

Approved: 02-15-08

PROGRAM REQUIREMENTS DOCUMENT (PRD) FOR CONSTRUCTION PROJECTS



NATIONAL NUCLEAR SECURITY ADMINISTRATION
Office of Infrastructure and Environment

PROGRAM REQUIREMENTS DOCUMENT (PRD) FOR CONSTRUCTION PROJECTS

1. **PURPOSE.** To establish a National Nuclear Security Administration (NNSA) policy for developing and maintaining a Program Requirements Document (PRD) on construction programs/projects being executed by the NNSA.
2. **CANCELLATIONS.** None.
3. **APPLICABILITY.**
 - a. This policy pertains to all projects (except General Plant Projects and Capital Equipment Projects) constructed for NNSA or managed by NNSA personnel on behalf of other government agencies with an estimated Total Project Cost (TPC) great than or equal to \$20 million. These projects include: Line Item (Capital) projects, Operation Expense funded (Op-Ex) projects, and Work For Others (WFO) projects. Secretarial Officers or their designated Acquisition Executive may invoke this policy for projects with a TPC less than or equal to \$20 million.
 - b. The Naval Nuclear Propulsion Program and its contractors, are excluded from this policy, where it is inconsistent with the authority of the Director, Naval Nuclear Propulsion Program, pursuant to Executive Order 12344, as set forth in Public Law (P.L.) 98-525, the Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1985, and P.L. 106-65, the National Nuclear Security Administration Act.
4. **BACKGROUND.** This PRD policy establishes the mission and program level requirements that apply to the development and execution of the program/project. It translates the “need” in the Mission Need Statement (MNS) into initial top-level requirements addressing such concerns as performance, supportability, physical and functional integration, human integration, security, test and evaluation, implementation and transition, quality assurance and configuration management. Experience has shown that a formal process resulting in an agreed-upon definition of requirements for new systems, new capabilities, updates, or enhancements to systems is a prerequisite to proceeding to system/capability design and also that failure to do this, results in rework and unnecessary costs and delays in schedule. The intent of this PRD policy is to establish a framework for the development of PRDs for programs/projects which define the requirements associated with project scope, assumptions and constraints in more detail than the MNS.
5. **POLICY.**
 - a. This policy will be applied in conjunction with and will not supersede any requirements established in accordance with DOE Order 413.3A.
 - b. The development and maintenance of the PRD is the responsibility of the Program Office Program Manager.

- c. The initial approved PRD shall contain as many requirements as can be determined at the CD-0 stage of the project and they shall be in as much detail as possible. For illustrative purposes, Attachment 2 of this BOP provides an example of an existing PRD at the CD-1/CD-2 stage of a project.
- d. The initial approved version of the PRD must be completed as part of the CD-0 documentation package and must be placed under configuration management at that point.

6. REQUIREMENTS.

- a. The PRD shall contain both mission and program requirements.
- b. The PRD shall establish the basic framework for the acquisition strategy.
- c. The PRD shall provide the bridge between the MNS and the more detailed System Design Description and General Design Criteria.
- d. The Program Office shall implement the Mission Need Statement by framing the mission need in expository language in the PRD.
- e. The PRD for a given project will be written utilizing the guidance provided in Attachment 1. (A sample PRD for the CMRR project is provided as Attachment 2).
- f. The PRD represents a formal agreement between the program and the project. Therefore, it shall be signed by the Acquisition Executive, Program Manager and Federal Project Director (when designated), at a minimum.

7. RESPONSIBILITIES. NA-50 is assigned the responsibility to serve as the NNSA cognizant organization for providing policy and guidance in the area of Program Requirements for construction projects. The Program Manager provides oversight of the project to ensure goals and objectives are met, and progress is maintained. The Federal Project Director (when designated), is responsible to the Acquisition Executive, through his site management chain for the successful execution of all NNSA construction projects as addressed in DOE Order 413.3A.

8. DEFINITIONS.

- a. **Acquisition Executive** – the individual designated by the Secretary of Energy to integrate and unify the management system for a program portfolio of projects, and

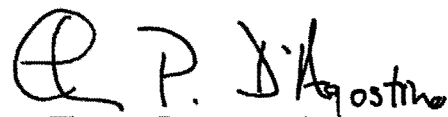
implement prescribed policies and practices. He/she is the approving authority for a project's Critical Decisions, per DOE O 413.3A.

- b. **Critical Decision** – a formal determination made by the Secretarial Acquisition Executive/Acquisition Executive at a specific point in a project's life cycle that allows the project to proceed to the next phase or Critical Decision.
- c. **Program Manager** – The individual designated by the Program Secretarial Office (PSO) and approved by the Acquisition Executive responsible for the oversight of project execution.
- d. **Federal Project Director** – The individual (usually on the site where the project is being executed) who is responsible to the AE/PSO, through his site management chain for the execution of the project.

9. REFERENCES.

- a. DOE Order 413.3A, Program and Project Management for the Acquisition of Capital Assets, 7-28-2006.
- b. Systems Engineering Fundamentals 2001, Defense Acquisition University, Part 2 – Chapter 4, Requirements Analysis.

10. CONTACT. Point of Contact for Administration of this Policy Letter is the Associate Administrator for Infrastructure and Environment (NA-50), 202-586-7349.


Thomas P. D'Agostino
Administrator

ATTACHMENT 1. RECOMMENDED PRD FORMAT AND CONTENT GUIDE.
ATTACHMENT 2. PROGRAM REQUIREMENTS DOCUMENT.

Recommended PRD Format and Content Guide

Title Page

Identifies the specific project(s), date, revision number, classification and the origin of the document.

Concurrence/Approval Page

Provides signature and dating space for the federal officials including (at a minimum) the Acquisition Executive (if not above NA-1), Program Sponsor (e.g., designated PSO Office), the Program Manager, the Site Manager, and the Federal Project Director. If desired by the Program Office, an additional concurrence page depicting concurrences from contractor officials and from non-NNSA offices may also be included.

Configuration Control Log

Provides a short discussion of approved changes made to the PRD. Lists references to applicable documentation that provide justification for the changes.

Table of Contents

Lists the contents of the PRD and the location of major topics.

Main Body of the PRD:

1. Introduction and Purpose

Provides a discussion of the purpose of the PRD. Explains that the Federal Program Manager has lead responsibility to develop and maintain the PRD as a controlled document and ensure that the proposed project solutions will meet the documented program requirements. The intent of the PRD is to provide a mechanism to document more detail than the MNS that can be used to define the program/project requirements for the project scope, assumptions and constraints.

2. Background (Optional)

Provides any relevant background of the program or project that may improve the reader's understanding of the document.

3. Relationship to Mission Need

The MNS should be referenced and a short synopsis of the MNS should be provided. This discussion should include a brief summary describing how the project, as implemented pursuant to the PRD, will meet the need identified in the MNS.

4. Mission Requirements Development

Provide a summary discussion of how the requirements were identified or derived. Explanations of processes, documentation, direction or guidance that govern the derivation or development of the requirements should be included. Incorporating information by reference is an acceptable method for providing the development history, where available. The basis for the requirements, where not obvious, should be traceable to decisions or source documentation. If desired, details relating to the traceability of requirements may be included in an attachment to the PRD.

5. Program Assumptions, Constraints & Key Interfaces

Documents the critical assumptions, constraints, and interfaces that are germane to the project. If the project is dependent on, or provides input to, other programs or decisions, the dependencies should be stated and their relevance and impact explained. Incorporation of information by reference is acceptable.

Assumptions:

An assumption is a presumed outcome, value or condition whose actual outcome value or condition cannot be known or controlled by the project. The assumptions need not include assumptions that are generic inherencies, such as “Congress will provide adequate funding,” or “The project will conform to applicable rules and regulations” because these assumptions prevail whether specified or not. Typical valid assumptions include expected outcomes of uncertain future events that will impact upon the project, such as “The preferred alternative in the Draft EIS is selected by the Secretary,” or “The research and development activities for the project will resolve the technical uncertainties for the project’s specialty equipment by FY XX.”

Constraints:

A constraint is an external demand or proscription that limits degrees of freedom to the project on how it might choose to execute the project. As above, generic inherencies need not be stated. Constraints might be physical (e.g., “The project must not generate more than X liters of low level waste per year.”) or administrative (e.g., “The project shall be limited to deploying proven technologies.”)

Key Interfaces:

The interfaces of the project to other projects and to programs that could impact upon execution of the project should be identified.

