

# Fermilab Implementation of DOE Critical Decision Process

## **FRA Project Management System Presentation**

by L Edward Temple Jr

Head, Office of Project Management Oversight (OPMO)

Fall, 2008

# Outline

- Potential New Projects involving Fermilab
- Project Phases
- Project Acquisition Process and Critical Decisions
- (DOE Order 413.3; (Manual &) Guides)
- [EIA Standards EIA-649 & 748-A]
- **FRA Project Management System**
- Conceptual Design
- Next Steps

# List of Potential New Projects

- Project X – 8 GeV Linac & beamlines
- mu2e – rare symmetry violating process
- MicroBooNE – LArTPC
- DUSEL beamline (and Detector)
  - Tunnel, beamline, target (near hall)
  - Large neutrino detector at Homestake
- SNAP - SuperNova Acceleration Probe



Office of Science

# *U.S. Department of Energy's Office of Science*

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## **Office of Science**

### **Project Management System, Processes and Practices for Large Scientific Facilities**

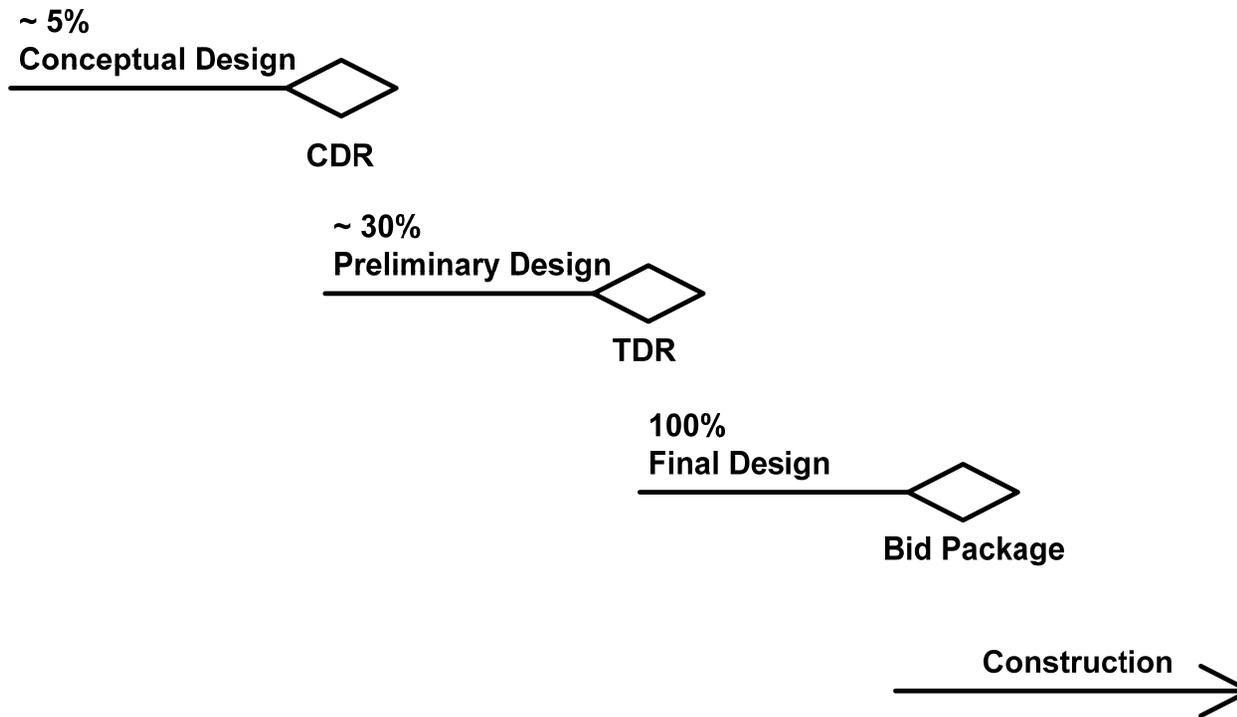
**Daniel R. Lehman**

*Office of Project Assessment*

[Daniel.Lehman@science.doe.gov](mailto:Daniel.Lehman@science.doe.gov)

# Project Design Phases

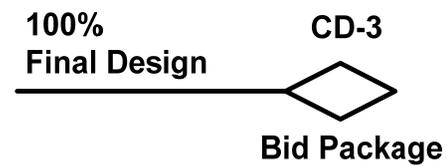
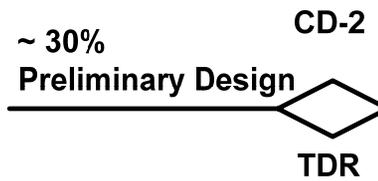
R&D



