appears low when compared to DOE metrics but may be appropriate given nature of project



3. Project Schedule and Critical Path

- The Critical and Near-critical Paths are well understood
- Open Plan schedule is resource loaded but not escalated
 - Full resource load requires Cobra output
- Milestones are well defined to Level 5 in a Milestone Dictionary
- The process to reach CD-2 and CD-3 (EIR, EVMS certification, etc) is not included in the schedule
- Eight months schedule contingency exists between completion of work and CD-4



4. Risk Management

- Risk Management processes are fully developed and appropriately implemented with mitigation actions identified and monitored
 - No separate DOE risk management plan. Some programmatic risks may not be identified however all significant risks appear to have been adequately considered
- Contingency spend plan is established based on the risk profile (by activity)
- Anticipated contingency management practice is exemplary
 - includes key schedule milestones for contingency evaluation to support adding more detector capacity
 - Not formally described and communicated



4. Risk Management - continued

- Contingency allowances cover both estimate uncertainties (resulting from degree of definition and unknown conditions or scope requirements) as well as consideration of identified risks, in particular those associated with key cost drivers
- Level of contingency is applied at low levels of the WBS in accordance with project ‘contingency rules’
 - Often appears greater than warranted by the nature of work and degree of uncertainty that exists



4. Risk Management - continued

- Overall ~30% contingency allowance appears more than adequate given nature of project uncertainties, technology maturity, and base estimate conservatism
 - No quantitative assessment of overall project confidence level or probability associated with proposed TPC but probably in excess of 90-95%
- No quantitative basis to support ~8 month schedule contingency
 - Appears appropriate given nature of project and identified risks



5. Funding Profile Comparison

Fiscal Year	Funding Profile (\$000)	Cost Profile, \$000	Cumulative Variance (\$000)
Prior Years	10,300	3,998	6,302
2008	36,000	33,906	8,396
2009	70,000	67,305	11,091
2010	69,000	58,876	21,215
2011	46,000	56,597	10,618
2012	28,000	37,747	871
2013	700	875	696
Total	260,000	260,000	696



6. Key Project Cost, Schedule, Technical, and Programmatic Assumptions

- Consolidated assumptions document is not available. Assumptions are generally identified, but are scattered among several sources
- Escalation rates appear reasonable and key procurement risks beyond those rates were evaluated as risk/contingency issues
- TPC is inconsistent with the DOE definition
 - Assumption that TPC does not start until CD-1 is not in accordance with DOE O 413.3A
 - Not all costs are captured since scientists and some Fermilab staff do not charge to the project
 - Commissioning of the modified beam line is not included



7. Systems, Functions and Requirements

- Requirements are documented in a hierarchy of documents
 - CDR
 - Tech Design Report (TDR)
 - Technical Requirements Documents
- Systems requirements documents appear to include adequate description of each component for design purposes
- Performance and deliverable requirements for CD-4 are not documented as coming from requirements documents through to the PEP



8. Basis of Design

- Design basis is established by SFR documents
 - Preliminary design is consistent with the SFR documents
- Prototypes are being constructed to test and validate appropriate design elements
- Overall design is sufficiently mature for baseline development



9. Preliminary Design, Design Review, and Comment Disposition

- Numerous design reviews have been conducted
 - Mix of science and facilities experts on the review teams
 - Recommendations are documented with proposed corrective actions
 - Preliminary design review conducted August 2007
 - Last cycle of reviews did not propose any significant technical issues
- Additional design and technical reviews are planned as design continues to mature
- Design review recommendations status is not updated until the following review



10. Value Management/Engineering

- Project-wide VE study conducted in summer, 2007
 - Resulted in ~\$13M in baseline cost reductions
 - Not led by Certified Value Specialist, but process approximated formal VE analysis
- Numerous other cost-driven design changes made to the project
- Plans are to continue to seek cost savings through design optimization



11. Startup Test Plan

- NOvA Start-up Test Plan developed
 - References Fermilab procedures
 - DOE O 420.2B (Safety of Accelerator Facilities) is not referenced in the Fermilab procedure
- Accelerator ARR is not part of the project
 - May impact the TPC
- Some start up test plan events are not identifiable in the schedule
- Startup Plan is integrated with the current CD-4 KPPs and deliverables



