NIF Project Management System Description

August 1997

NIF
The National Ignition Facility

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Introduction

This document has been prepared for two purposes:

1. To demonstrate compliance with the project management requirements of DOE Order 430.1, Life-Cycle Asset Management (LCAM).
2. To summarize in one place the approved Project documents which, taken as a whole, describe the NIF Project Management System.

DOE Order 430.1 identifies 14 requirements of a project management system for line-item projects.¹ Table 1 lists these requirements and also relates them to elements of the NIF Project Management System. Figure 1 shows the organization of the System into five logical groupings, with arbitrary sequence numbers for ease of reference. Table 2 lists the System elements in order of these sequence numbers. Each section in the remainder of this document is numbered in parallel with the sequence number of the element it describes.

While complying with the requirements of the Order, the NIF Project Management System contains some elements that do not correspond directly to those requirements (marked "other" in Figure 1). These elements have been developed by the Project either in response to other requirements or to extend management control beyond that called for in Order 403.1.

Table 1. Correspondence between Order 430.1 requirements and elements of the NIF Project Management System.

Order 430.1 requirement ¹	NIF Project Management System element	Defining reference(s)
Prior to the commencement of conceptual design [paragraph (a)]:		
1 - Mission need	1.2 - Project charter	2-7
2 - Functional requirements	1.2 - Project charter	8-10
3 - Cost and schedule	3.3 - Cost account process	30-32
	3.4 - Scheduling	33-35
4 - Environmental strategy	5.1 - ES&H planning	46-54
5 - Project technical and organizational interfaces	1.3 - MOA, interface definition	11, 12
	1.5 - Technology development	14, 15
6 - Integration with other project activities	1.4 - Commitment control and tracking	13
	3.4 - Scheduling	33-35
Prior to the commencement of execution [paragraph (b)]:		
1 - Project objectives	2.4 - Design review and approval	24-26
	3.4 - Scheduling	33-35
	4.2 - Procurement planning	38-40
2 - Scope, schedule and cost baselines	2.1 - Baseline definition and approval	16-21
	3.1 - Budgetary process	28, 29
	3.2 - Funds allocation	17
3 - Life-cycle cost analysis	3.1 - Budgetary process	28, 29
	3.3 - Cost account process	30-32
4 - Preliminary safety assessment	5.1 - ES&H planning	46-54
5 - Project controls, including baseline change control, change control thresholds, and statusing	2.1 - Baseline definition and approval	16-21
	2.2 - Change control	17, 22
	2.4 - Design review and approval	24-26
	3.3 - Cost account process	30-32
	3.6 - Reporting	16
	3.5 - Contingency control	17, 22, 36
6 - Completion of NEPA documentation	5.1 - ES&H planning	46-54
7 - Verification of performance criteria	1.5 - Technology development	14, 15
	2.5 - Completion criteria	27
	5.3 - Quality Assurance Plan	24, 25, 56-58
8 - Design alternatives	1.5 - Technology development	14, 15

(a) = Element required prior to the commencement of conceptual design
[Order 430.1, Paragraph 6e(7)(a)]

(b) = Element required prior to the commencement of execution [Order 430.1, Paragraph 6e(7)(b)]

(other) = Element either developed by the Project to extend controls beyond the minimum requirements of 430.1 or developed to comply with other requirements.

Figure 1. Organization of the NIF Project Management System. Sequence numbers are arbitrary but reflect logical groupings.

Table 2. NIF Project Management System elements. Each system element is described in the paragraphs following this table.

NIF Project Management System element #	Title
1.0	Roles, responsibilities, and interface definition
1.1	Project Management description
1.2	Project charter
1.3	MOA, interface definition
1.4	Commitment control and tracking
1.5	Technology development
2.0	Baseline definition and change control
2.1	Baseline definition and approval
2.2	Change control
2.3	Configuration management
2.3.1	PDM/MPL
2.4	Design review and approval
2.5	Completion criteria
3.0	Funds allocation, scheduling, control, and reporting
3.1	Budgetary process
3.2	Funds allocation
3.3	Cost account process
3.4	Scheduling
3.5	Contingency control
3.6	Reporting
4.0	Procurement
4.1	Requirements
4.2	Procurement planning
4.3	Supplier qualification
4.4	Acceptance
5.0	Assurances
5.1	ES&H plan
5.2	Security plan
5.3	Quality Assurance plan
5.3.1	Process control
5.3.2	Sub-tier QA plans

1.0 Roles, Responsibilities, and Interface Definition

1.1 Project Management System Description

The NIF Project Management System is described in summary form by this document. This document briefly touches on each element and provides references to other Project documents that describe the activity in detail.