# Project Design Phases

R&D

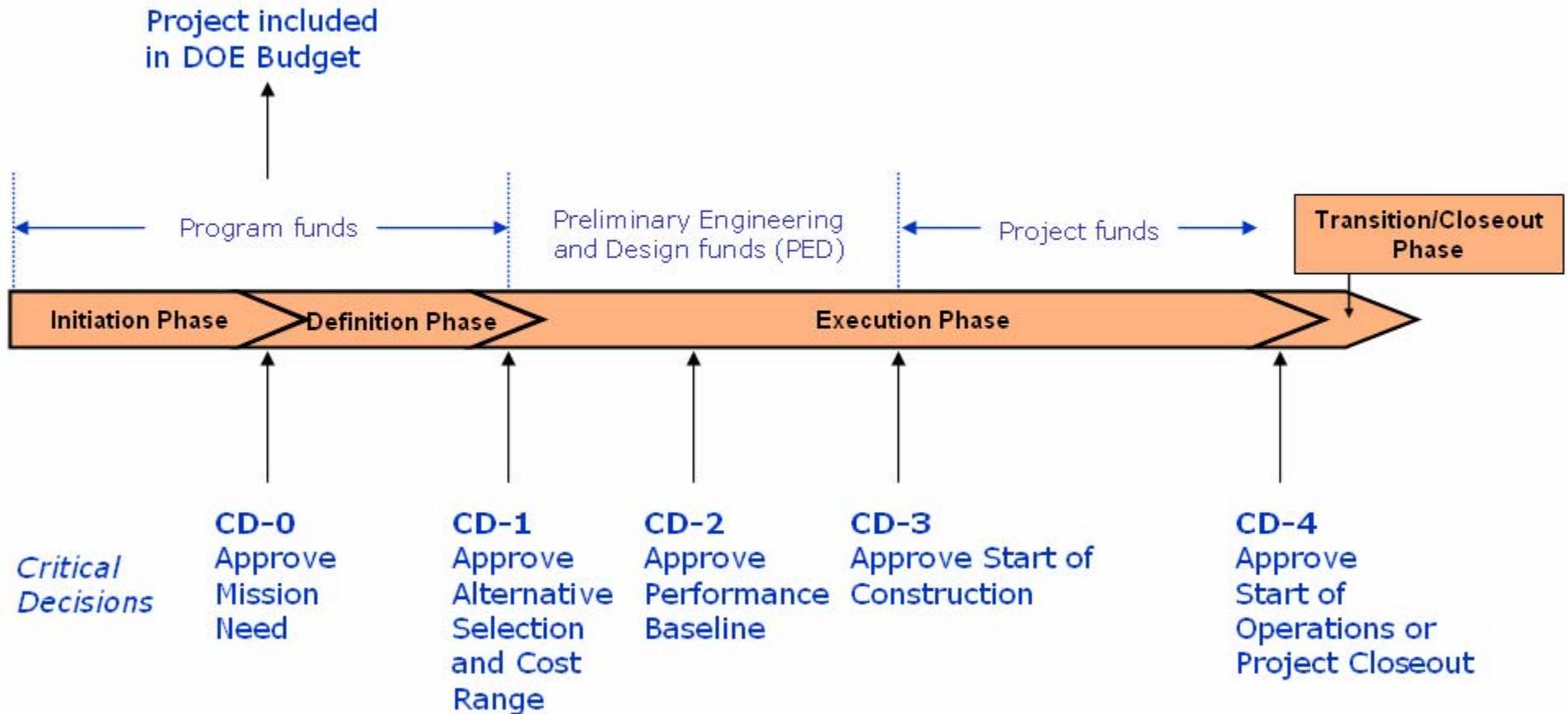
CD-0



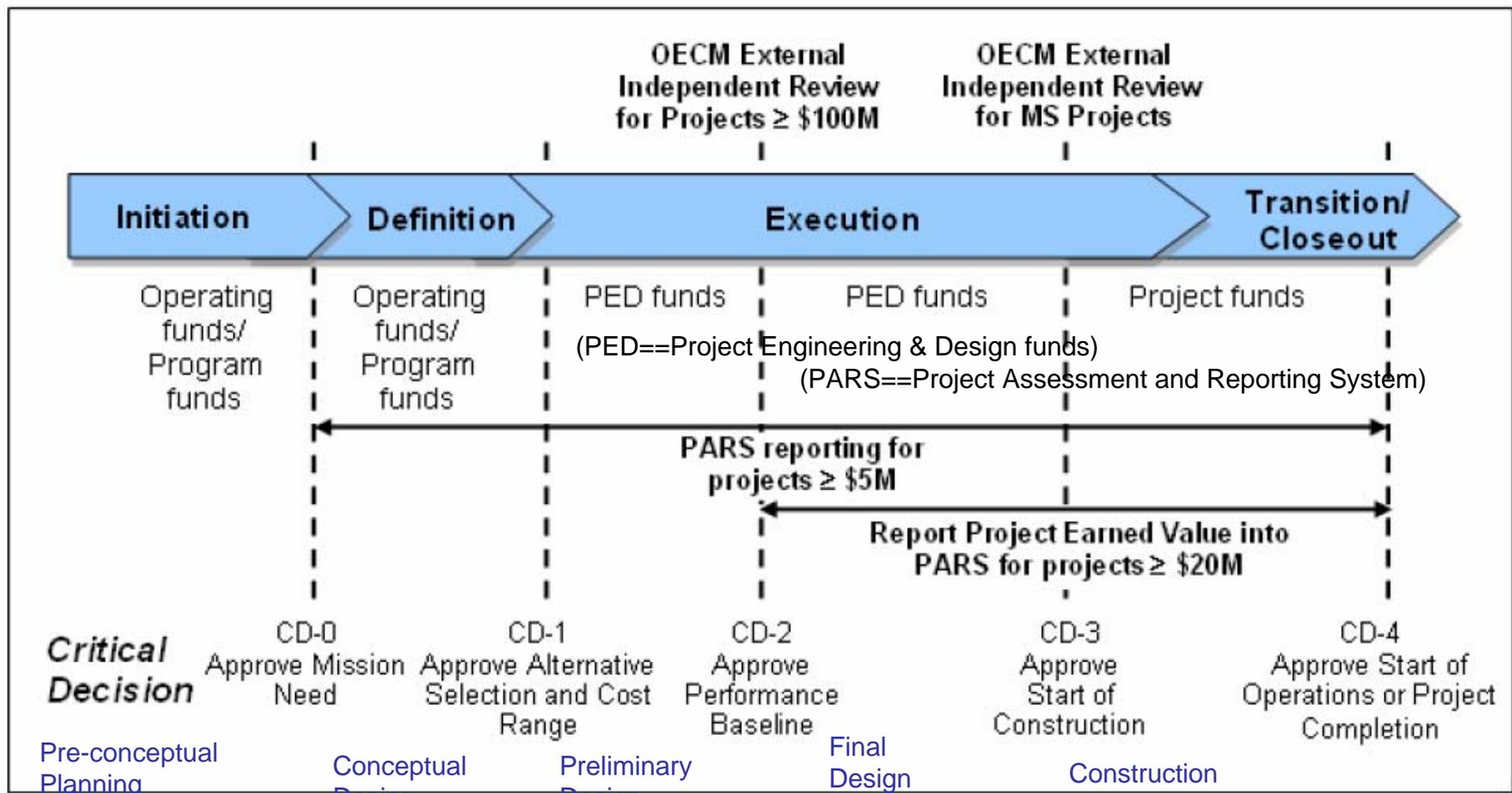


# Project Management Process

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# Typical DOE Acquisition Management System for Line Item Projects



**Figure 1. Typical DOE Acquisition Management System for Line Item Projects.**

# Critical Decision Authority Thresholds

**Table 1. Critical Decision Authority Thresholds**

Critical Decision Authority	Total Project Cost Thresholds*	Life Cycle Clean-Up Project Cost Thresholds*
Secretarial Acquisition Executive	<p>≥ \$750M</p> <p>(or any project on an exception basis when designated by the Secretarial Acquisition Executive)</p> <p>No delegation authority</p>	<p>≥ \$1B</p> <p>(or any Clean-Up Project on an exception basis when designated by the Secretarial Acquisition Executive)</p> <p>Delegation authority to Program Secretarial Office on an exception basis</p>
Under Secretaries	<p>≥ \$100M and &lt; \$750M</p> <p>(or any project on an exception basis when designated by the Under Secretaries)</p> <p>Delegation authority to Program Secretarial Officer for projects &lt; \$400M</p>	Not Applicable
Program Secretarial Officer	<p>≥ \$20M** and &lt; \$100M</p> <p>Delegation authority to a Program Manager or field organization manager. CD-0 may not be delegated below the Program Secretarial Officer.</p>	<p>&lt;\$1B</p> <p>Delegation authority to Headquarters or field Senior Executive Service manager. CD-0 may not be delegated below the Program Secretarial Officer.</p>
Chief Information Officer	<p>&gt; \$5M and &lt; \$750M</p> <p>Departmental Information Technology Projects</p> <p>No delegation authority</p>	Not Applicable

# CD-0 Critical Decision Requirements

**Table 2. Critical Decision Requirements**

CD Requirements	
Order 413.3A Requirements*	Approval Authority
<b>CD-0 Requirements</b>	
Perform <u>Pre-conceptual Planning</u> activities that focus on the Program's strategic goals and objectives, safety planning, and design.	
Prepare a <u>Mission Need Statement</u> that documents a mission requirement that cannot be met through other than material means. Additionally, the Mission Need Statement will document the potential hazards and their safety, security, and risk implications.	Program Secretarial Officer (with recommendation from Program Analysis and Evaluation for projects with a Total Project Cost or Environmental Management Total Project Cost > \$100M)
Prepare a <u>Tailoring Strategy</u> , if required, that describes the project's approach for appropriately adapting Critical Decision requirements based on the project's risk and complexity. The Tailoring Strategy may be included in the Project Execution Plan at later Critical Decisions.	Secretarial Acquisition Executive or Acquisition Executive
Perform a <u>Mission Validation Independent Project Review</u> on all Major System Projects.	Program Secretarial Officer

# CD-1 Requirements

CD-1 Requirements	
Prepare a <u>Conceptual Design Report</u> which is an integrated systems engineering effort that results in a clear and concise definition of the project.	
Prepare an <u>Acquisition Strategy</u> that describes the high-level business and technical management approach designed to achieve project objectives within specified resource constraints.	Program Secretarial Officer (with recommendation from the Office of Engineering and Construction Management for Major System Projects).
Comply with the <u>One-for-One Replacement</u> legislation (excess space/offset requirement) as mandated in House Report 109-86.	
Prepare a preliminary <u>Project Execution Plan</u> , including a Risk Management Plan and Risk Assessment, that establishes the initial policy and procedures to be followed to manage and control project execution.	Secretarial Acquisition Executive or Acquisition Executive
Approve appointment of the <u>Federal Project Director</u> .	Secretarial Acquisition Executive or Acquisition Executive (with Program Manager recommendation)
Establish and charter an <u>Integrated Project Team</u> . An Integrated Project Team, led by the Federal Project Director, is a multi-disciplinary team, which includes safety expertise. The Charter includes membership, roles and responsibilities, decision making authority and operating guidance. The Charter may be included in the Project Execution Plan.	Secretarial Acquisition Executive or Acquisition Executive
Conduct a <u>Design Review</u> of the conceptual design. Design Reviews are performed to determine if a product (drawings, analyses, or specifications) is correct and will perform its intended functions and meet requirements.  As part of the Design Review, for high-risk, high-hazard, and Hazard Category 1, 2, and 3 nuclear facilities, conduct a <u>Technical Independent Project Review</u> , the focus of which is to determine that the safety documentation is sufficiently conservative and bounding to be relied upon for the next phase of the project.	

continues  
see the  
Order  
DOE O  
413.3A

28-Aug-2008

DOE O 413.3A (Updated 2/2/07)

<i>Preconceptual Planning</i>	<i>Conceptual Design</i>	<i>Preliminary Design</i>	<i>Final Design</i>	<i>Construction</i>	<i>Operations</i>
❖ <b>CD-0</b>	❖ <b>CD-1</b>	❖ <b>CD-2</b>	❖ <b>CD-3</b>	❖ <b>CD-4</b>	
Approve Mission Need	Approve Alternative Selection & Cost Range	Approve Performance Baseline	Approve Start of Construction	Approve Start of Operations or Project Completion	