6. Requirements

A. General

- Requirements must be clear, stand-alone statements that are clearly differentiated as requirements.
- A requirement must be articulated with sufficient specificity that one can make a clear determination whether the requirement is satisfied or not.
- There must be at least one requirement, but there is no maximum number. A few requirements would typically be all that would be required to specify the set of mission requirements.
- Requirements are designated by verbs that compel an action, such as “must,” “shall” or “will₍₁₎.”
- Where useful for understanding or necessary to provide traceability for a requirement, context or background may be provided to clarify the requirement or why it exists.
- When generating a PRD, the Program Manager should review PRDs for other projects for commonality and take advantage of lessons learned from other projects. In particular, many program requirements tend to be of a conformance basis and would thus tend to apply to multiple projects. Where applicable, use of commonly accepted requirements is encouraged.

B. Mission Requirements

- The mission requirements shall be the first section of the requirements and segregated from program requirements.
- Collectively, the mission requirements should be a comprehensive set of WHAT the project must provide to satisfy the mission need.
- Mission requirements must include the foundational requirements, which would include answers to the following kinds of questions, as examples:

¹ The word “will” can be used in common language to mean different things. In the one case, the term can mean the result of an *expected* future action and in the other a *demand* for a future action. It is the latter usage that applies here. Where ambiguity might result about using the word “will,” use “shall” whose meaning is unambiguous.

- What functions and capabilities must the project provide?
- What size or capacity is required?
- What schedule demands must the project satisfy?
- What interfaces must the project satisfy?
- Are there any budget limitations?
- Are any requirements unique to this type project?

Examples of valid mission requirements:

* The HEUMF will provide storage for a minimum of 28,000 containers and a capability for the quantity of HEU identified in Reference X.

* When fully operational, CMRR shall integrate with PF-4 such that the pair of facilities, along with the supporting infrastructure at or near TA-55, will operate as a system to meet nuclear mission assigned to LANL.

* The CEF project shall provide the capability to x-ray various size weapons, including the largest dimensional weapons in the inventory with resolutions sufficient to verify established weapons certification requirements.

* The RLWTF shall provide the capabilities to process radioactive liquid waste from the Stockpile Stewardship, Manufacturing, and Related Programs.

Examples of requirements that are *not* mission requirements:

*The project shall conform to DOE Order 413.3. (Whereas this is a valid requirement, it is not a mission requirement. The requirement informs how one executes the project, not what need the project serves.)

*A new building should be provided for the project. (The mission requirements should specify functions, not architecture. An exception to this would be where there is an established mandate that a particular architecture is required, such as might result from a NEPA decision. In such a case, including such as a mission requirement would be valid.)

*Safety is the number one priority for the project. (Whereas this demand may be valid for the project, it is an expression HOW the project should be executed, not what it does.)

*Project systems and equipment should be functionally independent to enhance system reliability. (This is a design criterion, not a mission requirement.)

In some cases, judgment must be exercised to determine whether a requirement is a mission

requirement or not. For example, consider the case in which a project is expected to provide its capability for fifty years. If one expresses this as a mission performance requirement (“The project will provide its services for fifty years to meet the enduring requirements of the Nuclear Weapons Complex.”), this would be a valid mission requirement. However, one might express the same intent but use different prose (“The facility shall be designed for a fifty year design life.”) In this rewrite, the mission requirement is supplanted by a design criterion, which is not a mission requirement. The Program Manager has the responsibility to make the judgments about what constitute mission requirements and write them accordingly.

C. Program Requirements

Program Requirements may span a variety of topics and would be project-specific. The Program Manager should structure them to be logically organized by topic (e.g., safety, performance, management, environment, or security). The kinds of requirements that might be included in the program requirements section(s) are discussed below. Many program requirements are generic, boilerplate requirements that stem from conformance to existing DOE Orders, policies, and practices and as such they tend to apply to multiple projects.

1. Technical Requirements and Design Criteria

The PSO, as the sponsoring agent, may choose to impose more specific or more detailed design criteria or technical requirements for the project than would apply if nothing were specifically identified (2). The additional requirements and criteria that the Program Office might include in its PRD could relate to the following:

- Operational and Functional Requirements. Define operational and functional requirements the new capability must provide to satisfy mission need.
- Physical Integration. Define requirements associated with integrating the products of the acquisition program into the physical environment (e.g., real estate, space, environment, energy conservation, heating, ventilation, air conditioning, grounding, bonding, shielding lightning protection, cables, hazardous materials, power systems and commercial power, telecommunications, special Functional Integration).
- Define functional integration requirements associated with integrating the new capability into the operational environment.
- Human Integration. Define human-product integration requirements to achieve optimum performance from a total project perspective. Define requirements related to employee health and safety. Define requirements associated with special skills and capabilities for operators, maintainers, or support personnel.
- Safety and Health. Define high-level safety requirements, which meet the safety goals determined by the hazard identification process. Include requirements, which may not relate to specific hazards such as those from standards, laws, regulations, and lessons learned from similar systems.

- Security. Define requirements relevant to physical security, contractor-unique security, all information and information systems security, and personnel security.
- Integrated Logistics Support. Define supportability requirements for the following as appropriate: staffing, supply support, support equipment, technical data, training and training support.
- Test and Evaluation. Define test and evaluation requirements including mandatory evaluations of safety, environmental, and energy conservation issues prior to joint acceptance and inspection. Specify whether independent operational test and evaluation is required.

Hypothetical examples of technical and design criteria that the PSO might choose to impose are:

- “The performance margin shall be 10% greater than required by DOE Order 420.1A for decay heat removal.”
- “The information systems selected by the prime contractor must be compatible with Government-furnished software.”
- “The floor space for the project shall not exceed 10,000 sq ft.”
- “A tunnel must be built between the two facilities.”
- “Plutonium must be containerized as required by DOE Standard 3013.”

2. Management Requirements:

The Program Office may choose to impose more explicit or more rigorous requirements on the project than might otherwise be implied by DOE 413.3A, the Federal Acquisition Regulations FAR, The Life Cycle Asset Management Order or other Orders and directions that apply to DOE projects generally. Typical Types of management requirements are:

- Quality Assurance. Define quality assurance requirements for such functions as contractor status reporting, metrics, independent verification and validation, vendor quality, software development processes.
- Configuration Management. Define requirements for the configuration management of hardware, software, facilities, data, interfaces, tools, and documentation.
- Environmental. Define requirements to achieve compliance with the National Environmental Policy Act and other environmental regulations and standards.
- Energy Conservation. Define requirements to achieve compliance with energy and water conservation mandates of the National Energy Conservation Policy Act.
- Hazardous Materials. Define requirements for the handling, eventual removal, cleanup, and recycling of hazardous materials.

Management requirements that the Program Office might choose to impose might include the following kinds of hypothetical examples:

- “All subcontractors shall report to a common Work Breakdown Structure that is approved by the Program Office.”
- “The management of project X shall be coordinated with projects Y that is being executed contemporaneously.”
- “The risk management plan shall be linked to the contingency allocation model and validated against actual experience.”
- “The Preliminary Documented Safety Analysis Document shall be completed three months in advance of completion of preliminary design.”
- “The project shall develop and maintain a codes and standards management plan that tracks the application and date of applicability for every referenced technical standard.”

3. Preferences, Principles, and Goals:

Beyond specific requirements, the PRD affords the PSO the opportunity to state its preferences, principles, and goals to frame how the project should be executed. A preference, principle, or goal differs from a requirement in that the demonstration of it may not be straightforward or binary, the demand is tempered (“should” vs. “shall”), or the statement is made as an approach versus an established endpoint. That some preferences may be less rigid than requirements does not imply that their importance is any less than requirements, as the last example below attests. Examples of preferences that might be included in a PRD:

- “The project should have a goal that it shall not displace more than Y cubic yards of excavated soil during construction.” (This statement tells of a preference but does not explicitly demand a particular outcome).
- “The system must meet its safety design performance requirement in any event, but the project should minimize the need for actuating safety systems to meet those performance requirements.” (The latter sentence specifies an approach to minimize, which is expressed as a preference).
- “Safety of the public shall be the first priority.” (This is a principle. It is not specifically a requirement since it is not specifically verifiable).

7. Summary or Requirements

A summary of the requirements should be provided, including the list of applicable deliverables or products that are demanded by the PRD.

8. References

Provides a list of references with document title, origin and date that can be readily associated to the specific citations in the main body of the PRD.

Appendix I. Mission Need Correlation Matrix. Develop a correlation matrix that maps where every need in the Mission Need Statement is addressed in the PRD. Use table format.

| | <i>Need Statement</i> | <i>RD Section or Sub-Section Number</i> | <i>Requirement Statement</i> |
|--|-----------------------|---|------------------------------|
|--|-----------------------|---|------------------------------|

Appendix II. Definitions. Define important non-standard terms used in the PRD.

Appendix III. Acronyms. Define all acronyms used in the PRD.

