



DARK ENERGY
Survey



Fermilab

Dark Energy Survey (DES) Working Group Meeting

April 07, 2006

10:00 – 11:00 AM

Snake Pit

Agenda

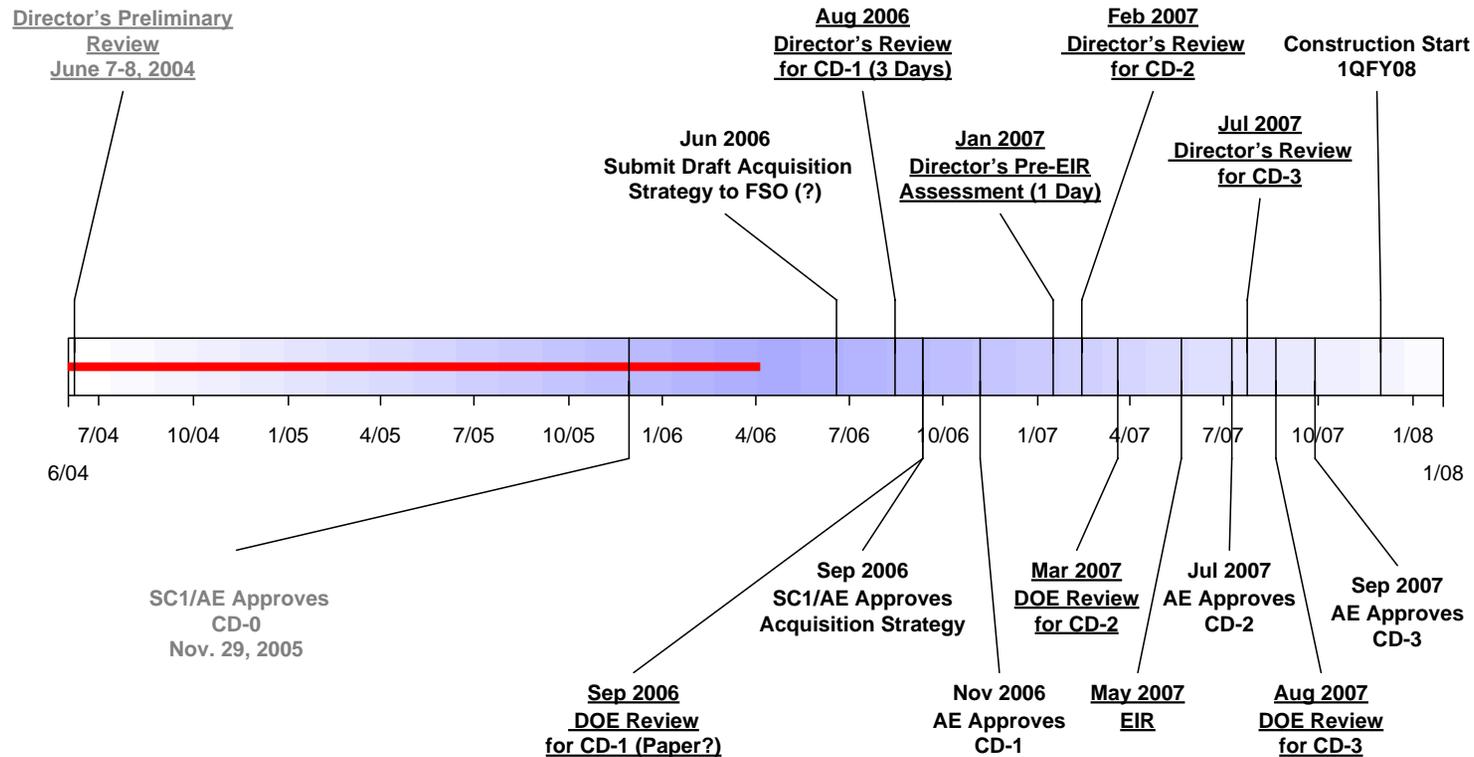
1. Discuss Schedule for Additional Working Group Meetings [Ed and All]
 - a. April 21 is P5
 - i. Arrange alternate (possibly April 14) for this or skip to May 5 for next meeting
 - b. 1st and 3rd Fridays 10 AM; possible “regular” meeting times do not seem to work in the near term
 - c. Alternate Possibilities for Brenna, Ed and Dean: 14 April, 28 April, 12 May, 2 June
2. Staffing for DES [Brenna and All]
 - a. Deputy Project Manager
 - b. Engineering and Other Support Situation
3. Discuss DES Timeline [Ed and All]
 - a. ~Summer CD-1; Director’s Review(?), DOE “Paper Review”
 - b. Separate CD-2 Review
 - c. FY2008 MIE money
 - i. Need a desired funding profile early
4. DOE Documentation [Ed and All]
 - a. Conceptual Design Report
 - i. 413.3 guidelines
 - ii. NOvA example status sheet and annotated outline
 - b. CD-1 Documentation
 - i. Preliminary Project Execution Plan
 1. A DOE document written by the DOE Federal Project Manager (FPM) and OHEP Program Officer
 2. FPM for DES is (?) Paul Philp, FOE Fermilab Site Office
 3. Describes the way DOE will manage the project
 4. DES preparing a first draft is probably a good idea