1.2 Project Charter

The Project Charter was established by the Justification of Mission Need,² which accompanied CD 1 (formerly KD 0), Approve Mission Need, and was reinforced by approval of CD 2 (formerly KD 1), Approve New Start.³ A definition of work scope has been developed for each phase of the Project. The NIF Project Charter for the NIF Conceptual Design⁴ described scope of the conceptual design activities. This was supplemented by the Conceptual Design Scope and Plan.⁵ Subsequent phases of the Project were described in the Title I Design Plan⁶ and the Title II Design Plan.⁷

Regulatory requirements and means for their implementation are delineated in the Functional Requirements/Primary Criteria.⁸ The process used to develop and revise these requirements is described in NIF Procedure 6.5.⁹ This process adheres to the necessary and sufficient criteria of DOE M 450.3-1.¹⁰

1.3 Memorandum of Agreement, Interface Description

The roles of institutional participants in the Project were described in early management documents. The Memorandum of Agreement Between Participating Laboratories¹¹ established the primary design responsibilities for the four DOE Laboratories involved in the NIF. These participants are LANL, LLNL, SNL, and UR/LLE. The relationships between ONIF and OICF at DOE/HQ were subsequently established.¹²

1.4 Project Commitment Tracking

These activities are described by NIF Procedure 1.8, Project Action Tracking.¹³ Each senior manager is responsible for managing commitments in his or her area of responsibility according to this guidance.

1.5 Technology Development

Activities conducted within technology development provide for verification of performance criteria and the test and evaluation of design alternatives (e.g., Beamlet Test Program). The integration and control of NIF supporting technology are managed in the NIF Special Equipment organization.¹⁴ Strategy and rationale for technology development are described in the Core Science & Technology Plan.¹⁵

2.0 Baseline Definition and Change Control

2.1 Baseline Definition and Approval

There are three baselines (cost, schedule, and technical) managed by the Project. Baseline definition and approval are outlined in the NIF Project Execution Plan¹⁶ and are described in further detail in NIF Procedure 1.7, Project Change Control.¹⁷ Procedure 1.7 describes the change control thresholds for each baseline. These thresholds define the jurisdiction of the Baseline Change Control Boards (BCCBs).

The technical baseline is derived from the top-level criteria that flow down from the Justification of Mission Need.² The Project Manager relies upon advice of the ICF Program scientific staff for technical baseline definition, according to NIF Procedure 9.1.¹⁸ A series of documents extends the technical baseline to design criteria in increasing detail. These documents are:

- System Design Requirements¹⁹ (SDRs).
- Subsystem Design Requirements²⁰ (SSDRs).
- Interface Control Documents²¹ (ICDs).

These documents are prepared for each engineering and support system of the NIF Project (WBS 1.2 to 1.10).

2.2 Change Control

Change control within the established baselines is described in NIF Procedure 6.4, Engineering Change Requests.²² The Configuration Control Board (CCB) is established by this procedure. This Board reviews and approves Engineering Change Requests (ECRs) within its jurisdiction. If the impact of a change exceeds a Project baseline (cost, schedule, or technical), a baseline change proposal (BCP) is prepared according to Procedure 1.7.¹⁷

2.3 Configuration Management

The NIF Configuration Management Plan²³ describes configuration management of technical design documents. The Plan is implemented by NIF Procedure 6.4.²²

2.3.1 The Project Data Management System

The Project Data Management System (PDM) is a software product described in Procedure 6.4.²² The protocol of this software is used as a tool by System Engineers and Project Management to manage the revision process for technical design documentation (criteria, drawings, calculations, and specifications).

2.4 Design Review and Approval

Design review and approval are governed by NIF Project Procedure 5.1.²⁴ During Title I, design review and approval dealt primarily with criteria development. Title II emphasizes design compliance with those established criteria. Management assessment²⁵ and audit²⁶ processes are selectively used to verify compliance.