Appendix IV. Residual Technical Requirements (if any). Specify those final sponsor requirements that are not intended to be satisfied by the acquisition program approved at CD-1. Resolving these deferred requirements is the responsibility of the Project Sponsor.



**LOS ALAMOS NATIONAL LABORATORY
CHEMISTRY AND METALLURGY RESEARCH
FACILITY REPLACEMENT PROJECT**

**PROGRAM REQUIREMENTS DOCUMENT
CMRR-PRD-009**

REVISION 1.0

November 19, 2004

This is a final draft version of this document that is being used here as an example for illustrative purposes.

**CHEMISTRY AND METALLURGY RESEARCH FACILITY REPLACEMENT
PROJECT****PROGRAM REQUIREMENTS DOCUMENT****CHAPTER II.** Program Requirements Document Change Log

| DATE | REV | PURPOSE | PREPARED BY | APPROVED BY |
|-----------|-----|-------------------------------------|-------------|----------------------|
| 2/25/2002 | 0 | Initial Issue, Part of CD-0 Package | T. Nelson | D. Beck, NA-12 |
| 10/29/04 | 1 | Revision for CD-1 submittal | P. Rhoads | M. Shoenbauer, NA-12 |

**CHEMISTRY AND METALLURGY RESEARCH FACILITY REPLACEMENT
PROJECT**

PROGRAMS REQUIREMENTS DOCUMENT

Revision 1

Approved by:

| | |
|--|-------------|
| Dr. Everett Beckner | Date |
| Deputy Administrator for Defense Programs, NA-10 | |

Concurrence by:

| | |
|--|-------------|
| Martin Schoenbauer | Date |
| Assistant Administrator for Military Application and Stockpile Operations, NA-12 | |

| | |
|---|-------------|
| David Crandall | Date |
| Assistant Deputy Administrator for Research, Development, and Simulation, NA-11 | |

| | |
|--|-------------|
| Xavier Ascanio | Date |
| Director Office of Operations and Construction Management, NA-124 | |

| | |
|--|-------------|
| Joseph Gazda | Date |
| Acting Director Office of Nuclear Weapons Stockpile, NA-122 | |

| | |
|--|-------------|
| Patrick Rhoads | Date |
| CMRR Program Manager Office of Operations and Construction Management, NA-124 | |

Concurrence by:

Juan L. Griego, PMP
CMRR Federal Project Director
Los Alamos Site Office, DOE

Date

Submitted by:

Dr. Tim O. Nelson
CMR Replacement Project Director
Los Alamos National Laboratory

Date

Classification Review:

B. Melton
Authorized Derivative Classifier
CMRR Project

Date

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| | |
|-------|---|
| AB | Authorization Basis |
| AC/MC | Analytical Chemistry/Material Characterization |
| A/E | Architect / Engineer |
| AE | Acquisition Executive |
| AL | Albuquerque Service Center |
| AS | Acquisition Strategy |
| BOA | Basic Order Agreement |
| CD-0 | Critical Decision 0 (Approve Mission Need) |
| CD-1 | Critical Decision 1 (Approved Alternative Selection and Cost Range) |
| CD-2 | Critical Decision 2 (Performance Baseline) |
| CD-3 | Critical Decision 3 (Start Construction) |
| CDR | Conceptual Design Report |
| CFR | Code of Federal Regulations |
| CII | Construction Industry Institute |
| CM | Construction Management/Manager |
| CMO | Construction Management Organization |
| CMR | Chemistry and Metallurgy Research Facility |
| CMRR | Chemistry and Metallurgy Research Facility Replacement |
| CRB | Contract Review Board |
| D/B | Design/Build |
| DBA | Design Basis Accident |
| DNFSB | Defense Nuclear Facilities Safety Board |
| DOD | Department of Defense |
| DOE | Department of Energy |
| EAC | Estimate At Completion |
| ESAAB | Energy Systems Acquisition Advisory Board |
| ECF | Entrance Control Facility |
| EVMS | Earned Value Management System |
| F&OR | Functions and Operating Requirements |
| FAR | Federal Acquisition Regulation |
| FEMA | Failure Effects and Modes Analysis |
| FFF | Fuel Fabrication Facility |
| FOCI | Foreign Ownership, Control, or Influence |
| FYNSP | Future Years Nuclear Security Program |
| FIC | Facility Incident Command |
| FITS | Facilities Improvement Technical Support Building |
| G&A | General and Administrative |
| HUB | Historically Underutilized Business |
| INP | Integrated Nuclear Planning |

ACRONYMS AND ABBREVIATIONS

| | |
|---------|---|
| IPT | Integrated Project Team |
| ICPP | Integrated Construction Program Plan |
| LASO | Los Alamos Site Office |
| LAC | Los Alamos County |
| LANL | Los Alamos National Laboratory |
| LI | Line Item |
| LIG | Laboratory Implementation Guidelines |
| LIR | Laboratory Implementation Requirements |
| LLNL | Lawrence Livermore National Laboratory |
| M&O | Management and Operations |
| M | Million |
| ML | Management Level |
| MNS | Mission Needs Statement |
| MOX | Mixed Oxide |
| MPF | Modern Pit Facility |
| MSA | Major System Acquisition |
| NA-1 | National Nuclear Security Administration |
| NA-10 | Defense Programs |
| NA-12 | Military & Stockpile Operations |
| NA-54 | Office of Project Management and Systems Support |
| NEPA | National Environmental Policy Act |
| NF | Nuclear Facility |
| NISC | Nonproliferation and International Security Center |
| NMGRT | New Mexico Gross Receipt Tax |
| NMSSUP | Nuclear Materials Safeguards and Security Upgrades |
| NNSA | National Nuclear Security Administration |
| NSSB | National Security Sciences Building |
| OMB | Office of Management and Budget |
| OPC | Other Project Costs |
| OPS | Operations Center |
| ORR | Operational Readiness Review |
| PADNWP | Principal Associate Director for Nuclear Weapons Programs |
| PDSA | Preliminary Documented Safety Analysis |
| PDCS | Project Delivery and Contracting Strategy |
| PED | Preliminary Engineering and Design |
| PEIS | Programmatic Environmental Impact Statement |
| PF/PF-4 | Plutonium Facility Building 4 (LANL Security Cat I, Haz Cat 2 Facility) |
| PHA | Preliminary Hazard Analysis |

PIDAS Perimeter Intrusion Detection and Assessment System

ACRONYMS AND ABBREVIATIONS

| | |
|----------|--|
| PL | Public Law |
| PM | Project Management |
| PPEP | Preliminary Project Execution Plan |
| PRD | Program Requirements Document |
| PSO | Program Secretarial Officer |
| RFI | Request for Interest |
| RFP | Request for Proposal |
| RFQ | Request for Qualifications |
| RLUOB | Radiological Laboratory/Utility/Office Building |
| ROD | Record of Decision |
| ROM | Rough Order of Magnitude |
| RTG | Radioisotope Thermoelectric Generator |
| S-1 | Secretary of Energy |
| S-2 | Deputy Secretary of Energy |
| S&S | Safeguards and Security |
| SCC | Strategic Computing Complex |
| SFE | Special Facilities Equipment |
| SMARTS | Simple Multi-Attribute Rating Technique With Swing Weights |
| SNM | Special Nuclear Materials |
| SOW | Statement of Work |
| SSP | Stockpile Stewardship Program |
| SSC | Source Selection Committee |
| SUP | LANL's Supply Chain Management Division |
| SWEIS | Site-Wide Environmental Impact Statement |
| TA | Technical Area |
| TBD | To Be Determined |
| TEC | Total Estimated Cost |
| TEF | Tritium Extraction Facility |
| Title I | Preliminary Design |
| Title II | Final Design |
| TPC | Total Project Cost |
| TYCSP | Ten-Year Comprehensive Site Plan |
| UBC | Uniform Building Code |
| UC | University of California |
| WBS | Work Breakdown Structure |
| WR | War Reserves |

CHEMISTRY AND METALLURGY RESEARCH FACILITY REPLACEMENT PROJECT

PROGRAM REQUIREMENTS DOCUMENT**I. Introduction and Purpose**

The Program Requirements Document (PRD) for DOE's National Nuclear Security Administration (NNSA) Chemistry and Metallurgy Research Facility Replacement (CMRR) Project at Los Alamos National Laboratory (LANL) addresses the tiered, programmatic requirements for the CMRR. The document builds upon and operationalizes the high-level requirements of the CMRR Mission Need Statement (MNS). This PRD identifies the National Nuclear Security Administration (NNSA) missions and programs that the CMRR will serve. The technical, managerial, and programmatic requirements in this PRD define the expectations for the CMRR Project at the Headquarters Level. The Federal Program Manager has lead responsibility to develop and maintain this PRD under change control and ensures that the proposed project capabilities meet the documented program requirements. The prime contractor (LANL) shall comply with the provisions in this document, and it shall maintain a strict accounting of how the requirements in this document are satisfied. LANL is responsible to ensure requirements in this document flow down to sub-contractors.