Dark Energy Survey Project Timeline for Critical Decisions & Reviews



Updated 04-Apr-06



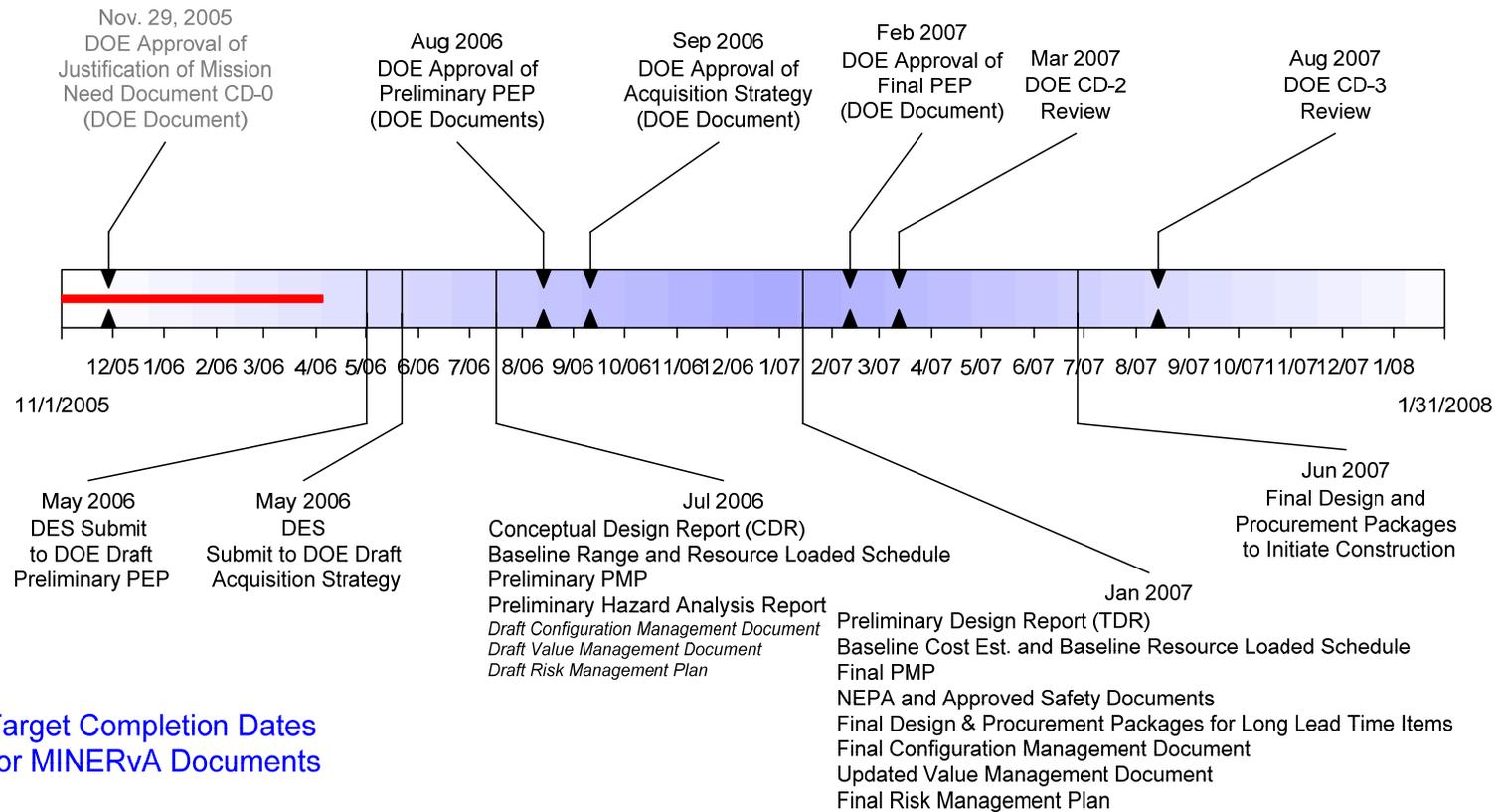


Dark Energy Survey Project Timeline for Critical Decisions & Reviews



Updated 04-Apr-06

Estimated Need by Dates for DOE Approvals and Documents



Target Completion Dates for MINERvA Documents

Note:
Items marked in Red indicates change from prior version

Critical Decision Prerequisites

	Critical Decision Prerequisites	Target Start Date	Start Date	Target Completion Date	Date Completed	Date Approved	Current Status
CD-0	Justification of mission need document (DOE CD-0 Document)						
	Preconceptual Planning (Proposal)						
	Fermilab PAC Stage 1 Approval						
	Mission Need Independent Project Review (HEPAP or Subpanel Recommendation)						
CD-1	Conceptual Design Report (CDR)						
	Acquisition Strategy - DOE Document						
	Preliminary Project Execution Plan (PEP) - DOE Document						
	Preliminary Hazard Analysis Report						
	Project Data Sheet for design (includes PED Funds)	N/A	N/A	N/A	N/A	N/A	
	Verification of mission need (DOE or Fermilab CD-1 Review)						
	Preliminary Project Management Plan (PMP)						
	Baseline range for Cost, Schedule and Scope (preliminary Resource Loaded Schedule (RLS), Bases of Estimate (BOE), WBS Dictionary and Milestone Dictionary)						
	Draft Risk Management Plan						
	Draft Configuration Management Document						
	Initial Value Management Document	N/A	N/A	N/A	N/A	N/A	
	PARS Reporting (reporting a comparison of project performance with the conceptual design schedule and cost plan)						
	CD-2	Preliminary Design (Technical Design Report (TDR))					
Review of contractor project management system (Pre-EIR Assessment)							
Final Project Execution Plan (PEP) - DOE Document							
National Environmental Policy Act (NEPA) documentation							
Project Data Sheet for construction							
Draft Preliminary Safety Analysis Document							
Performance Baseline External Independent Review (EIR) and Independent Cost Estimate (Part of EIR)							
Final Project Management Plan (PMP)							
Baseline Cost, Schedule and Scope (baseline Resource Loaded Schedule (RLS), Bases of Estimate (BOE), WBS Dictionary and Milestone Dictionary)							
Final Risk Management Plan							
Final Configuration Management Document							
Updated Value Management Document		N/A	N/A	N/A	N/A	N/A	
Performance Management System Document (EVMS)							
Final Design & Procurement Packages for Long Lead Time Items							
Fermilab PAC Stage 2 Approval							