2.5 Completion Criteria

Completion of the Project has been defined in accordance with direction from the Level 1 BCCB, "in a cost effective manner that integrates the Project with the ICF Program."²⁷

3.0 Funds Allocation, Control, and Reporting

3.1 Budgetary Process

The budgetary process is driven by the DOE Congressional budget submission process. The bottom-up cost estimates made during the Conceptual Design, and subsequently updated during Title I Design, are the basis for the NIF Project Data Sheet.²⁸ NIF Procedure 1.2, Cost Estimating,²⁹ describes the bottom-up cost estimate process.

3.2 Funds Allocation

Funds allocation is governed by the DOE and the Laboratory Project Office. The BCCBs establish the initial allocation and approve changes. The thresholds that define

the jurisdiction of these Boards are described in Project Procedure 1.7, Project Change Control.¹⁷

3.3 Cost Account Plans

Cost Account Plans (CAPs), defined according to the Project Work Breakdown Structure³⁰ (WBS), are prepared for system engineering and support areas within the Project. Project Procedure 1.9, Generation of Cost Account Plans,³¹ describes the process. Milestones within the CAPs are the basis for performance tracking. Direction from the Project Office³² provides guidance to CAP managers for status reporting.

3.4 Scheduling

The top-level Project schedule is tied to the Critical (formerly Key) Decision process. The schedule of Critical (formerly Key) Decisions for the NIF Project was first documented in the NIF Conceptual Design Report.³³ These milestones are managed in the Integrated Project schedule.³⁴

- CD 1 (formerly KD 0)—Approve mission need 1/15/93.
- CD 2 (formerly KD 1)—Approve new start 10/20/94.
- KD 1' (Dellums process)—NIF studies complete 12/20/95.
- CD 3—Approve construction start 3/7/97.
- CD 4—Project complete 10/1/03.

The Integrated Project Schedule is the basis for all lower-tier schedules and is prepared and maintained according to the process described in Procedure 1.3, Schedule Preparation.³⁵ Approved and controlled milestones identified in the CAPs provide detail for the current fiscal year.

3.5 Contingency Control

Contingency was calculated in a bottom-up fashion during Conceptual Design and updated during Title I Design as part of the cost estimating activities.³⁶ Contingency controls are implemented through functioning of the BCCBs. The Level 1, 2, 3 BCCBs¹⁷ and, to a limited extent, CCB 4²² have the authority to allocate contingency.

3.6 Reporting

Reporting is the responsibility of the Laboratory Project Office. The requirements for monthly and quarterly reports are described in Section 4.6.2, Project Execution Plan.¹⁶

4.0 Procurement

4.1 Requirements

Procurements for the NIF Project will follow the Laboratory's DOE-approved procurement system. This system consists of the "Laboratory Commercial Procurement Procedures" and, as applicable, the University's Laboratory Standard Practices Manual as supplemented by LLNL's local implementation (Supplemental Instructions). These topics are summarized in NIF Procedure 7.2, Standard Procurement Policies and Practices.³⁷

4.2 Procurement Planning

Procurement planning follows the CAPs and the Integrated Project schedule. The NIF Acquisition Plan³⁸ describes the strategy for selection of contract type. The NIF Procurement Plan³⁹ lists the scheduled procurements and their estimated dollar value. NIF Procedure 7.4, Special Equipment Procurement Process,⁴⁰ describes the process that technical requesters must follow to develop and issue procurement documents.

4.3 Supplier Qualification

Qualification of NIF special equipment and optics suppliers is described in NIF Procedure 7.1, Supplier Qualification.⁴¹ The preselection process for construction subcontractors is described elsewhere.⁴² Vendor surveillance is described in NIF Procedure 7.3.⁴³

4.4 Acceptance

Acceptance requirements (e.g., inspection and testing) will be defined in specifications written by the technical requesters. The content and organization of specifications are described in NIF Procedure 8.2, Standard Specification Content.⁴⁴ A program that institutes receiving inspections to ensure that suspect/counterfeit items are not incorporated into Project work is described by NIF Procedure 8.1.⁴⁵