Revision 1 (REV 1) of the PRD focuses on engineering, design, management, and planning requirements, consistent with the stage of the project. Future revisions of this document will add relevant requirements relating to procurement, construction, operations, and other aspects.

It is noted that the Background (Section II) of the original PRD (PRD-Rev 0) is not included in Rev 1 for brevity, however, that information remains valid as a foundation for the updated information contained in this document.

II. Mission Need

The CMRR *Mission Need Statement* approved with Critical Decision 0 (CD-0) on July 2002 lists critical NNSA and DOE missions and programs that would be supported by capabilities of the proposed CMRR. The CMRR Project seeks to relocate and consolidate mission critical CMR capabilities at LANL to ensure continuous support of NNSA stockpile stewardship and management strategic objectives; these capabilities are necessary to support current and directed stockpile work and campaign activities at LANL beyond 2010. This PRD operationalizes the overall goals in the Mission Need Statement.

III. Requirements Development and Use of this Document

PRD development during the pre-conceptual phase (Rev 0):

NNSA and LANL have undertaken the Integrated Nuclear Capabilities Planning (INP) activities to assure that actions to upgrade, replace, or refurbish aging nuclear facilities, such as CMR, are performed in an integrated, coordinated, and cost-effective manner. The INP activity, with review and input from NNSA, established the specific programs and missions to be supported by the CMRR. An overall INP mission set was defined, programs that support the mission set were identified, and the subset of programs and activities to be supported by the CMRR was subsequently developed.

Workshops involving both LANL and NNSA participants were held to review candidate INP missions, select a consensus mission set that was consistent with the NNSA Defense Program guidance (Gioconda, 2001), and review the required capabilities associated with the mission set. The workshops also focused on the CMRR-its role and required capabilities to satisfy mission needs, general facility requirements, and a potential site.

LANL performed additional evaluations to prioritize the program support capabilities to be included in affected facilities, in particular what should be included in CMRR. These evaluations resulted in a recommended set of core capabilities that should be included in CMRR, as well as a set of optional capabilities identified for further consideration. (cf Ref 2-6)

PRD development to support preliminary design execution (Rev 1):

During conceptual design phase activities, the INP process was used to review and present information and results of CMRR conceptual design development, including technical and programmatic scope options responding to NNSA program direction. INP-driven consensus recommendations were primary input to NNSA Program Secretarial Officer (NA-10) decision briefings that produced formalized direction that serves as the basis for CMRR CD-1 recommendations. This Revision of the PRD captures results of decisions made during the conceptual phase of project development.

Rev 1 of the PRD reflects scope decisions made by DOE in response to the Conceptual Design and responds to the evolving maturity of the design, structure, and functions for CMRR by the following:

- Definitizing and, where applicable, quantifying requirements previously specified at

- generic levels;
- Reflecting the implementation of CMRR as a phased project with two major facilities and supporting structures and services;
 - Refining and consolidating safety and management requirements;
 - Establishing expectations for the design phase for CMRR;
 - “Projectizing” requirements to facilitate implementation and tracking;
 - Reflecting the missions assigned to CMRR as defined by NA-10 (Beckner, 2004); and
 - Distinguishing between mission requirements (those relating to what the project does) and implementation requirements (those relating to how the project will be executed).

The basis for the Rev 1 requirements and a crosswalk to Rev 0 is provided for information in the Attachment to this PRD.

Use of the PRD

The PRD is DOE’s link from the high-level Mission Need Statement to the programmatic and technical documentation that is assigned for the contractor to implement. The PRD is DOE’s top-level specifications and requirements for CMRR.

The PRD is broken into several sections. The first section, *Mission Requirements*, corresponds to the “Technical Scope” Level 0 or Level 1 as defined in DOE Order 413.3, “*Program and Project Management for the Acquisition of Capital Assets*.” The other sections correspond to “Technical Scope” Level 2 requirements. Level 2 changes can be administered at a lower level of authority than Level 0 and Level 1 requirements.

This PRD specifies a number of deliverables and products that will be generated by the contractor to meet DOE’s expectations for project execution.

IV. Program Assumptions, Constraints, & Interfaces

There are several key assumptions and constraints that factor into the scope and content of the program requirements for CMRR. In addition, there are several facilities and projects, both existing and proposed, whose interfaces with CMRR must be carefully coordinated. A list of the assumptions² and constraints and key interfaces is provided.

² An assumption is a presumed outcome, value or condition whose actual outcome, value or condition cannot be known or controlled by the project.

Assumptions and Constraints

- NNSA will ensure availability of budget resources necessary to optimize CMRR project implementation.
- The CMRR will be located at TA-55 and will consist of Security Category I and Radiological structures.
- The CMRR project will provide typical infrastructure support: office facilities, roads, electrical, natural gas, water, sewer, communications, etc, needed specifically for CMRR facilities and operations. CMRR infrastructure support will require additional LANL TA-55 site infrastructure improvements that will be provided via other projects/program activities and require close integration with CMRR (See Key Interfaces below).
- The CMRR project will not address all LANL Hazard Category 3 and 4 space requirements. For example, CMRR will not accommodate several low material-at-risk (MAR) and NIS operations currently conducted at TA-48, TA-46, and the existing CMR Building.

Key Interfaces

Interfaces between the CMRR project and other related projects and activities need to be monitored and controlled to ensure that no detrimental impacts are forced on one project by another. This section identifies the known key interfaces to enable effective planning to mitigate any untoward impacts.

In addition to meeting the higher-level interfaces relating to budgetary planning and processes, CMRR must interface with the following activities, tasks, and facilities:

- CMR operations and planning, especially for transition to CMRR and for shutdown.
- PF-4 operations, assignment of mission functions between PF-4 and CMRR, and emergent upgrades.
- LANL Nuclear Facility Consolidation activities and upgrades to facilities and equipment including the following active/planned activities: TA-18 Critical Experiments Facility Relocation, Nuclear Material Safeguards and Security Upgrade Project (NMSSUP) Phase-II, relocation of radiography from TA-8, and the Radioactive Liquid Waste Treatment Facility (RLWTF) Upgrades Project.
- Interfaces and integration with ongoing and planned TA-55 site programs, actions and activities, including Safeguards and Security, Safety/Authorization Basis, and site infrastructure initiatives.
- The user communities to ensure their needs will ultimately be satisfied by CMRR when it

is operational.

V. Program Requirements

Program requirements for the CMRR Project are derived from the mission needs considering the current configuration of existing facilities, assessments of current facility conditions and effectiveness, and current and future LANL missions. The following lists the program requirements for the CMRR project. All requirements are numbered. Other text is provided for context or for clarity. Attachment 1 provides a crosswalk of program requirements between Rev 0 and Rev 1 of this document

A. Mission Requirements

Requirement P1. *Base Nuclear Facility Requirements*: The CMRR project shall provide the following nuclear laboratory and research capabilities to be installed in the new Nuclear Facility (NF) as detailed in Table I that shall be operational³ no later than as specified in the Preliminary Project Execution Plan (PPEP), when published:

- Facilities and equipment needed to support missions assigned to LANL with nuclear analytical chemistry and materials characterization operations, including relocating all mission-essential CMR AC/MC capabilities and associated research and development space for these functions;
- Facilities and equipment needed to support anticipated CMRR operational and general LANL long-term special nuclear materials (SNM) storage requirements;
- Facilities and equipment needed to support large vessel handling operations; and,
- Facilities and equipment necessary to support the implementation of the above requirements into a capable nuclear facility to meet its mission objectives, such as materials handling, short-term storage, waste management, sample management, and sample preparation.

Requirement P2: *Base Requirements for the Radiological Laboratory, Utility, Office Building*: The CMRR project shall provide the following radiological and non-radiological capabilities in the new Radiological Laboratory, Utility, Office Building (RLUOB) that will be operational⁴ no later than as specified in the RLUOB Project Execution Plan at CD-2/3, when published:

- A radiological laboratory for conducting up to radiological levels (< 8.4 g Pu239 equivalent) quantities for analytical chemistry, materials characterization, or actinide research and development;
- Facilities to house utilities for operation of the full suite of CMRR requirements (RLUOB and NF) including heat supply and heat rejection, water systems, power, communications, gases, and similar functions;
- Space to support consolidated TA-55 training; and,
- Space for CMRR RLUOB and NF equipment testing, general maintenance, and

³ Pending publication on an approved PPEP, this date is deemed to be the end of FY 2012.

⁴ Pending publication of an approved PEP, this date is deemed to be the end of 1 Q FY 09.

administrative needs.