<b>Actions Authorized by Critical Decision (CD) Approval</b>				
<b>CD-0</b>	<b>CD-1</b>	<b>CD-2</b>	<b>CD-3</b>	<b>CD-4</b>
<ul style="list-style-type: none"> <li>Proceed with Conceptual Design</li> <li>Request PED funding</li> <li>Start monthly PARS &amp; Quarterly Project Performance reporting</li> </ul>	<ul style="list-style-type: none"> <li>Allow Expenditure of PED Funds for preliminary design</li> <li>Approval of long-lead procurement if necessary</li> </ul>	<ul style="list-style-type: none"> <li>Establish Performance Baseline</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 completion</li> </ul>
<b>Non-Nuclear Facilities--Prerequisite Activities for CDs</b>				
<ul style="list-style-type: none"> <li>Review of Mission Need Statement (MSN) by Office of Program Analysis &amp; Evaluation (CF-20) for \$100M or greater.</li> <li>Perform Mission Need Independent Project Review (IPR) for Major System (MS) projects (&gt;=\$750K)</li> <li>Perform Pre-conceptual Planning</li> <li>Evaluate Information Technology (IT) projects with Departmental Enterprise Architecture framework</li> </ul>	<ul style="list-style-type: none"> <li>Review of Acquisition Strategy (AS) (OECM review for MS project)</li> <li>Review of Conceptual Design                             <ul style="list-style-type: none"> <li>Requirements Analysis</li> <li>Risk Analysis</li> <li>Alternative Analysis</li> <li>Value Management determination</li> </ul> </li> <li>Assess Requirements Analysis, Risk Analysis, Alternative Analysis, &amp; Value Management.</li> <li>Appoint FPD</li> <li>Establish &amp; charter Integrated Project Team</li> <li>Ensure compliance with One-for-One Replacement requirement for building square footage</li> <li>Ensure Integrated Safety Management Implementation</li> <li>Ensure consideration for High Performance Sustainable Building</li> <li>Assess if QA Program is acceptable</li> </ul>	<ul style="list-style-type: none"> <li>Perform Baseline External Independent Review (EIR) &amp; validation by OECM for \$100M or greater. Perform Independent Cost Review or Independent Cost Estimates for MS project as part of EIR</li> <li>Program IPR for \$20M to less than \$100M</li> <li>Review of Preliminary Design</li> <li>Establish compliant project EVMS for \$20M or more, &amp; OECM certifiable EVMS for project TPC with \$50M or more</li> <li>Conduct Value Engineering (as applicable)</li> <li>Incorporate High Performance Sustainable Building provisions into design</li> <li>Determine if QA Program is acceptable</li> </ul>	<ul style="list-style-type: none"> <li>Perform Executability EIR by OECM for MS projects</li> <li>Perform IPR for Non-MS projects by Program (SC)</li> </ul>	<ul style="list-style-type: none"> <li>Verify Key Performance Parameter or Completion Criteria achieved</li> <li>Perform Readiness Assessment or Operational Readiness Review</li> <li>Revise environmental management system.</li> </ul> <p><u>Post CD-4 Closeout</u></p> <ul style="list-style-type: none"> <li>Perform Final Administrative &amp; Financial Closeout</li> <li>Conduct Post Implementation Review for IT projects</li> </ul>

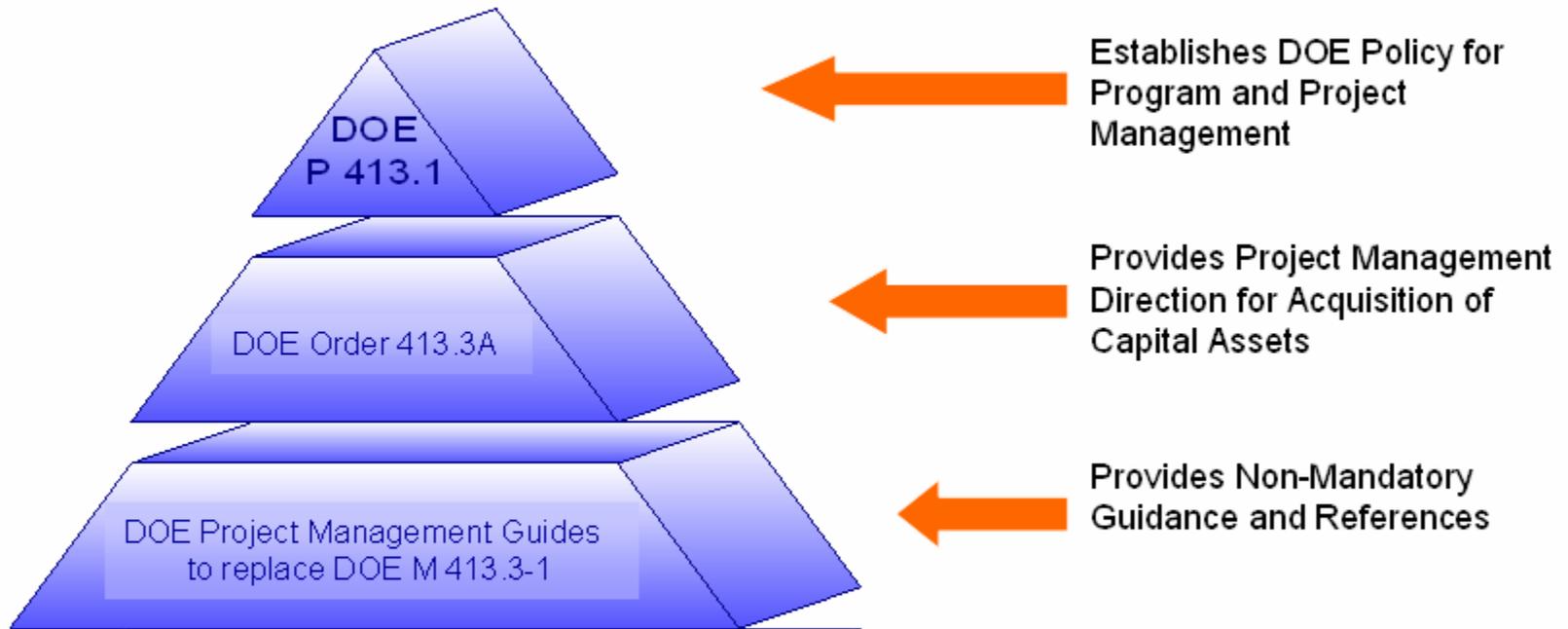
<i>Preconceptual Planning</i>	<i>Conceptual Design</i>	<i>Preliminary Design</i>	<i>Final Design</i>	<i>Construction</i>	<i>Operations</i>
❖ <b>CD-0</b> Approve Mission Need	❖ <b>CD-1</b> Approve Alternative Selection & Cost Range	❖ <b>CD-2</b> Approve Performance Baseline	❖ <b>CD-3</b> Approve Start of Construction	❖ <b>CD-4</b> Approve Start of Operations or Project Completion	
<b>Prerequisite Documents</b>					
<ul style="list-style-type: none"> <li>• MNS</li> <li>• Tailoring Strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Acquisition Strategy</li> <li>• Conceptual Design Report</li> <li>• Risk Management Plan</li> <li>• Risk Assessment</li> <li>• Preliminary PEP,</li> <li>• Preliminary Hazard Analysis (HA),</li> <li>• Preliminary Security Vulnerability Assessment Report (SVAR)</li> <li>• Initial Cyber Security Plan for IT projects.</li> <li>• QA Program Documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Performance Baseline</li> <li>• Preliminary Design</li> <li>• Updated Risk Assessment</li> <li>• Updated PEP</li> <li>• Updated HA (Approved at Field Level)</li> <li>• Updated Preliminary SVAR</li> <li>• NEPA Documentation</li> <li>• Updated Initial Cyber Security Plan for IT projects</li> </ul>	<ul style="list-style-type: none"> <li>• Final Design</li> <li>• Updated CD-2 documents</li> <li>• Updated QA Program</li> <li>• An Approved Construction Project Safety &amp; Health Plan</li> <li>• Updated Cyber Security Plan for IT projects</li> </ul>	<ul style="list-style-type: none"> <li>• Checkout, Testing &amp; Commissioning Plan</li> <li>• Project Transition/ Closeout Plan</li> <li>• Transition-to-Operations Plan</li> <li>• Finalized QA Plan, SVAR, HA Report, Construction Project Safety &amp; Health Plan,</li> <li>• Finalized Cyber Security Plan for IT projects &amp; completed Certification &amp; Accreditation, as required</li> <li><u>Post CD-4 Closeout</u></li> <li>• Final Project Closeout Report</li> <li>• Lessons Learned Report</li> <li>• Required Operational Documentation</li> </ul>	
AS-Acquisition Strategy EIR-External Independent Review EVMS-Earned Value Mgmt. System HA-Hazard Analysis IPR-Internal Project Review	MNS-Mission Need Statement MS-Major Systems OECM-Office of Engr. & Const. Mgmt. QA-Quality Assurance PSVR-Prelim. Safety Validation Report	SAR-Safety Analysis Report SDR-Safety Design Report SER-Safety Evaluation Report SVAR-Security Vulnerability Assess. Report TPC-Total Project Cost			
<b>Budget Related Documents</b>					
<ul style="list-style-type: none"> <li>• After CD-0 approval, Exhibit 300 for Projects --&gt;\$20M: Annual submission initiated during the federal budget cycle when funds are requested.</li> <li>• Project Data Sheets: Annual submission initiated during the federal budget cycle when TEC funds are requested.</li> </ul>					