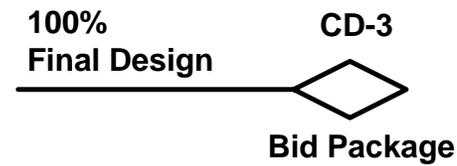
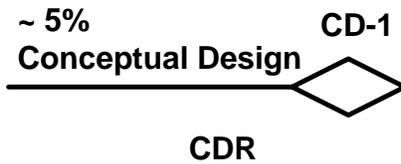
Excerpt from Ground-Based Dark Energy Experiment CD-0 Document

Option 1: Construct a large-scale charged-coupled device (CCD) camera for galaxy cluster counting and other dark energy measurements. The camera could be installed on the Blanco 4m Telescope in Chile. The combination of this telescope and camera with the necessary sensitivity will make it more than 10 times more powerful than any existing facility. In combination with galaxy cluster mass measurements from other telescopes, the data would provide the first high precision (5 – 10% statistical errors) dark energy constraints.

Project Design Phases

R&D

CD-0



Conceptual Design

- Definition from Manual (page A-6)

Conceptual Design. The concept for meeting a mission need. The conceptual design process requires a mission need as an input. Concepts for meeting the need are explored and alternatives considered arriving at the set of alternatives that are technically viable, affordable and sustainable.

Conceptual Design

- Descriptive Paragraph from the Manual (Section 5.2)

5.2 CONCEPTUAL DESIGN

The conceptual design effort is dependent on the nature of the need. While it is normal for solutions to quickly present themselves in response to a need, the conceptual design process must be approached methodically to ensure that the arrived at solution or alternatives are not merely responsive to an approved need, but are within the current technology, are affordable, and provide the best value to the Department. Research, development, testing and other efforts may be required that will contribute to the concept. The conceptual design process may also require negotiation with outside organizations, stakeholders or other legal entities to agree on functional, technical, operational requirements, performance requirements or standards. Value management is a key ingredient in the process that supports reaching the lowest cost alternatives. Value management should be employed 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. Value management conducted during the early phases of capital asset acquisition yields the greatest cost reductions.

Conceptual Design DOE M 413.3

5.2.4 Conceptual Design Report

The Conceptual Design Report is developed during the conceptual exploration and design process when the outcome is envisioned as an asset that performs a specific function. When used in this Manual, the Conceptual Design Report refers to the documentation that identifies the requirements and concept for fulfilling those requirements. The Conceptual Design Report is often the first technical document produced during the acquisition process. It is a necessary element in decision making because it presents the results of analysis of requirements, risks, and alternatives to arrive at a recommended solution. The conceptual design or equivalent should clearly and concisely describe the recommended alternative, the requirements and functions that must be performed and the key performance parameters that form the basis of the Performance Baseline. When the purpose of the project is remediation, restoration, or demolishing, other forms of documenting the requirements and alternative(s) may be used.

Common elements of the report may include the following (and other items not listed) as necessary to support the transition from concept to design.

- A description of the recommended alternative (design or characterization) and a synopsis of the development activities. In remediation projects, the report is a combination of applicable regulations and characterization.
- A schedule and cost range (or rough order of magnitude cost) including resources necessary to complete the design and preparation activity. Including identified resources necessary for a Project Engineering Design budget request, when required.
- An alternatives analysis including life-cycle costs, operational considerations, site development considerations, relationships to other site activities, and the comparison of alternatives, the risks, and the determined preferred alternative. Life-cycle costs are to include decontamination and demolition, transition (personnel and equipment moves), utilities, and maintenance including comparisons that incorporate a review of research and development and/or technology development challenges presented by the selected alternative.
- A preliminary Safeguards and Security Plan
- Performance parameters that are responsive to the mission need
- A preliminary Project Execution Plan
- The summary test and acceptance criteria
- The Work Breakdown Structure, which identifies the elements of the end product and dictionary