Requirement P3: The start of operations in the RLUOB and the NF shall be implemented in conjunction with the existing CMR and PF-4 operations to ensure continuity of AC/MC services during operational transition as will be formally agreed to and documented in the CMR-CMRR transition plan. The CMR-CMRR Transition Plan shall be prepared by the contractor and approved by the Program Manager as a controlled living document as part of the DOE technical baseline to detail how the transition will be implemented under a suite of potential transition scenarios.

Requirement P4: The CMRR Project shall be integrated and coordinated with existing and emergent activities at LANL, and particularly with activities related to Integrated Nuclear Planning and existing and emergent operations at CMR and PF-4. When fully operational CMRR shall integrate with PF-4 such that the pair of facilities, along with the supporting infrastructure at or near TA-55, will operate as a system to meet the NNSA nuclear missions assigned to LANL.

Requirement P5: Specific performance requirements for the base CMRR functions are as follows:

- Analytical chemistry and materials characterization capabilities: CMRR AC/MC capabilities shall be established to support pit manufacturing and other LANL NNSA mission activities at rates consistent with level of operations analyzed and established in the LANL SWEIS.
- SNM storage: Maximum quantity of SNM storage for CMRR operations and LANL long-term requirements contained with CMRR NF shall be limited to no more than 6 MT Pu239 equivalent to minimize security and safety concerns, material intended for long-term storage in the long-term storage vault should be containerized.
- Large vessel handling capabilities: The CMRR will provide large containment vessel handling support for the Dynamic Experiments Program including vessel loading and unloading operations, and material recovery at a rate of 2 vessels every three years.
- RLUOB:
 - The radiological laboratory shall have separable spaces to enable performing cleared and uncleared work independently.
 - Office space for 350 staff members.
 - Facilities for consolidated TA-55 training operations, including sufficient space to support a training staff of approximately 46 people.
 - An entrance control facility with underground connecting tunnel that enables access to the Nuclear Facility.

B. Programmatic Engineering Specifications and Overall Design Principles

Requirement P6: The CMRR shall be designed, constructed, started up, and operated in accordance with all applicable laws, regulations, DOE orders, and codes and standards.

Requirement P7: Laboratory spaces shall be designed to be flexible and modular to provide sufficient flexibility to accommodate future changes in mission and the

dynamic conditions associated with normal processing and maintenance activities in a laboratory environment.

Requirement P8: Systems, structures and components (SSCs) shall be reliable, maintainable, and inspectable. The design shall maximize the mean time between failures by designing high reliability into the subsystems. The design shall minimize the mean time to restore system operations. The CMRR shall be designed for ease of system and unit operations checkout, maintenance, inspection, and surveillance, and allow ready access to operations and support equipment. The design of SSCs should maximize passive features, consistent with established norms and security and safety demands. Major systems should be designed to make them as functionally independent as practical.

Requirement P9: The CMRR Project structures, systems, and components (SSCs) shall be designed to support a service life of 50 years. The strategy for achieving a 50-year service life shall explicitly identify components that are anticipated to require replacement during the operating life of CMRR. The design shall provide features that enable SSCs to be replaced.

Requirement P10: The CMRR Project shall develop and maintain a program to identify, track and control technical requirements and directives that emanate from authorities with jurisdiction to issue such guidance (henceforth referred to as “codes and standards management”). A database of applicable codes and standards shall be included in a controlled document. The sources of such guidance include codes, standards, DOE Orders, federal, state, and local laws, rules, and regulations, this PRD, and provisions in the contract between the University of California and the Department of Energy, Contract No. W-7405-ENG-36. The codes and standards management task may be accomplished in conjunction with the Systems Engineering Management Plan, if desired. The codes and standards management task shall incorporate the following:

- CMRR facilities shall comply with all applicable codes and standards, NNSA requirements, and applicable NNSA implementation plans for Defense Nuclear Facility Safety Board (DNFSB) recommendations.
- The facility design shall comply with applicable nuclear facility requirements in Appendix G of the contract between the University of California and the Department of Energy (UC Contract Number W-7405-ENG-36).
- CMRR facilities design requirements shall be consistent with those specified in Modification No. M507, Supplemental Agreement to the contract between the University of California and the Department of Energy, Contract No. W-7405-ENG-36, Appendix G, and in the Los Alamos National Laboratory Work Smart Standards.
- CMRR facilities design shall formally consider analogous codes and standards from industry in accordance with Secretary of Energy guidance memorandum, dated October 31, 2000, to include regulations and guidance documents for commercial nuclear facilities promulgated by the Nuclear Regulatory Commission.

Requirement P11: CMRR shall be designed in accordance with DOE Order 430.1B, “Real Property Asset Management” for lifecycle considerations. Effective lifecycle cost control and asset management shall be a key goal of the CMRR. Technology

and operational practices that can reduce facility lifecycle costs shall be applied consistent with safety and security requirements.

Requirement P12: CMRR shall be designed to facilitate deactivation, decontamination, and decommissioning at the end of the facility's life.

Requirement P13: The CMRR Project design shall use proven technology to the extent practicable, thereby minimizing engineering and technology development. For gloveboxes, hoods, and other nuclear specialty equipment, standard design platforms should be selected to minimize procurement and operational risks associated with acquiring and maintaining an unnecessarily large number of equipment platforms.

Requirement P14: Prior to Title I design of the CMRR, facility design features pertaining to meeting safety, security, and quality assurance criteria shall be identified and tracked as part of the project's technical baseline.

C. Safety Management and Design Requirements

Consistent with DOE Policy P 450.4, the term "safety" as used here "is used synonymously with environment, safety and health (ES&H) to encompass protection of the public, the workers, and the environment."

Requirement P15: LANL shall develop and maintain as a controlled document that is part of the DOE technical baseline, an Integrated Safety Management Plan (ISM Plan). The ISM Plan shall include the following:

- That safety of the public and the worker shall be a primary consideration in design, construction, start-up, and operation of CMRR;
- How the DOE commitments "to conducting work efficiently in a manner that ensures the protection of workers, the public and the environment" and "to systematically integrate safety into management and work practices at all levels" are implemented;⁵
- How environment, safety, and health shall be integrated into the planning and execution of all project activities in accordance with NNSA policies for integrated safety management and NNSA standards for nonreactor nuclear facilities and Integrated Safety Management at LANL, as defined in IMP-300-00-00.0, "Integrated Work Management for Work Activities" applicable to where work is being performed;
- How CMRR shall implement a comprehensive safety review process, including input from self-assessments as well as external independent review groups; and
- How the safety case documents, including the Preliminary Documented Safety Analysis and the Documented Safety Analysis, will be developed, reviewed, and managed.

Requirement P16: The CMRR project shall provide features and information necessary to support effective site emergency response actions. Emergency response planning shall be included in the design phases of the project and shall be coordinated with the existing emergency planning for the facility site.

⁵ Both citations are from DOE P 450.4, "Safety Management Policy", p.1, October 15, 1996.

Requirement P17: Waste minimization shall be a goal of the CMRR. The production of waste requiring off-site disposal shall be reduced to shall be minimized, consistent with cost-benefit analyses. The CMRR facilities shall not allow the long-term accumulation of waste and shall minimize the mixing of radioactive and non-radioactive wastes.⁶

Requirement P18: The Nuclear Facility shall be designed to prevent the uncontrolled release of hazardous material to the environment during all normal and anticipated operations and, to the extent practical, during, and subsequent to design basis accidents.⁷

Requirement P19: The CMRR Project shall comply with Occupational Safety and Health Administration Process Safety Management Law, 29 CFR 1910.119.

Requirement P20: All areas where a critical mass of material could conceivably amass shall be designed to be criticality safe under normal operating and design basis accident conditions. The facility design must meet applicable DOE Order 420.1A and ANSI/ANS 8 series for criticality safety.

Requirement P21: The CMRR shall comply with the applicable fire protection criteria for facilities in DOE Order 420.1A.

Requirement P22: Explosion hazards shall be prevented by design to the extent practical. Where an explosion hazard cannot be precluded by design, mitigative features must be provided to ensure attainment of the safety requirements specified in this PRD.

D. Integration Requirements

The following requirements are detailed requirements relating to integration of CMRR to the TA-55 and nearby environs. This section amplifies the overriding integration requirement P4.

Requirement P23: Shipment to and receipt of nuclear and possibly other materials shall emanate from PF-4. The CMRR project will provide a means to provide safe and secure transfer of SNM between the two facilities, such as a tunnel.

Requirement P24: The CMRR Project shall be integrated with other ongoing programs' milestones and activities in order to minimize the impacts on the objectives of all programs. The design and construction sequencing shall include provisions to achieve this objective. The other ongoing programs shall specifically include all Integrated Nuclear Planning activities at LANL, operations at PF-4, and operations at CMR.