# DOE Project Management System

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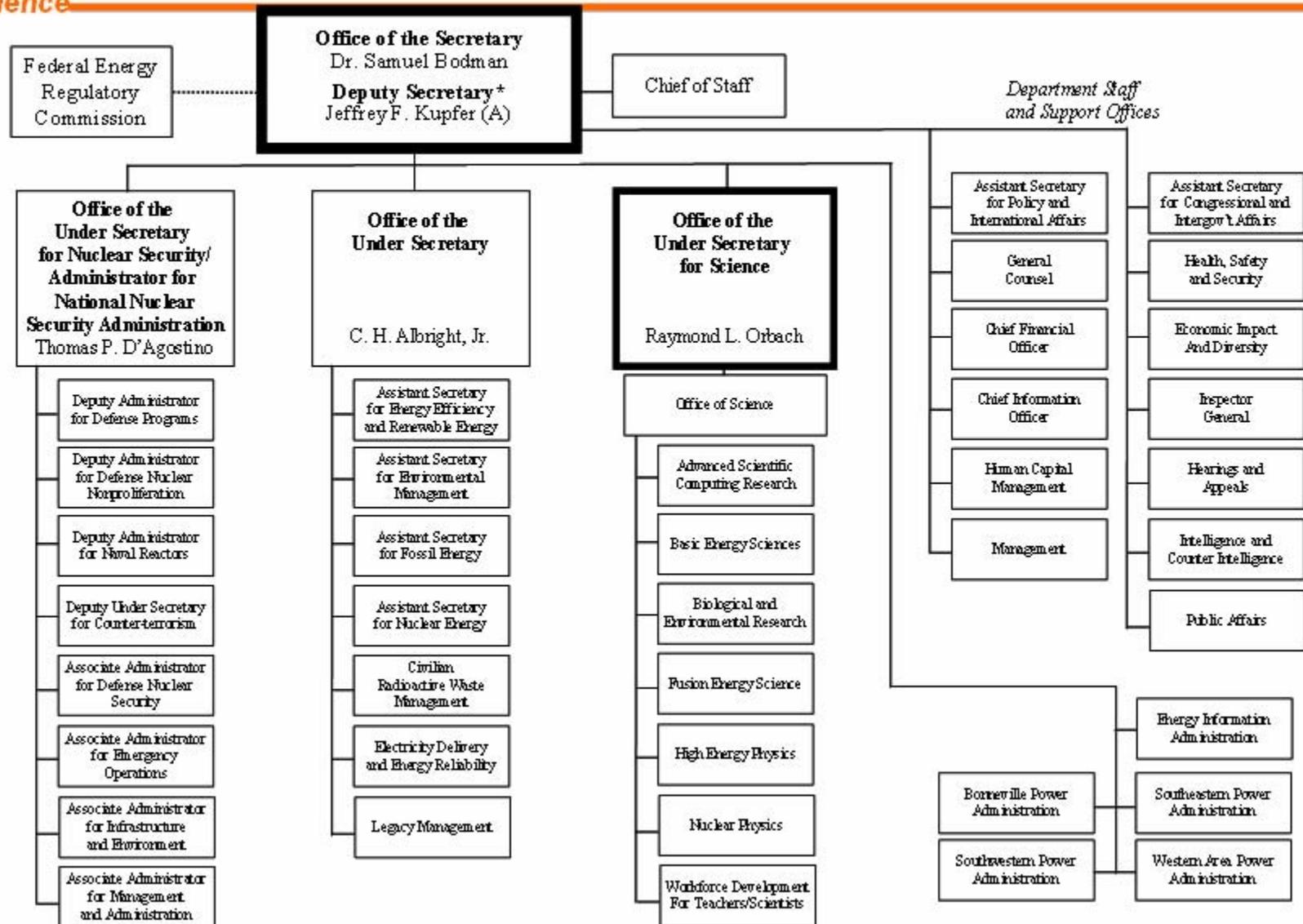
# DOE Order 413.3; Manual & Guides EIA Standards EIA-649 & 748-A

- Handout Copy
  - 413 Order, Manual, Guides available at [www.directives.doe.gov](http://www.directives.doe.gov)
- Standards must be purchased
  - EIA 649 Configuration Management
  - EIA 748-B Earned Value Management Systems



# U.S. Department of Energy

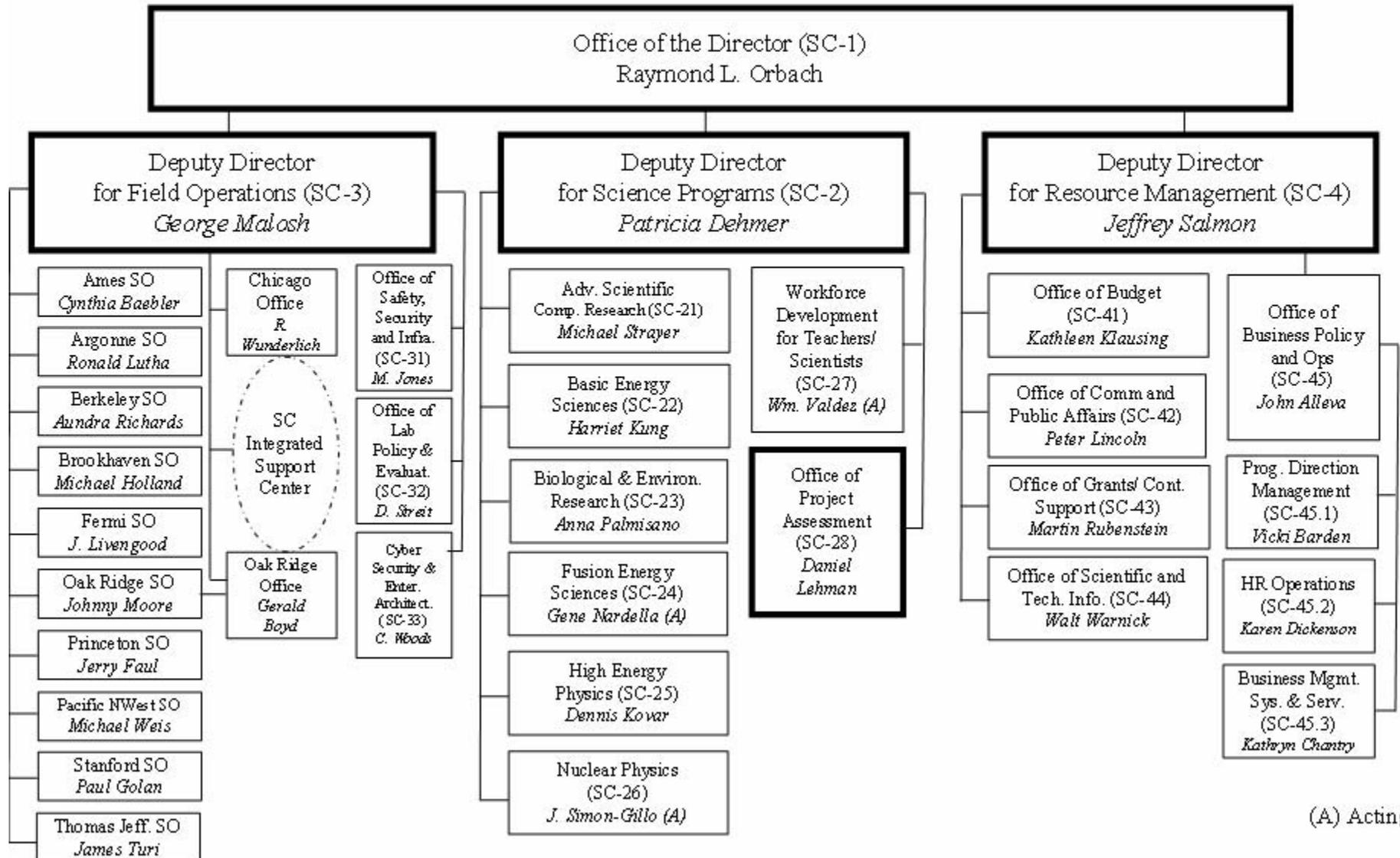
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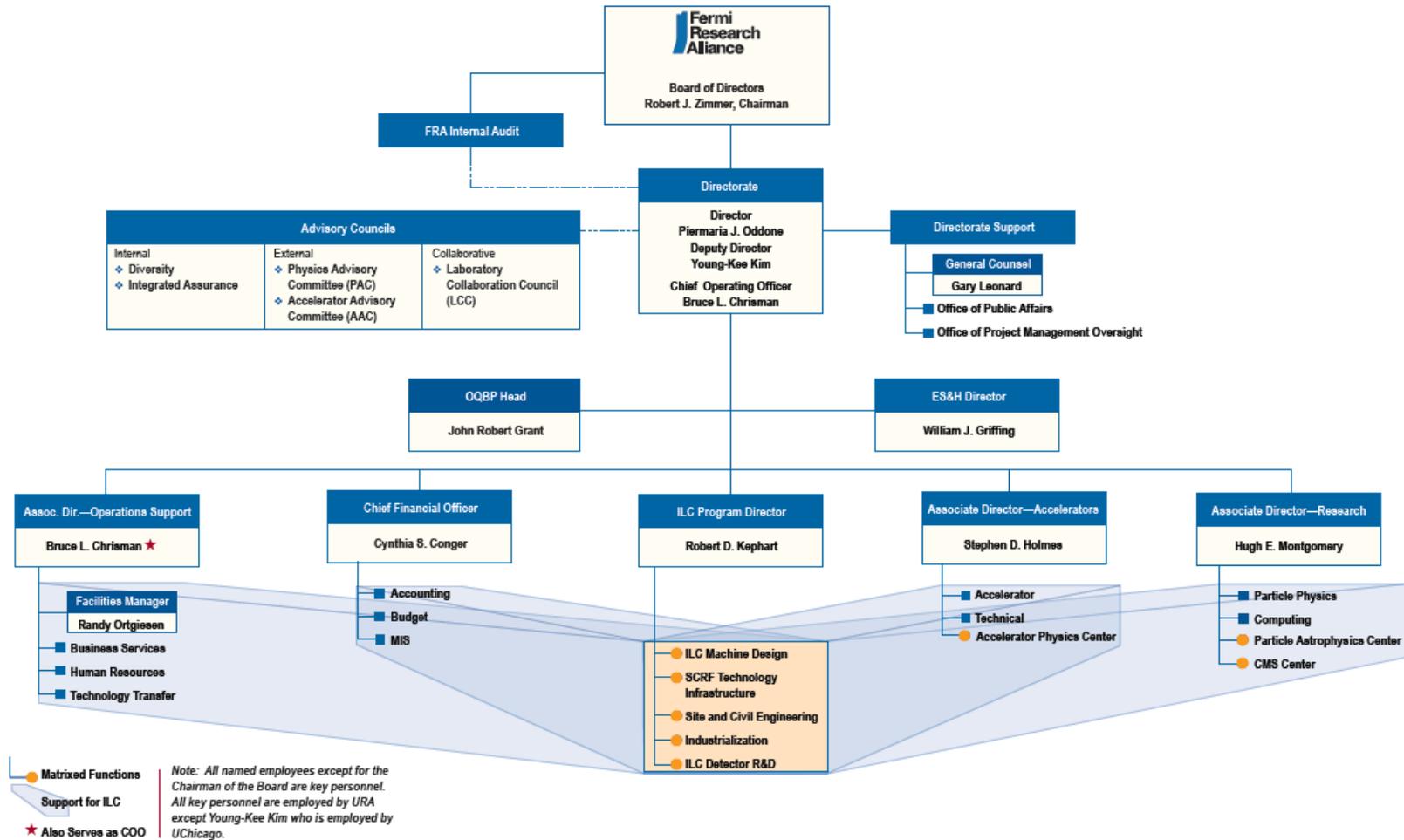
# Office of Science