5.0 Assurances

5.1 ES&H Planning

The NIF ES&H Management Plan⁴⁶ describes the overall approach to environment, safety, and health (ES&H) management by the NIF Project. Individual activities are

addressed in sub-tier documents, such as the ALARA Program description,⁴⁷ PHA,⁴⁸ PSAR,⁴⁹ Construction Safety Program,⁵⁰ Environmental Permits, NIF Risk Management Plan,⁵¹ Decommissioning Plan,⁵² and Mitigation Action Plan.⁵³

ES&H responsibilities for the NIF Project are implemented by line management beginning with the Project Manager. Responsibilities are specified in the Project Execution Plan¹⁶ and expanded in NIF Management Descriptions,⁵⁴ the ES&H Management Plan,⁴⁶ and the Construction Safety Program.⁵⁰

5.2 Security Planning

Security planning is managed by the Laser Programs Assurance Office. The NIF Security Procedure (draft) describes security requirements and design features specific to the NIF.

5.3 Quality Assurance Plan

Quality Assurance for the NIF is managed according to the NIF Quality Assurance Program Plan.⁵⁵ This Plan complies with the requirements of DOE Order 5700.6C. A graded approach is implemented by NIF Procedure 1.6,⁵⁶ which identifies the logical process by which Q-levels are assigned to Project elements based upon consequences in the event of failure. Management assessments are described in NIF Procedures 9.2²⁴ and 10.1.²⁵

5.3.1 Process Control

Project process control is achieved by documented procedures contained in the NIF Project Control Manual.⁵⁷ This manual is kept current by means of controlled distribution. Holders of the Manual are registered, automatically receive updates, and are required to keep the Manual current. Furthermore, the Manual must be relinquished upon leaving the Project. The manual currently contains approximately 30 procedures, some of which are cited in this Project Management System Description.

5.3.2 Sub-tier Quality Assurance Plans

Sub-tier Quality Assurance Plans are required of major subcontractors. In addition, organizations within the NIF Project may write their own. Currently, five sub-tier Plans have been written by the following:

- Parsons Infrastructure and Technology Group (LTAB A/E firm).
- A. C. Martin & Associates (OAB A/E firm).
- NIF Integrated Computer Controls organization (WBS 1.5), Software QA Plan.⁵⁸
- Laser Materials and Optics Technology organization (WBS 1.6), QA Plan for Laser Materials and Optics Technology.⁵⁹
- Sverdrup Facilities, Inc. (Conventional Facilities Construction Management firm).

5.3.3 Training

The training to ensure competency commensurate with responsibility is documented in the NIF Project Training file. In the file, each Laboratory employee and outside subcontractor has a professional resume and job-specific training record. Maintenance of training records is described in two Project procedures.⁶⁰

References

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2. Justification of Mission Need, (1/93) see NIF Conceptual Design Report Appendix A, Vol. 1, bk. 1, UCRL-PROP-117093.
3. CD 2 letter (formerly KD 1), Approve New Start (10/21/94).
4. Project Charter for NIF Conceptual Design (3/93).
5. Conceptual Design Scope and Plan (NIF-93-043, 9/93), also App.A Vol 1 Bk 3 of reference #32.
6. NIF Title I Design Plan, NIF-96-650.
7. NIF Title II Design Plan, NIF-0001249 (3/97).
8. NIF Functional Requirements and Primary Criteria, Rev 1.6, NIF-0001006-OC (3/97).
9. NIF Procedure 6.5, Preparation of Primary Criteria/Functional Requirements, NIF-0001459.
10. DOE M 450.3-1, The DOE Closure Process for Necessary and Sufficient Sets of Standards (3/1/96).
11. Memorandum of Agreement between LLNL, LANL, SNL, and LLE with respect to NIF activities, NIF-93-018 (8/10/93).
12. Memorandum of Understanding Regarding Relationship between the Office of the National Ignition Facility and the Office of Research and Inertial Fusion (3/27/95).
13. NIF Procedure 1.8, Project Action Tracking, NIF-95-666.
14. NIF Project memorandum, Restructuring of the NIF Special Equipment Organization, NIF-0001562.
15. Core Science and Technology Development Plan for Indirect-Drive ICF Ignition, UCRL-ID-117076, Rev 1 (12/95).
16. NIF Project Execution Plan, CD-079 (4/96).
17. NIF Project Procedure 1.7, Project Change Control, NIF-95-667.
18. NIF Procedure 9.1, Project Scientist's Advisory Panel, NIF-95-462.
19. NIF Procedure 6.1, Preparation of System Design Requirements, NIF-93-251.
20. NIF Procedure 6.2, Preparation of Subsystem Design Requirements, NIF-93-252.
21. NIF Procedure 6.3, Preparation of Interface Control Documents, NIF-95-662.
22. NIF Project Procedure 6.4, Engineering Change Requests, NIF-0000280.
23. NIF Configuration Management Plan, NIF-96-070).
24. NIF Procedure 5.1, Title II Design Review, NIF-0002174.
25. NIF Procedure 9.2, Management Assessments, NIF-000967.
26. NIF Procedure 10.1, Independent Assessments, NIF-000281.
27. NIF Project memorandum; J. Paisner, NIF Project Completion Criteria, NIF-0001587 (2/27/97).
28. See Appendix F of the PEP, Ref. #16.
29. NIF Procedure 1.2, Cost Estimating, NIF-0001205.
30. NIF Work Breakdown Structure Rev. 17, NIF-5000220 (4/22/97).
31. NIF Procedure 1.9, Generation of Cost Account Plans (CAPs), in process.