E. Protection of SNM and sensitive information

⁶The last part of this requirement duplicates a requirement in DOE Order 420.1A but is included here for completeness.

⁷ Short transients, SUCH AS THOSE relating to fan and/or damper evolutions, shall not be deemed to be "uncontrolled" in applying this requirement.

Requirement P25: The CMRR project shall have an Integrated Safeguards and Security Plan as part of the DOE-NNSA planning baseline that specifies:

- How the CMRR Project shall protect sensitive information, whether classified or not, in accordance with applicable directives. Sensitive information includes but is not limited to business- and procurement-sensitive information, official use only information, unclassified controlled nuclear information, and classified data.
- How the project will integrate the physical protection for CMRR with the balance of TA-55 and LANL consistent with DOE Design Basis Threat (DBT) requirements and implementation plans.
- How design reviews the approval processes will be planned to ensure physical safeguards and safeguards provisions are considered in the design processes and to ensure timely approval of design products and information.
- How design concepts at other nuclear facilities, such as HEUMF and the PDCF, might be considered in the CMRR development processes.
- How DOE Policy 470.1, Integrated Safeguards and Security will be implemented for CMRR.

Requirement P26: The CMRR facilities shall incorporate physical protection measures necessary to prevent the theft or diversion of fissile materials consistent with applicable regulations. Security requirements for protecting Category I and II SNM include DOE O 5632.1 C, DOE M 5632.1 C-1, DOE O 474.1, and DOE M 474.1-1.

Requirement P27: The CMRR facilities shall incorporate material control and accountability measures necessary to detect the prompt loss of material and to monitor accretion of material unaccounted for. A near real-time inventory management system is preferred.

Requirement P28: The CMRR NF shall be contained within the Perimeter Intrusion Detection and Assessment System at TA-55 and incorporate safeguards and security protection strategies consistent with PF-4. The construction and startup operations of CMRR must be coordinated with PF-4 and the Nuclear Material Safeguards and Security Upgrade Project Phase II to ensure CMRR activities proceed in a timely manner without challenging the integrity of the operating PIDAS already in place.

F. Management

Requirement P29: The CMRR shall have a Systems Engineering Management Plan maintained under the prime contractor's technical baseline and concurred in by DOE that:

- Identifies how the engineering process is established and managed, including how oversight and integration of efforts by sub-contractors is effected and how value engineering is embedded into the processes;
- Establishes the hierarchy of technical documents and demonstrates how requirements are flowed down from DOE and from the prime contractor's requirements documents to lower level documents;
- Describes how the design basis is developed and maintained;

- Explains how plant or facility wide level requirements are allocated down to SSCs;
- Establishes and maintains the data base that cross-walks commitments for SSCs that are made in the safety case against design features to meet them.

Requirement P30: Project management systems shall conform to DOE Order 413.3, “Program and Project Management for all Acquisition of Capital Assets,” as required. Furthermore, the prime contractor shall develop and maintain an integrated resource- loaded schedule for all phases of the project (henceforth: Integrated Project Schedule (IPS)) as a living document. The IPS shall be used for planning, reporting and monitoring. It shall be linked to a central Work Breakdown Structure that the contractor and all sub-contractors conform to, the project’s cost and schedule baselines, the earned value management systems, and the risk management systems.

Requirement P31: The CMRR Project shall implement a quality assurance program appropriate for design and construction of a nuclear facility as defined by DOE/UC Contract W-7405-ENG-36, Appendix G. The program shall meet applicable quality assurance requirements and shall be consistent with established quality management processes at LANL. Procurement activities must be conducted in accordance with the applicable LANL procurement QA requirements.

Requirement P32: A formal Risk Management Plan shall be developed early in the Conceptual Design Phase of the project to evaluate the potential impacts of each identified risk and to develop specific risk mitigation/management strategies. The plan shall identify responsibilities for handling risks and the schedules for their disposition. The plan shall be maintained as a living document during the life of the project.

Requirement P33: The CMRR Project shall be executed in compliance with configuration management and change control procedures at LANL. A records management system consistent with the requirements for design, startup, and operations of a nuclear facility shall be maintained. All design documents shall be revised to reflect “as-built” condition before project turnover.

Requirement P34: The CMRR project shall support and participate in NNSA programmatic activities designed to drive information exchange, sharing of lessons learned, and development of consistent technical/managerial approaches for nuclear facility construction activities. This includes actively seeking opportunities to participate in information exchange forums involving other DOE/NNSA large nuclear projects such as the Pit Disassembly and Conversion Facility, Highly Enriched Uranium Materials Facility, the Mixed Oxide Fuel Fabrication Facility, TA-55 Reinvestment Project(s), and general LANL Integrated Nuclear Planning activities.

G. Other Requirements

Requirement P35: The M&O Contractor shall ensure flow-down of these requirements as necessary to meet CMRR objectives in all sub-contracts.

Requirement P36: The CMRR Project construction activities shall be performed using technically acceptable and cost-effective methods and practices. Thorough and comprehensive integration of construction requirements shall be included throughout the design process.

Requirement P37: Training plans for the CMRR shall support necessary skills development for

design, construction, and operation. Prior to operation, the training plans shall include the type, amount, and content of training required for personnel operating, maintaining, visiting and/or inspecting the facility.

CHAPTER IV. VI. Program Risks & Management

Information relating to project risks and management are included in the Project Risk Management Plan, as invoked by Requirement P32 above.

CHAPTER V. VII. Program Requirements Summary:

PRD, Rev 1, derives from Revision 0. Rev 1 establishes DOE/NNSA expectations for the contractor to satisfy during the planning, engineering, and Preliminary Documented Safety Analysis phase of the project. Later revisions will be prepared to address procurement, construction, start up, and operations when ripe. The principal contents in Rev 1 of the PRD include:

- Establishing the technical requirements at the Level 0 and Level 1 levels for conformance with DOE Order 413.3.
- Establishing the high-level Level 2 technical, programmatic, and performance criteria for CMRR.
- Defines expectations for certain deliverables that DOE considers vital to the execution of the project.
 - The CMR-to-CMRR Transition Plan
 - The Codes and Standards Management Plan, including its Non-Conformance Log
 - Integrated Safety Management Plan
 - Integrated Safeguards and Security Plan
 - Systems Engineering Plan
 - Integrated Project Schedule
 - Risk Management Plan.

Table 1 Programs Supported by CMRR Functional Capabilities (highlighted in gray)

| Directed Stockpile Work (DSW) ⁷ | | | | | Campaigns ⁷ | | | | | | | Readiness in Technical Base & Facilities (RTBF) | | Non-DP Programs ⁸ | | | | | | | | Additional Programs (non-Pu Strategies) ⁸ | | | |
|--|-----------------------------|-----------------------------|--------------------|---------------------------|----------------------------|-----------------------------|-----------------------|-----------------------|------------------------------|----------------------|---------------------------------------|---|--------------------------------|------------------------------|--------------------------|-----------------------------------|-------------------------------|---------------------------------|--------------------------------|---------------------------------|---------------------|--|-------------|----------------------------|----------------------------|
| Subcritical Experiments (1-4 expt./y) | Plutonium Measurements/AGEX | Special Recovery Line (SRL) | mW/RG Surveillance | Pit Surveillance (15 ppy) | Pit Manufacturing (20 ppy) | Material Readiness (20 ppy) | Enhanced Surveillance | Primary Certification | Dynamic Materials Properties | Advanced Radiography | Certification in Hostile Environments | Materials Storage | Materials Recycle and Recovery | Pit Disassembly & Conversion | Plutonium Immobilization | Arms Control and Nonproliferation | Nuclear Materials Stewardship | Nuclear Materials Stabilization | Nuclear Materials – Focus Area | Offsite Source Recovery Program | Heat Source Program | Advanced Fuels | HEU Support | WIPP Characterization Work | |
| | | | | | X | | X | X | X | | | X | | | | | | | | | | X | X | Assay | |
| X | X | | X | | X | X | X | X | X | | X | X | | X | | | X | X | X | | X | X | X | X | Isotopic/MS |
| | X | | X | X | X | X | X | X | X | | X | X | | X | | | X | X | X | | X | | X | X | Trace Elements |
| | | | | | X | X | X | | | | | | | X | | | | | | | | | X | X | XRF/XRD |
| X | X | | X | | X | X | X | | | | X | X | | X | | | X | X | X | | X | | X | X | Radiochemistry |
| X | | | | | X | X | | | | | X | X | | X | | | X | X | X | | X | | X | X | Analytical Chemistry |
| X | | | X | X | X | X | X | X | X | | X | | | X | | | X | X | X | | X | | | | Materials Characterization |
| X | X | | X | X | X | X | X | X | X | | X | X | | X | | X | X | X | X | | X | X | X | X | Sample Management |
| X | X | | X | X | X | X | X | X | X | | X | X | | X | | | X | X | X | | X | | X | X | Standards and QC |
| | X | | X | X | X | X | X | X | X | | X | X | | X | | X | X | X | X | | X | X | X | X | Waste Acct./Handling |
| | | | | | | | | X | X | X | | | | | | | | | | | | | | | Other Capabilities |
| | | | X | X | | | | | | | | X | | | | | | | | | | | | | Large Vessel Handling |
| X | X | X | X | X | X | X | X | X | X | | X | X | | X | X | X | X | X | X | X | X | X | X | X | Nuclear Materials Storage |

⁷ As a minimum, CMRR will support AC/MC requirements for the programs listed in the shaded region of this table. Additionally, CMRR could potentially support higher throughput for programs like Pit Manufacturing and Pit Surveillance if sampling requirements are reduced below December 2004 levels as described in the Analytical Chemistry and Materials Characterization Task Team Preliminary Recommendations Letter (LANL Memorandum 05-CMRR-008, dated December 7, 2004).