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(A) Acting

# Fermilab Organization Chart



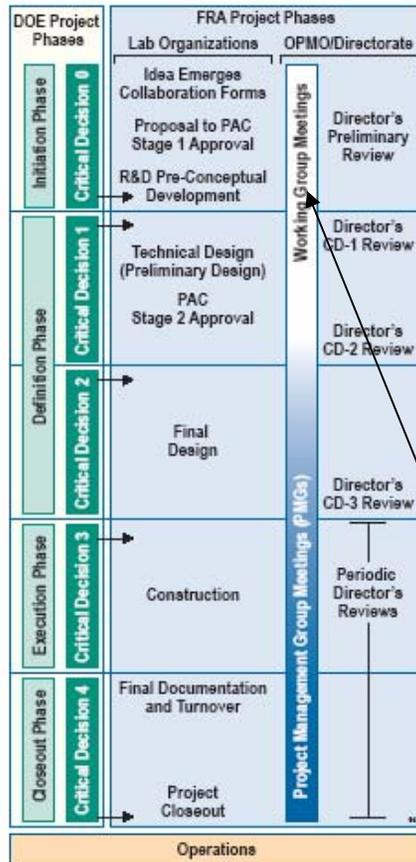
# FRA PM System

Figure from the FRA Proposal in Section 4b  
 “Achieving Excellence in FNAL Operations  
 Business Management”

Provides FNAL with powerful assets and capabilities including training for managers.

Available at FRA website:

<http://fra-hq.org/about.html>



## Project Management Working Group Meetings (PM WGM)

Marshall (/ shepherd) the troops to meet the formally required Project Management documents, systems, and prepare for DOE Lehman CD (and other) Reviews

***Much of the training is “just in time” and provided in the Project Management Working Group Meetings specific to each project.***

Figure 4.b-7. FRA Project Management System. Our systematic approach to project management controls scope, schedule, and cost in accordance with DOE's project management systems and DOE Order 413.3.

# OPMO Activities

- Setup, coordinate, lead parts of, run Project Management **Working Group Meetings** for each project at the request of an Associate Director.
- Conduct **Director's Reviews** of Projects as requested by a Director.
- **Assist** project teams in **others ways** upon request. Eg Hoffer did Schedule for Spalding on Tevatron Luminosity Upgrade

# OPMO Prior Project Document and Review Archive

- <http://www.fnal.gov/directorate/OPMO/Projects/home/base.htm>
- **Fermilab Projects**
- [Dark Energy Survey \(DES\)](#)
- [MINERvA](#)
- [MicroBooNE](#)
- [NOvA](#)
- [Proton Plan](#)
- [Project X](#)
- [Super NuMI \(SNUMI\)](#)
- **Completed Fermilab Projects**
- [Run IIb Upgrade DZero](#)
- **Non-Fermilab Projects**
- [Argonne Leadership Computing Facility \(ALCF\)](#)
- [ITER](#)
- [National Synchrotron Light Source II \(NSLS-II\)](#)

# 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.

28-Aug-2008

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# Possible Project X Schedule

- Near Term Activities / Goals
  - 2008 Sept / Oct Initial Configuration Document complete
  - 2009 Feb Director's Preliminary Review supports CD-0
  - DOE Lehman Review IPR for CD-0 (Independent Project Review)
- Longer Term Goal
  - FY 2013 "Construction Start"
- See Hoffer / McCluskey presentations for much more detail

# CD-0

- DOE G 413.1-17 “Mission Need Statement Guide”
  - this is a DOE document prepared by the HQ Program Office (OHEP for Fermilab)
  - background information is supplied by the lab
  - occasionally a “draft” document provided to HQ
- CD-0 “package” prepared to support a CD-0 ESAAB (Energy Systems Acquisition Advisory Board) meeting.

# Example CD-0 Resource and Schedule Forecast Information

## EXAMPLE 1 (PU DISPOSITION).

The project is planning to utilize the DWPF canisters as a disposition vehicle for the plutonium glass, as well as providing security during storage and transportation because the canister is self-protecting. Therefore, conceptual design must be completed in FY 2006 to ensure that the vitrification of the plutonium is completed by 2018. The project must be included in the FY 2006 budget request to ensure funds are available and Congressional approval has been obtained prior to the initiation of conceptual design which is greater than \$3M.

ROM Cost Estimate Range: \$300M ≤ estimate range ≤ \$700M

### Estimated Cost.

The estimated cost needed to proceed to CD-1 is \$10 million. This estimate is \$2 million more than the current funded amount of \$8 million. The funding profile by fiscal year for the upcoming FY08-FY12 planning window is contained in the chart below:

Five-Year Planning Period					
Fiscal Year	08	09	10	11	12
ROM estimate of PED profile		\$35M	\$40M	\$15M	
<b>ROM estimate of 5-yr cost profile</b>	\$10 M	\$60M	\$110M	\$120M	\$130M

### ROM Schedule Estimate.

Current estimated dates for major milestones are as follows:

Conceptual design start	FY2008
Preliminary design start	FY2009
Construction start	FY2010
Startup and testing	FY2012
Operations start	FY2013
Operations complete	FY2015



(Work Breakdown Structure /  
Organizational  
Breakdown Structure)