12. Acquisition Strategy

- The DOE Acquisition Strategy (March 2007) remains consistent with current execution plans
 - Fermilab to act as prime contractor for accelerator modifications and detector fabrication
 - University of Minnesota to provide far detector site and enclosure through a Cooperative Agreement
- There is a “Contractor Acquisition Plan” which defines the major procurements
- Performance incentives (“shared savings” clauses) are not planned for subcontracts
- Fermilab has small business participation goals
 - Goals generally achieved; 2006 results exemplary



13. Hazards Analysis

- Project presents minimal impact to the environment
 - An EA has been submitted, not yet approved. Project likely to receive a FONSI
- Hazard Assessment team well qualified.
 - Two HAs written; one for accelerator and one for detector and supporting components
 - The detector HA not updated to reflect removal of scintillator mixing from the Fermi work scope
 - Accelerator HA compliant with FESHM 2010; no reference to O 420.2B found in documentation
- A comprehensive PSAD has been written; a comprehensive SAD is planned



14. Sustainability

- At Fermilab, conventional facility designs are evaluated against LEED design goals and utilize sustainable design principles
 - Conforms to Executive Order 13423
- Most NOvA facility energy usage is process-related; accelerator modifications offer little opportunity to apply sustainable design concepts
- The Far Detector building was assessed to have the potential for LEED “gold” certification
 - CA does not address LEED compliance in U of Minn scope



15. Project Execution Plan (PEP)

- The PEP generally reflects current plans and addresses topics delineated in M 414.3-1; minimal deficiencies noted, including:
 - Project life-cycle cost is not well defined
 - CD-4 acceptance criteria (deliverables) and KPPs are not sufficiently described—see “Project Execution” discussion
- The PEP is complemented by a Fermilab NOvA Project Management Plan
 - Taken together, the PEP and PMP clearly define the project structure and goals



16. Integrated Project Team (IPT)

- The IPT Charter is an attachment to the PEP
 - IPT Charter is not signed as a free standing document.
- The IPT appears adequate with respect to depth and qualification of personnel
 - Fermilab personnel are included in the core IPT
 - The core IPT is supported by CH and various Fermilab organizations, as needed
 - The IPT meets ~weekly; minutes/action items are produced and used to focus project activity.
- The FPD is not certified at Level 3
 - FPD is certified at level 2 and is diligently in process of completing requirements for Level 3 but completion is not likely until late 2008
 - The Deputy FPD is also certified at Level 2, and is in process of completing requirements for Level 3