⁸ Non-DP/Additional Programs evaluated during Pre-conceptual INP Workshops (circa 2001) are shown in unhighlighted portion for historical context only. CMRR capacities are not being developed to include support for these missions; however, these programs could be supported if AC/MC capacities are available.

CHAPTER VI. VII. Bibliography

- 1) NNSA/DOE Guidance Memo. Thomas F. Gioconda, Brigadier General, USAF, Acting Deputy Administrator for Defense Programs, Memo: Defense Programs Guidance on Integrated Planning for Los Alamos National Laboratory Nuclear Mission Capabilities and the Chemistry and Metallurgy Research Replacement Project, dated April 6, 2001.
- 2) *Integrated Nuclear Capabilities Planning: Implementation Plan for Upgrades and Consolidation of LANL Actinide Chemistry and Materials Engineering Facilities, Volume 1: Mission Set Document*, Los Alamos National Laboratory, LA-CP-01-250 (OUO), July 2001. This document describes the process used to develop LANL Integrated Nuclear Planning Mission Set and Mission Capacity Factors. The CMRR Project is scoped consistent with the mission capacity factors agreed upon at the Joint DOE/LANL Workshop #1.
- 3) *Workshop Briefing Materials (OUO/UCNI)*. Workshop #1 held April 18, 2001, Workshop #2 held July 11, 2001, both at DOE/AL.
- 4) *Options to Provide Facilities for Actinide Analytical Chemistry, Metallography, and Materials Characterization in Support of Ongoing Defense Missions*, DRAFT, Los Alamos National Laboratory, (UCNI), December, 2000.
- 5) "Integrated Nuclear Planning Infrastructure Development Project (U), Utility Systems and Parking Report," DRAFT, JCNNM, October 2001.
- 6) *Analytical Chemistry Processes for Pit Manufacturing Mission, LA-UR-97-1898, September 1997*.

Minimum Analytical Chemistry Requirements for Pit Manufacturing at Los Alamos National Laboratory, LA-13482-MS, August 1998.

- 7) Memorandum from Everet Beckner, Deputy Administrator for Defense Programs, to Ed Wilmot and G. Peter Nanos, issued September 30, 2004. Subject: Programmatic Direction regarding Critical Decision-1 (CD-1) planning for the Chemistry and Metallurgy Research Building Replacement (CMRR), Los Alamos National Laboratory (LANL).

Attachment I: Disposition of Rev 0 PRD Requirements and Basis for Rev 1 PRD Requirements

The Rev 0 Requirements specified NA-10's (Defense Program's) requirements at the time CD-0 was rendered in order to frame the project and set the immediate expectations for the Conceptual Design Phase as well as provide an outline of expectations for beyond the immediate phase of the project. The Rev 0 requirements have been updated as a result of completion of the conceptual design phase and receipt of additional NA-10 programmatic guidance. Program approved changes to the original (Rev 0) version of the PRD are reflected in Rev 1.

This attachment is provided to document traceability between Revisions. It is provided as information. This attachment will be removed from future versions of the document and is not considered part of the document with respect to any authority to define requirements. The discussion included in this attachment is meant to be a high level discussion of the salient changes between revisions. No attempt is made here to be a comprehensive, word-by-word history of the PRD text changes. The discussion here is limited to the changes in the numbered requirements with its referenced material only and not in the other textual data in the PRD.

Two tables are provided to inform the crosswalk to the Rev 0 to the Rev 1 requirements and also to understand the origins of new requirements.

Table 2 Mapping of Rev 0 PRD Requirements to Rev 1 of the PRD

| Rev 0 Requirement # | Location in Rev 1 | Rationale and commentary where necessary to describe the disposition of the old requirements |
|---------------------|-------------------|--|
| 1 | 1 | The new requirement embeds much of the original in meaning with the following additional features: (1) the mission schedule is included in the new requirement; (2) the evolution to a two-facility project is reflected; (3) the scope of the project is definitized with respect to PF-4 consolidation, contingency space, large vessel handling, and SNM storage. |
| 2 | 1 and 2 | The new requirement reflects the evolution to a two facility project, definitizes the imperative to maintain AC/MC capabilities, and defines the expectations and deliverable for ensuring continuity of mission support during the CMR-to-CMRR transition. |
| 3 | Deleted | No contingency space will be provided in the NF. |
| 4 | 7 | Previous requirement for flexibility is assigned to the NF and the RLUOB. |
| 5 | 1 and 2 | Differences are partly editorial and partly reflective of the evolution in Rev 1 to a more performance-based specification of the requirements, based on the evolved maturity of the project. |
| 6 | 1, 2 and 4 | The new requirements are organized more along functional lines and are therefore editorially different. The new requirements precisely describe the desired end state for CMRR when operational with PF-4, which was not specified previously. |
| 7 | 1 and 17 | None required. |
| 8 | 10 and 15 | The original requirement calls out directives in a piece meal fashion. The new one incorporates directives more categorically. The new requirement also establishes expectations and deliverables for implementing a directives task, an element not included in the original. |
| 9 | 10, 15 and 19 | See commentary RE: Rev 0 #8. |
| 10 | 15 | The original requirement is very general. The new requirement embeds the original but also establishes the expectations and deliverables for implementing the requirement. The new requirement also formally links to DOE policies with respect to safety management. |
| 11 | 25 | None required. |

| | | |
|----|--------------|--|
| 12 | 25-27 | The new requirements convey the spirit of the original but the new requirements: (1) distinguish between safeguards and security; (2) embed the security orders call outs into the requirement, which were previously included within the introductory text of the document; and (3) call out inventory management control specifically in the new requirement, unlike the original. |
| 13 | 20 | The new requirement applies to all areas where a critical mass of fissile material might accumulate. |
| 14 | 4, 23 and 24 | The old requirement is expanded consistent with the evolved maturity of the project. The new requirement #4 also clarifies how CMRR and PF-4 ultimately will interact and integrate. |
| 15 | 4 and 24 | None required |
| 16 | 4 and 27. | None required. |
| 17 | 33 | None required. |
| 18 | 9 | None required. |
| 19 | 10 | See commentary on old requirement #8. |
| 20 | 10 | See commentary on old requirement #8. |
| 21 | 36 | None required. |
| 22 | 16 | None required. |
| 23 | 5 | None required. |
| 24 | 10 | None required. |
| 25 | 5 and 10 | None required. |
| 26 | 11 | The new requirement embeds the meaning of the old requirement in the context of DOE Order 430.1B |
| 27 | 12 | None required. |
| 28 | 10 | None required. |
| 29 | none | Old requirement is now overcome by events and is now deleted. |
| 30 | 30 | The new requirement is more explicit in clarifying how a set of project management tools need to work together. |
| 31 | 13 | None required. |
| 32 | 31 | None required. |
| 33 | 5 and 10 | None required. |
| 34 | 8 and 11 | The new requirement captures the older requirement but embeds it in the broader overlay of DOE Order 430.1B, which superceded DOE Order 430.1A. |
| 35 | 32 | The new requirement also establishes that the Risk Management Plan is a living document, rather than a point-in-time assessment tool. |
| 36 | 37 | None required. |
| 37 | 17 | None required. |

| | | |
|----|----|----------------|
| 38 | 15 | None required. |
|----|----|----------------|

Before addressing specific changes that are made on a requirement-by-requirement basis, the significant changes in Rev 1 are as follows:

- o Editorial reasons: (1) In the current version all of the requirements are specifically included in numbered requirements. In the original version, ambiguity existed regarding whether non-numbered text was descriptive material or requirements. (2) Organization: The older version scatters related requirements across the document. The revised structure lumps like requirements for ease of review and comprehension.
- o Requirements specification: The revised version of the requirements tends to be performance-based.
- o Mission requirements: The mission statement for the CMRR project is more tightly refined now than when Rev 0 was prepared. The focused mission is now reflected in the PRD.
- o Two facility project: The current Rev reflects the two facility concept for the CMRR project.
- o Codification of expectations into deliverables: This feature does not exist in the earlier version. The consolidation of a technical directives task is a good example of this (Requirement #10).