J. Cooper,  
R. Ray,  
N. Grossman,

Project Manager  
Deputy Project Manager  
Associate Project Manager

2.0  
Accelerator  
& NuMI  
Upgrades  
(ANU)

N. Grossman  
E. McCluskey, de

2.1  
Far Site  
& Building

S. Dixon

2.2  
Scintillator

S. Mufson

2.3  
Fiber

C. Bromberg

2.4  
PVC  
Extrusions

R. Talaga

2.5  
PVC  
Modules

K. Heller

2.6  
Electronics  
&  
2.7 Data  
Acquisition

L. Mualem

2.8 Near  
Detector  
&  
2.9 Far  
Detector  
Assembly

D. Ayres

2.10  
Project  
Management

WBS 2.x for the construction project, similar WBS 1.x for R&D/Ops

### Project Office Staff:

Dave Pushka, Mechanical Project Engineer

John Oliver, Electronics Project Engineer

Anna Pla-Dalmau, Project Chemist

Suzanne Pasek, Project Financial Officer

Bill Freeman, Project Scheduler

Ken Doman, ANU scheduler

Harry Ferguson, Assistant Project Scheduler

Keith Schuh, ES&H Detector, EA, pSAD

Mike Andrews, ES&H for Accelerator side

Alan Wehmann, websites / document databases

Nancy Grossman, QA oversight

Elaine McCluskey, Configuration Control

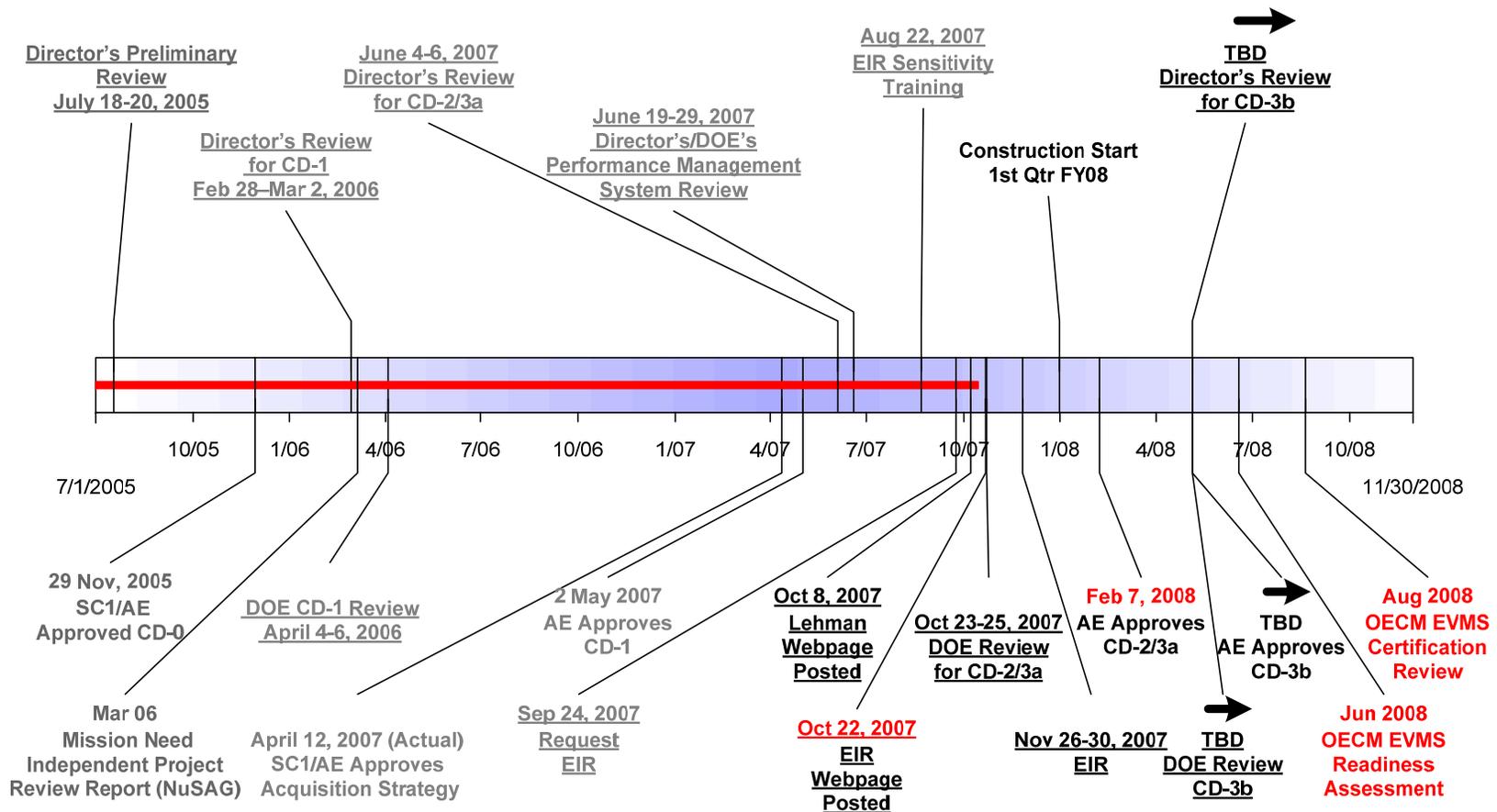
Bob Bernstein, Expediter & Document Coord.

Jon Paley, databases



# DRAFT NOvA Project Timeline for Critical Decisions & Reviews

Updated 08-Oct-07



Note:

- Text in Red indicates change from prior version
- Text in Gray indicates activity is complete

28-Aug-2008



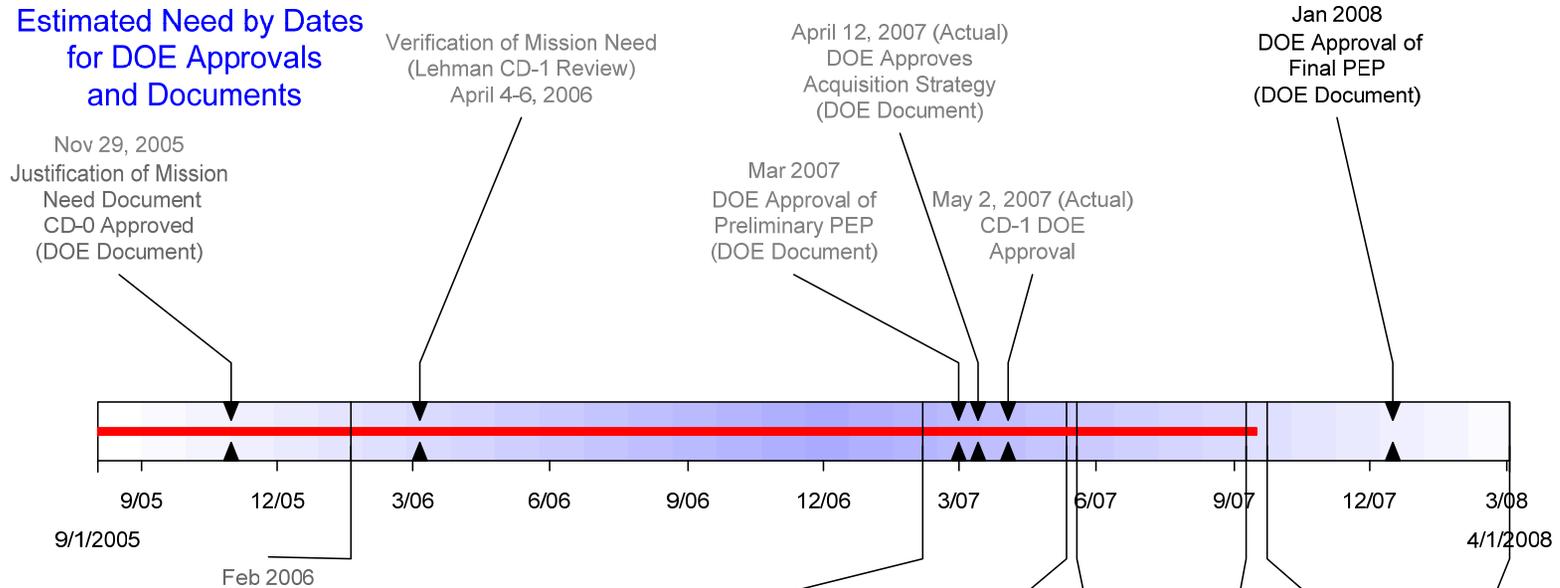
# NOvA Project

## Draft Critical Design Prerequisites

Updated 01-Oct-07



### Estimated Need by Dates for DOE Approvals and Documents



#### CD-1 Docs:

- Conceptual Design Report (CDR)
- Baseline Range and Resource Loaded Schedule
- Draft Configuration Management Document
- Preliminary PMP
- Preliminary Hazard Analysis Report
- Value Management Documentation
- Draft Risk Management Plan

### Target Completion Dates for NOvA Documents

#### Note:

- Text in **Red** indicates change from prior version
- Text in **Gray** indicates activity is complete

#### CD-2/3a Docs:

- Technical Design Report (TDR)
- Baseline Cost Est. and Baseline Resource Loaded Schedule
- Final Configuration Management Document
- Final PMP
- NEPA and Approved Safety Documents
- Final Design & Procurement Packages for Long Lead Time Items for CD-3a
- Updated Value Management Documentation
- Final Risk Management Plan

Mar 6, 2007  
Submit Updated CD-1  
Docs w/Accelerator  
Work Included

Jun 2007  
Performance Management  
System Document (EVMS)