32. NIF Project memorandum, J. A. Paisner, Monthly CAP Status and Reporting Reporting - Overall Progress, Accomplishments, and Cost Account Plan (CAP) Status, NIF-0002236.
33. NIF Conceptual Design Report, UCRL-PROP-117093, Chapter 8 Integrated Project Schedule, specifically *Table 8-1 Major NIF Project schedule milestones* and *Figure 8-1 NIF Summary Schedule*.
34. NIF Project memorandum, S. Kumpan, NIF Quarterly Report (3/97) Attachment 1, NIF-0002038.
35. NIF Project Procedure 1.3, Schedule Preparation, NIF-000320.
36. NIF Project memorandum, W. Williams, Title I Contingency Estimate, NIF-000538 (8/27/96).
37. NIF Procedure 7.2, Standard Procurement Policies and Practices, NIF-0001169.
38. NIF Acquisition Plan, NIF-96-251.
39. NIF Procurement Plan, NIF-0001028.
40. NIF Procedure 7.4, Special Equipment Procurement Process, in preparation.
41. NIF Procedure 7.1, Supplier Qualification, NIF-0001014.
42. NIF Project memorandum, V. Davis, NIF Construction Subcontractor Process (8/96).
43. NIF Procedure 7.3, Vendor Surveillance, NIF-96-398.
44. NIF Procedure 8.2, Standard Specification Content, NIF-0002052.
45. NIF Procedure 8.1, Suspect/Counterfeit Items Detection and Prevention, NIF-0001458.
46. NIF ES&H Management Plan, NIF-95-599.
47. described in ref. #46, Section 2.1.
48. Preliminary Hazards Analysis for the National Ignition Facility (PHA) 12/93, UCRL-ID-116983 (also contained in ref. #32, Appendix A vol 2 bk 4).
49. NIF Preliminary Safety Analysis Report (PSAR), UCRL-ID-123759 (9/30/96).
50. Construction Safety Program for the NIF, UCRL-ID-125990 (1/14/97).
51. NIF Risk Management Plan, NIF-0001564.
52. NIF Decommissioning Plan, NIF-0001670.
53. Mitigation Action Plan for NIF, NIF-0001726.
54. NIF Management Descriptions, NIF-0002996.
55. NIF Quality Assurance Program Plan, NIF-000618.
56. NIF Procedure 1.6, Assignment of Quality Assurance Levels, NIF-000320.
57. NIF Project Control Manual Rev 5, NIF-0001554 (2/13/97).
58. Software QA Plan for the NIF Integrated Computer Control System, NIF-000288.
59. NIF QA Plan for Laser Materials and Optical Technology, NIF-96-276.
60. NIF Procedure 2.1, Personnel Qualification Approval and Records Retention, NIF-94-016, and NIF Procedure 2.2, Personnel Orientation and Training, NIF-96-012.