Conceptual Design

DOE M 413.3

- Condition assessments for the facilities, if the project is upgrading existing facilities. These assessments may confirm the suitability of facilities for the proposed action.
- A waste minimization/pollution identification and prevention plan, and a Waste Management Plan including control, storage, treatment, and disposal commensurate with the type of asset and maturity of the planning
- A draft Decontamination and Decommissioning Plan, if required
- Assessments of and strategy for:
 - The National Environmental Policy Act (NEPA). The level of NEPA documentation required and the plan for completing these documents in support of the proposed project schedule.
 - Safety. The level of safety documentation required for the project, and the plan for completing these documents in support of the proposed project schedule. An initial Hazards
 - Assessment and/or Preliminary Safety Analysis.
 - Security Considerations.
 - Site Selection. The application of a coherent, defensible methodology to identify and evaluate site options.
 - Waste Management. Decontamination and decommissioning plans where appropriate and applicable; waste minimization efforts.
- Public and/or stakeholder input
- Preliminary interface control documents
- System requirements and applicable codes and standards for design, procurement, construction, or characterization
- Site selection criteria and site surveys/ evaluations
- Anticipated/project products/deliverables (project end-state)
- Known and anticipated project constraints
- Conceptual design drawings/renderings/calculations
- Readiness assessment or readiness review concepts
- A vulnerability assessment
- A preliminary plan for demobilization and/or disposal of facilities being replaced

Design Terminology

Circa August 2003

Helen,

I was reading from Attachment 4, Project Acquisition Process and Critical Decisions of the attached pdf document to answer your questions this morning.

Furthermore I suggested the following 1 to 1 correlations

Equipment	Buildings	Design Fraction Complete
Conceptual Design	Conceptual Design	O(5%)
Preliminary Design	Title I	O(30%)
Final Design	Title II	O(100%)
Acceptance	Title III	QA thru Project Completion

On Detector Projects we frequently talk about a Proposal and then a Technical Design Report. Appropriately cast information at the Proposal stage may sometimes be equivalent to a Conceptual Design and the Technical Design Report might correspond to something like the Preliminary Design.

Sincerely,

Ed.

PS: I'm not sure how my table of correlations will come out in the email. I may have to create it in an attached file and resend.

Design Definitions

Page 6-1 of DOE M 413.3-1 (3-28-03)

6.2 PRELIMINARY DESIGN

Evolving the conceptual design into the preliminary design provides the depth and detail to allow the asset to take shape and form. Preliminary design initiates the process of converting concepts to a design appropriate for procurement or construction. This stage of the design is complete when it provides sufficient information to support development of the Performance Baseline. The appropriate completion percentage is dependent upon the project. When the project is less complex, such as a facility repair with single design, the percent complete is generally **equivalent to 20 to 35 percent of the total design effort**. For complex projects, the percentage of design may not be definitive because these projects may have many subsystems undergoing concurrent designs that may be at various stages of completion. Scientific systems, such as accelerators and detectors, production and manufacturing facilities, spacecraft and other systems, do not follow a linear process in which all subsystems reach the same maturity at the same time. Concurrency in these types of projects increases the risk because each subsystem design is dependent upon the design maturity of other subsystems.

From the Glossary of the Project Management Practices document.

Preliminary Design. Continues the design effort utilizing the conceptual design and the project design criteria as a basis for project development. Title I design develops topographical and subsurface data and determines the requirements and criteria that will govern the definitive design. **Tasks include preparation of preliminary planning and engineering studies, preliminary drawings and outline specifications, life-cycle cost analysis, preliminary cost estimates, and scheduling for project completion. Preliminary design provides identification of long-lead procurement items and analysis of risks associated with continued project development.**

Conceptual Design. Conceptual design encompasses those efforts to: (a) develop a project scope that will satisfy program needs; (b) assure project feasibility and attainable performance levels; (c) develop reliable cost estimates and realistic schedules in order to provide a complete description of the project for Congressional consideration; and (d) develop project criteria and design parameters for all engineering disciplines, identification of applicable codes and standards, quality assurance requirements, environmental studies, materials of construction, space allowances, energy conservation features, health safety, safeguards, and security requirements, and any other features or requirements necessary to describe the project.