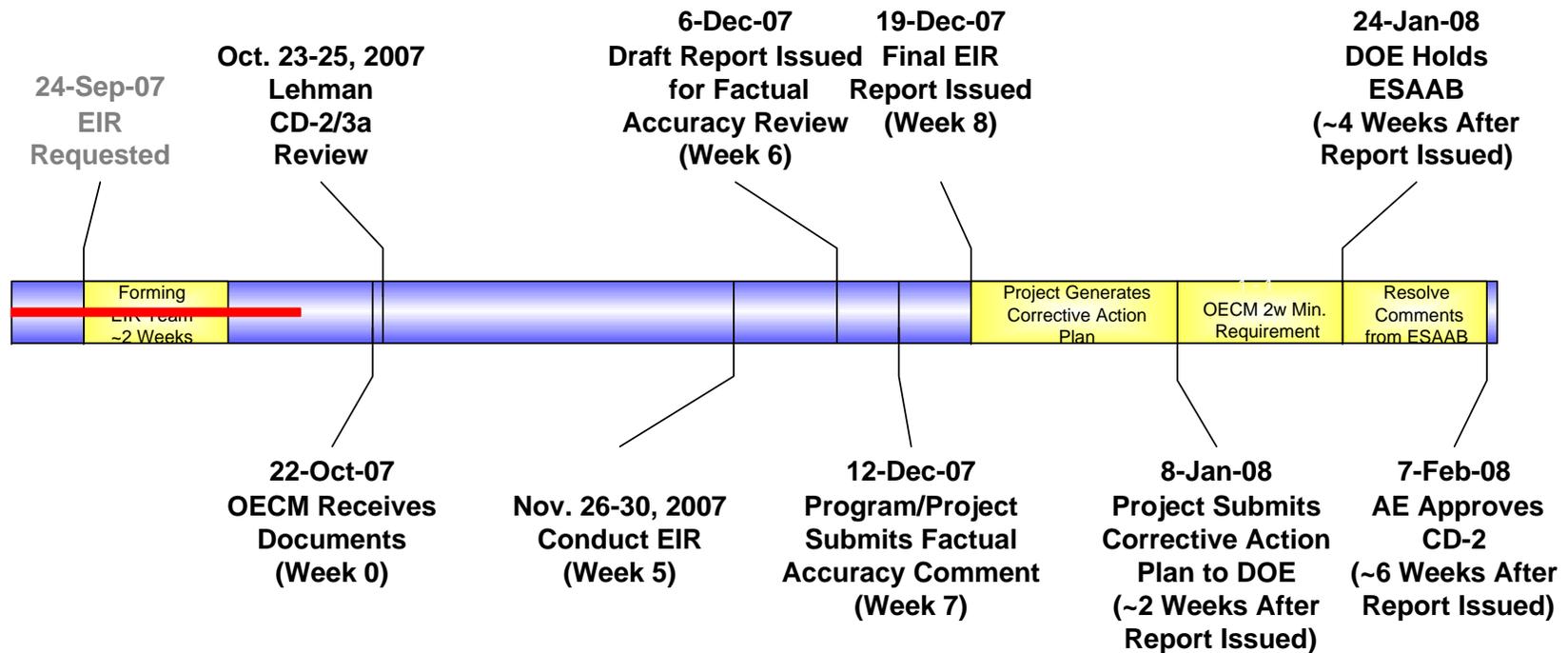
Oct 8, 2007  
Lehman  
Webpage

Oct 22, 2007  
EIR  
Webpage

TBD for CD-3b  
- Updated CD-2 Documents  
- Final Design Complete or design  
is sufficiently mature to start  
procurement or construction

# External Independent Review (EIR) Process Timeline

Updated (08-Oct-07)



Note:

- Text in Red indicates change from prior version
- Text in Gray indicates activity is complete

28-Aug-2008

# Action Items

## (New Items from Oct. 2 WGM)

- 1) Address Pepin's request that FNAL Procurement Representative signoff on NOvA's Acquisition Plan [Ron Ray, Bob Cibic]
- 2) Determine if DOE FSO can electronically signoff documents in NOvA's Docdb [Alan Wehmann]
- 3) Discuss FY2011 shutdown schedule start date with Steve Holmes and Roger Dixon and get back with NOvA. [Hugh Montgomery]
- 4) Send to Dean the name and contact information of EIR Reviewer that needs access to NOvA's project file and Open Plan to start process for getting the reviewer access rights. [Pepin Carolin]

## (Carryover from Sept. 18 WGM)

- 5) Develop document that describes assumptions used in building the schedule. [Ron Ray/Bill Freeman]

## (Carryover from Sept. 04 WGM)

- 6) Send copy of updated EA to ES&H (Bill Griffing) and Mike Martens to review prior to notification to Fermi's nearest neighbors about submittal of EA. [John Cooper]

# DOE 413.3 Attachment 1 - CONTRACTOR REQUIREMENTS DOCUMENT

1. Earned Value Management System (Not required if <\$20M)
2. Monthly Reports
3. Acquisition Plan
4. Technical performance analyses and corrective action plans
5. Critical path schedule and Project Master Schedule
6. Cost estimate; (Basis of Estimate)
7. Risk identification, quantification and mitigation
8. Integrated technical, cost, and schedule baseline
9. Configuration Management
10. Value Engineering
11. Quality Assurance Program
12. Integrated Safety Management System
13. Sustainable Building Design

# DOE O 413.3 Attachment 1

## CONTRACTOR REQUIREMENTS DOCUMENT

### DOE O 413.3, PROJECT MANAGEMENT FOR THE ACQUISITION OF CAPITAL ASSETS

The Department of Energy (DOE) prime contractor's project management system must satisfy the following requirements.

1. The industry standard for project control systems described in American National Standards Institute (ANSI) EIA-748, *Earned Value Management Systems*, must be implemented on all projects with a total project cost (TPC) greater than \$20M for control of project performance during the project execution phase.
2. Cost and schedule performance, milestone status, and financial status must be reported to DOE on a monthly basis using DOE-approved work breakdown structure elements and data elements for all projects with a TPC greater than or equal to \$20M, except for time-and-materials contracts, firm fixed-priced contracts, or level-of-effort support contracts, for control of project performance during the project execution phase. The report must also include variance analyses and corrective action plans that integrate cost, schedule, and scope if variances exceed DOE-established reporting thresholds. Also reported will be analyses of cost and schedule trends, financial status, and baseline change control activity, including the allocation of management reserve, potential problems, and critical issues.

Qtrly

# DOE O 413.3 Attachment 1 (cont.)

3. For project contracts that will be accomplished by M&O/M&I contractors, the contractor must have a written Acquisition Plan that is appropriate for the requirement and dollar value of each contract and consistent with the intent of the FAR. The Acquisition Plan for a project contract to be awarded by an M&O/M&I contractor is developed by a team of contractor employees including, as a minimum, the prospective Project Manager and Contract Negotiator. The Acquisition Plan will also be concurred in by the DOE Contracting Officer.
4. Technical performance analyses and corrective action plans must be reported to DOE for variances to the project baseline objectives resulting from design reviews, component and system tests, and simulations.
5. A critical path schedule and a project master schedule must be developed and maintained.
6. Cost estimating must be an integral part of cost baseline and life-cycle cost development and maintenance, budget request development, and estimates at completion.
7. Project technical, cost, and schedule risks must be identified, quantified, and mitigated (as appropriate). Risk mitigation strategies must be developed and implemented.
8. An integrated contractor technical, cost, and schedule baseline must be developed and maintained through the use of a contractor-level change control board.

# DOE O 413.3 Attachment 1 (cont.)

9. A configuration management process must be established that controls changes to the physical configuration of project facilities, structures, systems, and components in compliance with ANSI/EIA-649, *National Consensus Standard for Configuration Management*. This process must also ensure that the configuration is in agreement with the performance objectives in the technical baseline.
10. A value engineering process must be used that identifies high-cost project activities in order to realize a maximum return on investment through the use of systems engineering trade-offs and functional analyses that identify alternate means of achieving the same function at a lower life-cycle cost.
11. A quality assurance program must be developed and implemented for the contract scope of work in compliance with DOE O 414.1A, QUALITY ASSURANCE, at the beginning of the project and maintained over the project life. This program must assign responsibilities and authority for quality, define policy and requirements, and provide for the performance and assessment of work.
12. An Integrated Safety Management system must be developed and implemented for the contract scope of work in compliance with DEAR 970-5204-2, Integration of Environmental, Safety and Health into Work Planning and Execution.
13. Sustainable building design principles must be applied to the siting, design, and construction of new facilities.

# Next Steps

Regular Project X PM WGMs  
in addition to  
regular Project X project meetings

Frequency of PX PM WGMs will vary  
suggest monthly to start  
(open for discussion)

# Back Up Slides



# Unique Features of Science Projects (with Implications for Project Management)

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SC Laboratories are Not-for-Profit

SC contracts are rigorously managed, but the working relationship is a partnership

R&D is not a project phase, but a means for validating and optimizing design concepts

Projects are typically “design to cost” with a goal of maximizing science capability

Facility users (and science community) are thoroughly engaged throughout the project lifecycle

Internal project advisory committees (technical and managerial) are thoughtfully appointed and valued

Conceptual Design Reports establish reasonableness of design, but does not preclude further optimization

Project designs consider future upgrades—programs and projects take a long view

Project delivery organization evolves into the operating organization

Lehman (peer) reviews are regular, recognized by the science community, and facilitate active sharing of lessons learned from other projects

TABLE 1

Source: W.K.H. Panofsky  
May 28, 1980

## RECORD OF LARGE EARLY HEP PROJECTS

Device	Site	Construction Start	On Schedule	Specifications	Cost Estimates	Cost in Then Yr \$'s
Proton-Synchrotron	FNAL	1969	Yes <sup>1</sup>	Exceeded	Under 3%	243,000,000
2-Mile Linac	SLAC	1962	Yes	Exceeded	Met	114,000,000
PEP	SLAC	1976	Yes	Met <sup>2</sup>	Met	78,000,000

<sup>1</sup> Three months ahead of original schedule.

<sup>2</sup> Final performance not yet established.