The rationale for new requirements or changes to existing requirements is reflected in this table. The crosswalk to original requirements follows from Table A above. For example, Requirement #7 below is functionally the same as a requirement in the Rev 0 PRD. To determine which is referenced, refer to the second column to find new Requirement #7 and the linkage to the previously numbered requirement is #4. (The revision to the sequencing of like requirements between the two PRD Revs follows from the reasoning in bullet 2 above.)

Table 3 Basis for Rev 1 PRD Requirements

| Requirement | Basis for the requirement (if significantly revised from Rev 0 or was added in Rev 1). |
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| 1 | Defines the NF functionality, including support systems and equipment. Attempts to express requirements on a performance basis. Includes a schedule requirement as a basis for execution. |
| 2 | Defines the RLUOB functionality, analogous to #1 above for the NF. |
| 3 | Establishes as a central tenet the imperative to maintain continuity of AC/MC nuclear support. Also establishes the requirements for the deliverable that defines the plan on how the transition to CMRR operations will be effected. Owing to its significance, this Plan is included as part of the DOE-controlled baseline. |
| 4 | The new requirement codifies site integration into specific performance-based terms and establishes the endpoint for how CMRR will integrate with PF-4 and other nearby facilities. |

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| 5 | <p>AC/MC: Establishes performance requirements for AC/MC for sizing and for expectation. These expectations derive from the EIS for pit production rate and from the CMR-to-CMRR transition plan that LANL prepared during the CDR phase.</p> <p>Containerization of long-term storage of SNM: Pu needs to be containerized because of the security and safety risks that would carry forth otherwise. The quantity of SNM is set in the SWEIS</p> <p>Large vessel: As stated in previous PRD.</p> |
| 6 | <p>This generic requirement, which is valid whether stated explicitly or not, requires the contractor to conform to all applicable controlling directives.</p> |
| 7 | <p>As in previous version.</p> |
| 8 | <p>Incorporates original but also adds explicit RAMI considerations in a consolidated way from DOE Orders 420.1A and 430.1B.</p> |
| 9 | <p>As in previous version.</p> |
| 10 | <p>The new requirement establishes the formality in the application of technical directives. This is a new requirement as written but embeds many piecemeal requirements in the Rev 0.</p> <p>Experience has shown that establishing a directives control task early on is an essential element of controlling the scope and facilitating the execution of the project.</p> <p>Though not specifically required, the design of the CMRR should be informed by what NRC-type requirements would apply to comparable commercial facilities.</p> |
| 11 | <p>Upgraded previous requirement to 430.1B citation.</p> |
| 12 | <p>As in previous version</p> |
| 13 | <p>As in previous version.</p> |
| 14 | <p>As in previous version.</p> |
| 15 | <p>Integrated Safety Management is operationalized by this new requirement. Linkage back to DOE policies is included. A Plan to manage the safety program is deemed to be part of the DOE technical baseline, owing to its overriding significance to the program.</p> |
| 16 | <p>As in previous version.</p> |
| 17 | <p>As in previous version.</p> |
| 18 | <p>The original is ambiguous whether uncontrolled releases were precluded or not. The existing words are more concrete. The clear preference for no uncontrolled releases is stated and the requirement is manifest for all accidents of lesser severity than design basis accidents.</p> |

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| 19 | As in previous version. |
| 20 | Expands original requirement to all areas where a critical mass might accumulate. |
| 21 | The fire protection requirements are applied to both the RLUOB and the NF. |
| 22 | Explosions are not addressed in the original. Rev 1 gives specific direction for explosion prevention and mitigation. |
| 23 | The requirement for a tunnel to PF-4 is made manifest in the Revision. |
| 24 | Similar to a Rev 0 requirement, this requirement is more expansive in addressing a broader swath of integration aspects for CMRR at TA-55. |
| 25 | Integrated Safeguards and Security Planning is codified in the version. Additionally, the control of sensitive information was not addressed in the original and is included now. |
| | As in previous version. |
| 26 | Physical security requirements are explicitly called out. In the previous version, whether the requirements applied or not was unclear because the calls out were in the introductory text not with the numbered requirements. |
| 27 | The new requirement distinguishes the safeguards program from the security program. This corrects an error in the original. |
| 28 | The final security posture for CMRR is called out explicitly in the revision. |
| 29 | <p>The Systems Engineering processes are formalized. Experience shows that these functions must be established early on in the execution of a project because backfitting is difficult and uncertain. Owing to the importance of the systems engineering process, the plan that implements systems engineering is deemed to be part of DOE's technical baseline.</p> <p>This requirement also demands that the safety case commitments and design processes need to be transcribed upon each other.</p> |
| 30 | An integrated project schedule with resource loadings and connectivity to cost estimation, risk management, budgeting, and work authorization has been shown to be a critical (perhaps "the" critical) component of a successful project management system. |
| 31 | As in previous version. |
| 32 | The risk plan is established as a living document. |
| 33 | As in previous version. |
| 34 | New requirement. NNSA-HQ desires that the CMRR should be executed cognizant of the execution of other large nuclear projects to improve lessons learned and minimize stovepiping. |

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| 35 | Establishes the principle of requirements flow down in the PRD. |
| 36 | As in previous version. |
| 37 | As in previous version. |

CHAPTER VII.**CHAPTER VIII.****CHAPTER IX.** Attachment II: Cross-walk to the Revised Mission Need Statement

This document provides a cross-walk of how the revisions to the Mission Need Statement from the CD-0 version are captured in the current PRD version. (A crosswalk between the CD-0 MNS and CD-0 PRD, Rev 0 are approved in the PRD, Rev 0.) The italicized words are excerpted from the revised Mission Need Statement. The non-italicized words describe how the Mission Need is reflected in the current PRD.

The CMR Replacement (CMRR) Project seeks to relocate and consolidate mission critical CMR capabilities at LANL to ensure continuous support of NNSA stockpile stewardship and management strategic objectives; these capabilities are necessary to support current and directed stockpile work and campaign activities at LANL beyond 2010.

This direction is set forth firmly in the “Mission Requirements” Section A, most explicitly in Requirement P1.

The CMRR project will provide supporting operations that will complement existing and planned nuclear capabilities at LANL, principally at PF-4, the Plutonium Facility, to facilitate meeting the integrated near- and long-term plutonium needs at LANL.

This direction is also included in the Mission Requirement Section, especially in Requirement P4.

The project satisfies the near- and long-term needs by: (a) providing mission-critical capabilities at LANL from degraded facilities (primarily in the existing Chemistry and Metallurgy Research Facility (CMR))- such that, these capabilities would be available on a long-term basis to successfully accomplish the mission (or programs) assigned to LANL;

This direction is embedded in Requirement P1.

and (b) satisfying currently known but unmet nuclear needs at LANL, namely including long-term storage of strategic nuclear materials (SNM) and large vessel handling capabilities.

This direction is embedded in Requirement P1 as supplemented by Requirement P5.

The CMRR project will apply risk mitigation efforts in the planning, development and implementation of design and construction activities to reduce overall program risk associated with premature loss of existing CMR Building AC/MC capabilities.

This direction is embedded primarily in Requirement P3. Requirement P32 also relates but it is a more general requirement regarding risk management

Risk mitigation efforts include providing limited (radiological) AC capabilities by approximately the first quarter of FY 09, and by interacting with program and operational elements to effect transition to new operations as efficiently and integrated as practical while maintaining continuity of mission-critical AC/MC capabilities.”

This direction is incorporated in Requirement P2 in calling out the schedule for the RLUOB, by establishing the Transition Plan as an integral part of the technical baseline in Requirement P3, and by invoking a life-cycle risk management planning process in Requirement P32.

The restatement of the MNS also implements the following specific changes from the original MNS:

- Elimination of dedicated space in CMRR for non-LANL users (Reference: NA-10 Memorandum dated June 2, 2003)

As previously decided, DOE now considers that there is no need to include this capability. The requirement for such space in the CD-0 MNS has been deleted.

- Removal of explicit unequipped mission contingency space as a core element of CMRR scope (Reference NA-10 memorandum dated September 30, 2004)

Once thought to be an essential component of the CMRR mission, DOE has now decided that mission contingency space, though desirable, is not strictly necessary. Accordingly, the requirement for mission contingency space has been deleted from the PRD.