Final Design. This continues the development of the project based on approved preliminary design. Definitive design includes any revisions required of the preliminary effort; preparation of final working drawings, specifications, bidding documents, cost estimates, and coordination with all parties that might affect the project; development of firm construction and procurement schedules; and assistance in analyzing proposals or bids.

NOvA Conceptual Design Report

Chapter	Author	outline	figures, incomplete text)	2nd draft (after TB reading)	Final
i		X			
ii		X			
iii		X			
iv		X			
1	John	X			
2	Gary	X			
3	John	X	X		
4	John	X	X		
5	John	X	x		
6	John	X			
7	John	X			
8	John	X			
9	Ron	X	x		
10		X			
11	Ron	X	X		
12	Ron	X	X		
13	Ron	X	X		
14	Ron	X	X		
15	Ron	X	x		
16		X			
17		x			
18	Ron	x			
19					
20					
21	John	X	X		
A1?	Ron +L2	X	x		

NOvA's CDR Outline

- i. Title Page
- ii. Author List
 - full list of ~ 130 people
- iii. Preface
 - Just describes the chapters in brief text
- iv. Table of Contents
- 1. Executive Summary
 - Detector Overview (~ page)
 - Detector Capabilities (~ page)
 - Cost & Schedule (few sentences, mention R&D, PED??)
 - Acquisition Strategy (short paragraph, reference DOE document?)
 - Line Item?, in-kind site?, perhaps in-kind on other aspects?
- 2. NOvA Scientific Requirements (Gary)
 - Neutrino Physics Overview (~ few pages)
 - reference Proposal, other documents(?) for additional details
 - Off-Axis Beam description
 - Opportunity to note that the beam exists
 - Site Requirements
 - Physics vs. L
 - Detector Requirements
 - Mass, efficiency for nue detection (but also protons on target?)
 - Required energy resolution, cell size, S/N
 - Near Detector required for backgrounds
 - Detector Hall requirements
 - Overburden & cosmics,

3. Overview of the NOvA Detector Design (John)

Site

Detector Technology

Far Detector Structure

Near Detector?

Detector Performance

Cell light output details here, demonstrated S/N here

Event pictures here

Nue event efficiency here

Scanning mentioned here

Cost Range

R&D funds, PED funds here?

TPC range

Funding Profile

Schedule Range

Key Milestones

State deliverable (2 detectors) to satisfy 6th bullet from bottom on pg 5-7 of 413.3

4. Alternate Detector Designs Considered (John)

Sites

Lake Superior to Trans-Canada Highway

Perhaps more detail on Orr-Buyck here?

Reference Scientific Requirements for “farthest in US” choices

Detector Technologies

Water Cherenkov, Sampling Calorimeters, Liquid Argon TPCs

Just like Cooper Prelim Director’s Review talk

Detector Structures Considered

Vee, Containers, Bathtub

5. Optimization of the Selected NOvA Detector Design (John)

Optimized Site

more details on Ash River and Orr-Buyck sites here,
noting multiple sub-sites considered at each spot
reference scientific requirements as basis to optimize at Ash River Reference
reference some value engineering document(s) for more details
comparing Orr-Buyck to Ash River?

Optimized Detector

Light Level vs. Detector parameters, cost & risk vs. ways to get more light
Cost vs. Detector parameters from the point of view of less light, associated risks
e.g. risk effects of more pseudocumene, not just additional cost
Reality is the combination of the two previous viewpoints, some up, some down
Optimized cell size, 2.2 cm → 4.5 cm → 6.0 cm deep, associated PVC structure?