**GOOD!**

Prepared in September 1983

TABLE 2

## ER PROJECTS WITH INCREASED TEC'S

	TEC (\$ In Millions)	
	Initial	Current
<b>High Energy Physics</b>		
CBA (Isabelle)	275	473.3 (First Sextant R&D)
Energy Saver	38.9	50.8
Tevatron I	41.5	82.5
SLC	112	115
<b>Fusion</b>		
TFTR	215	314 (Minor Descope)
LCTF	18	35.7
MFTF-B	94.2	243.2 Major Upscope
EBT-P	(25) 44	97.8
FMIT	85	105
	<hr/>	<hr/>
	924	1517

$\frac{\text{CURRENT}}{\text{INITIAL}} \approx 1.6$

Not As Good

TABLE 3

Source: GAO Report NSIAD-83-32  
 "Status of Major Acquisitions as of  
 September 30, 1982"

## ACQUISITION STATUS SUMMARY AS OF SEPTEMBER 30, 1982 (DOLLARS IN MILLIONS)

Agency: Architect of the Capitol

Project Name ID#/Category/LOC/Quantity	Total Estimated Cost			Federal Share of Estimate				Unit Cost			% of Fundg Rcv'd	Yrs Slip	
	Current Estimate	Change From Development		Current Amount	Change From Initial Est		Change During Fiscal Yr. 82		Amount (in \$)	Init % Chg			Qnty % Chg
		Amount	%		Amount	%	Amount	%					
Hart Senate Office Building 523 /Other /DC/1020000 Gross SQ F	138.0	52.9	62	138.0	90.0	188	0.3	0	135	187	0	100	6.2
<b>Subagency Total</b>	<b>138.0</b>	<b>52.9</b>		<b>138.0</b>	<b>90.0</b>		<b>0.3</b>						
<b>Agency Total</b>	<b>138.0</b>	<b>52.9</b>		<b>138.0</b>	<b>90.0</b>		<b>0.3</b>						

48 - 138

$$\frac{CE}{IE} = 3$$

Source: GAO Report NSIAD-83-32  
 "Status of Major Acquisitions as of  
 September 30, 1982"

TABLE 4

## MAJOR ACQUISITIONS AS OF SEPTEMBER 30, 1982 (DOLLARS IN MILLIONS)

Agency Name	Total Ongoing Acquisitions		Acquisitions Having Cost Growth				Agencies Over \$10B (Dollars in Billions)		
	No. Acqs.	Current Estimate (CE)	Development Est		Initial Estimate		Current Estimate (CE)	CE/IE	Rank
			Amount	Growth	Amount	Growth			
Architect of the Capitol	1	138.0	85.1	52.9	48.0	90.0			
Army Corps of Engineers	97	24852.0	15343.2	6569.1	6878.4	15063.0	\$ 24.9	3.6	4
Health and Human Services	2	175.0	56.6	24.4	56.6	24.4			
Department of Justice	1	65.0	57.2	7.8	55.4	9.6			
Department of Commerce	6	1797.0	996.4	751.6	1035.1	712.9			
Department of Defense	173	741832.0	183036.2	364416.3	152828.3	414684.9	741.8	4.9	5
Department of Energy	57	29302.3	11501.5	3895.0	11663.0	11012.2	29.3	2.5	1 ←
Department of Interior	32	13088.0	4670.7	8053.3	4664.2	8066.1	13.1	2.8	3
Department of Transportation	32	13632.0	4136.1	6422.9	5228.4	2129.6	13.6	2.6	2
General Services Admin.	2	167.0							
National Aero. & Space Admin.	0	3320.0	1655.3	869.7	1685.0	925.0			
Pennsylvania Ave. Devlp. Corp.	1	279.0	223.0	56.0	223.0	56.0			
Department of State	1	96.0	85.6	10.4	85.6	10.4			
Department of the Treasury	2	177.2			100.0	3.0			
Tennessee Valley Authority	15	11804.0	1586.0	9110.0	1976.0	9171.0	11.8	6.0	6
Veterans Administration	14	1639.0	644.0	641.0	643.8	641.2			
<b>Grand Total</b>	<b>444</b>	<b>842363.5</b>	<b>224076.9</b>	<b>400880.4</b>	<b>187170.8</b>	<b>462599.3</b>			

DOE Ranks #1 of 6 Agencies W/>\$10B Construction

#2 in Total Cost of Construction Underway

CE/IE = 2.5 Not Good?

Not Bad!

## SOME NUCLEAR POWER PLANT COST OVERRUNS

	<u>IE</u>	<u>CE</u>	<u>CE/IE</u>
Marble Hill, Indiana	\$ 1.4B	\$7.7B	5.5
Shoreham, Long Island, NY	261.0M	4.0B	15.3
Midland, Michican	350.0M	4.4B	12.6
Zimmer, Ohio	240.0M	3.0B	12.5
Seabrook, New Hampshire	973.0M	5.8B	6.0
			[10.4]
Alaska Pipeline	\$7B/\$.9B =		7.8

TABLE 6

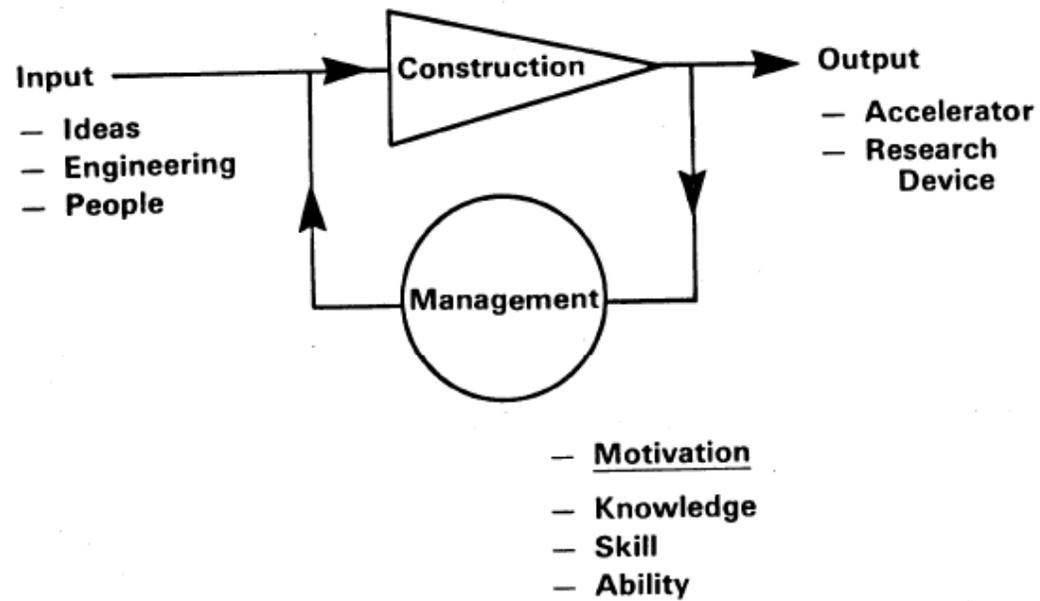
## SELECTED HISTORY OF PROJECT PERFORMANCE

	<u>CE/IE*</u>
Early HEP Projects	1.0
Recent "Worst Case" ER Projects	1.6
Recent DOE-wide Projects	2.5
New Senate Office Building	3.0
Recent DOD Projects	5.0
Alaska Pipeline	7.8
Recent "Worst Case" Nuclear Power Plants	10.4

\* CE/IE is the ratio of the current (or final) estimate to complete to the initial estimate. For government agencies the IE is taken to be initial formal request for funds from Congress.

FIGURE 1

## MANAGEMENT OF CONSTRUCTION PROJECTS



## ER PROJECT MANAGEMENT SYSTEM

- HOLD RESPECTIVE LABORATORY OR UNIVERSITY MANAGEMENT PRIMARILY RESPONSIBLE FOR MANAGING AND COMPLETING PROJECTS SUCCESSFULLY AND WITHIN THE PLANNED RESOURCES.
- KEY ELEMENTS OF THE "SYSTEM"
  - 1) ESTABLISH TECHNICAL, COST, AND SCHEDULE BASELINES,
  - 2) TRACK PERFORMANCE AGAINST THOSE BASELINES THROUGH MONTHLY REPORTS AND TWICE YEARLY TECHNICAL/COST/SCHEDULE/AND MANAGEMENT REVIEWS, AND
  - 3) UTILIZE THE "MANAGEMENT FEEDBACK LOOP" TO MODIFY THE CONSTRUCTION PROCESS SO THAT THE BASELINES CAN BE MET.
- EMPLOY CONCEPT OF CONTINGENCY, THAT IS PLANNING AN ADDITIONAL AMOUNT OF FUNDING RESOURCES BEYOND THE BASIC ESTIMATED COST TO ALLOW FOR:
  - ERRORS AND OMISSIONS IN THE BASIC ESTIMATE,
  - UNCERTAINTIES DUE TO DEVELOPMENTAL ASPECTS, AND
  - PROVIDE SOME FLEXIBILITY FOR ACCOMMODATING OTHER "UNKNOWN" AT THE TIME THE BASELINE ESTIMATE IS PREPARED
- UTILIZE DOE OPERATIONS OFFICE PERSONNEL TO CARRY OUT DAY-TO-DAY PROJECT MANAGEMENT OVERSIGHT.



# Lehman Reviews: Designated as a Best Practice

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- Performed prior to project critical decisions; semi-annually on large projects
- Relies on expert knowledge and experience of peers (world-class scientists, engineers and managers)
- Examines project cost, schedule, funding and management in detail
- Ensures project team is executing project according to agreed upon plans
- Informs senior management on status and readiness to proceed to next phase

# A Scientist's View

circa Summer 2008

New order(s) just adds more

**“crushing bureaucracy,  
incompetence, apathy and  
management bloat!!”**