17. Project Execution

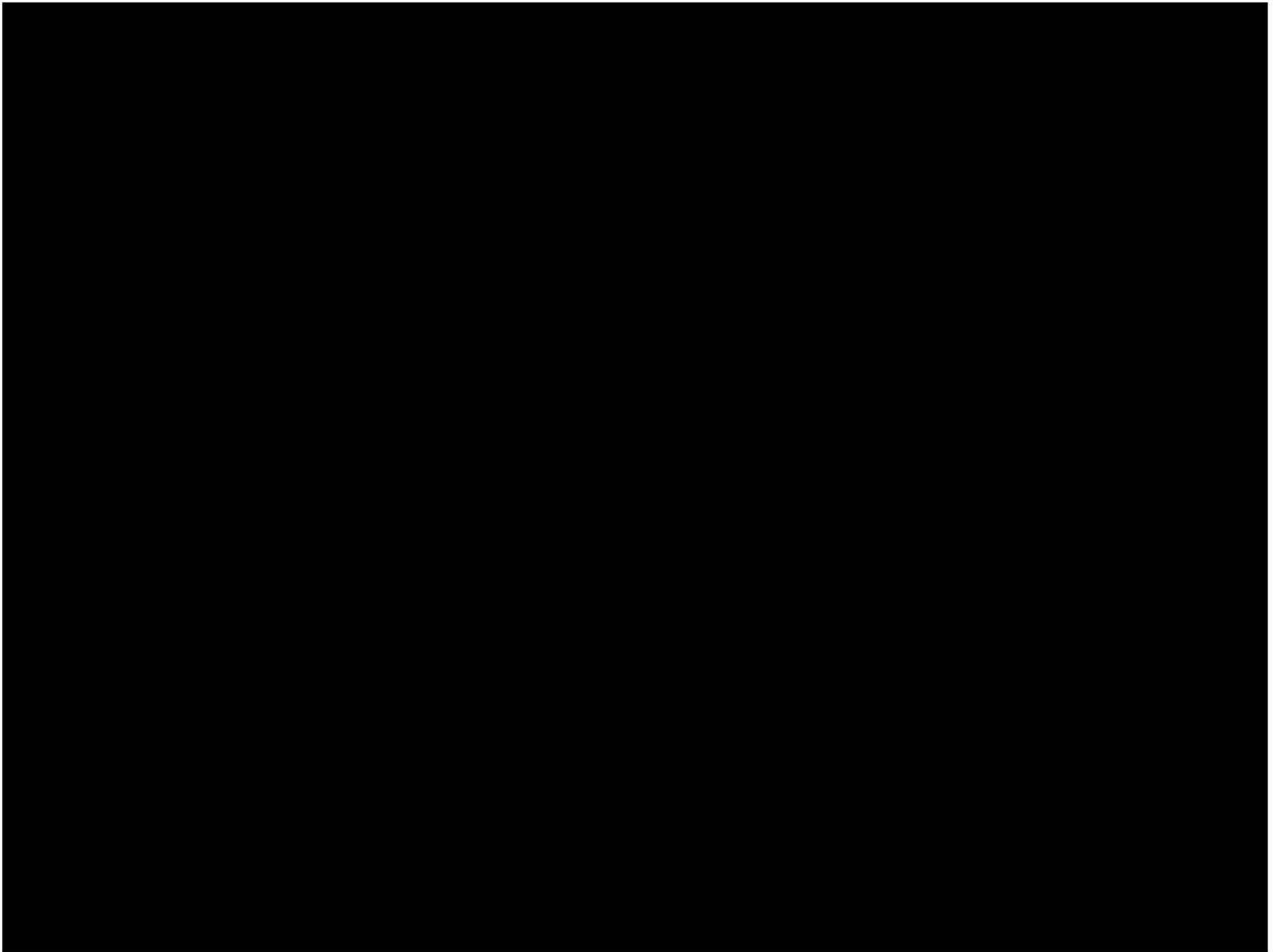
- The Key Performance Parameters (KPPs) and CD-4 “deliverables” are not adequately defined and are co-mingled in the PEP
 - KPPs presently found in the PEP are vague and lack measurable characteristics
 - A comprehensive table of specific CD-4 deliverables has not been defined in the PEP
- The Fermilab/U of Minn MOU for implementation of the U of Minn/DOE CA has not been executed
- Currently the project is not able to report earned value progress—EVMS reporting at CD-2 is required
 - Although EVMS tools are in place, cost and schedule data transfers and manipulation is not error-free at present
 - Fermilab scientists and some other personnel, and outside scientists do not charge to the project
 - Earned value calculations cannot be made for such work



EIR Completion Schedule

- Nov 30 EIR Out Briefing
- Dec 18 Draft EIR report issued for factual accuracy
- Dec 28 EIR Team receives factual accuracy comments
- TBD Comment Resolution Conference (if needed)
- +10 WD Final report issued to OECM
- TBD Resolve CAP Issues





Major Finding

- A deficiency that has a significant scope, cost, or schedule impact and, in our professional judgment, needs to be satisfactorily addressed before we recommend validating the proposed baseline change. Major findings also include findings that significantly impact safety or the ability of the project team to successfully execute the baseline.



Finding

- Any deficiency that can impact the estimated project cost or schedule. In general, findings include deficiencies in the hazards analysis, design, risk assessment, scope definition, system requirements, or start-up. Findings also include concerns for safety or the ability of the project team to successfully execute the baseline.



Observation

- A comment that is not related to potential scope, cost, or schedule impacts.