6. Site Description

Ash River in detail
The EAW process, the RGU

7. Conventional Facilities

Far Detector Hall at Ash River
3m overburden design
Outfitting
Safeguards and Security (could reference a separate document?)
Alternate designs considered
30 ft excavation, concrete planks, concrete walls w 1m overburden
Optimization / Value engineering in progress
Optimization of depth, ...
Truss vs. concrete planks
Catwalks vs. lift-a-lofts
Near Detector Hall at Fermilab
Opportunity to note that it all exists.

8. Scintillator
 - “517L”
 - Components
 - Describe mechanism for scintillator and waveshifters
 - Light level
 - Mix at Fermilab
 - Shipping Model
 - Alternate mixing schemes considered
 - Alternate shipping models considered
 - Optimization / Value engineering in progress
 - Investigation of different mixes vs. light level

9. Wavelength Shifting Fiber
 - 0.8 mm double clad
 - Describe mechanism of waveshifter
 - Attenuation length
 - Interaction with pseudocumene is a risk
 - Results from 10-year old COSMOS device?
 - Alternate fibers considered
 - Diameter
 - Optimization / Value engineering in progress
 - Different R27 levels, spec on diameter?

10. PVC Extrusions
 - Describe rigid PVC mechanical properties
 - Describe 19 psi problem here?
 - TiO₂ and reflectivity
 - Plot of # of bounces in a cell?
 - Alternates Considered
 - Rutile, anatase, additives
 - Cell size optimization and PVC thickness here?
 - Optimization / Value engineering in progress
 - 16 cell vs. 32 cell?
 - Rutile vs. Anatase
 - PVC additives and structural properties
 - Shipping?

11. PVC Modules

- Bottom Closure & Top Manifold

- Adhesive & alternates

- Light output vs. fiber position in the cell

- Factory Description

- Factory Tools required

- Optimization / Value engineering

 - # of factories, shipping, spiders

 - Two designs for closure

 - Two designs for manifold

12. Photodetector and Electronics (Ron)

- APD

 - Spectral response

 - New packaging developed

- HV supply

- Amplifier

 - New design in progress, result in TDR?

- TE Cooler and water cooling system

- Full electronics package description

- Alternates Considered

 - To APD, HV, amp, coolers, air cooling

- Optimization / Value engineering

 - Exploration of gain vs. S/N?

 - Installation of electronics at Far Site?

13. Data Acquisition System (Ron)
 - Description
 - Alternates considered
 - Optimization?
 - Supernova detection capability preserved, but not in scope

14. Near Detector Assembly (Ron)
 - Describe detector here (previously just discussed as “identical, 250 tons” in Ch3?)
 - Describe modular scheme and access restrictions
 - Alternates
 - Optimization

15. Far Detector Assembly (Ron)
 - Structure details, calculations of stability
 - Adhesive requirements
 - Block Raiser and other tools
 - Alternates
 - Optimization

18. ES&H Overview
 - Pseudocumene and containment, is this a waste min plan?
 - MPCA letter
 - Fire protection is different
 - EAW process here instead of in 6) above?
 - NEPA, EAW expected to lead to FONSI
 - EAW also satisfies the “public and/or stakeholder input”, pg 5-7
 - Reference Hazard Analysis?
 - Decommissioning “plan”? This is part of “alternatives” / Life cycle cost, pg 5-7

19. Quality Assurance Overview??

“summary test and acceptance criteria” , page 5-7

Could do this in each WBS section, or is it better to bring them altogether here in one spot? Or both?

Need some language on production readiness reviews here?

20. Risk Analysis?????

Or reference a separate document tied to contingency?

20. Work Breakdown Structure, pg 5-7

Description down through Level 3

Or is the PMP version good enough?

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

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