96-0002213

Department of Energy

Washington, DC 20585

May 31, 1996

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W.
Suite 700
Washington, D.C. 20004

Dear Mr. Conway:

Enclosed is the "UF_6 Cylinder Program Engineering Development Plan" dated June 1996. This document satisfies the third commitment to the board as stated in Secretary O'Leary's October 16, 1995, "Implementation Plan for Recommendation 95-1." The engineering development plan identifies the process used to manage the progress, cost, and schedule of the engineering development activities prior to field deployment. In addition, the plan contains near-term development actions, costs, and schedules.

This document is unclassified and is suitable for placement in the public reading room.

Sincerely,

Ray A. Hunter

Ray A. Hunter, Deputy Director
Office of Nuclear Energy,
Science and Technology

Enclosure

K/TSO-28

LOCKHEED MARTIN

UF_6 CYLINDER PROGRAM ENGINEERING DEVELOPMENT PLAN

JUNE 1996

EM AND ENRICHMENT FACILITIES TECHNICAL SUPPORT ORGANIZATION

MANAGED BY
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

UCN-13675 (6 8-95)

K/TSO-28

UF_6 CYLINDER PROGRAM
ENGINEERING DEVELOPMENT PLAN

EM AND ENRICHMENT FACILITIES
TECHNICAL SUPPORT ORGANIZATION

JUNE 1996

Prepared by the:
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LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
U. S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

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ACRONYMS

ASME	American Society of Mechanical Engineers
DNFSB	Defense Nuclear Facilities Safety board
DOE	Department of Energy
EDP	Engineering Development Plan
K-25	K-25 Site
LMER	Lockheed Martin Energy Research Corporation
LMES	Lockheed Martin Energy Systems, Inc.
LMUS	Lockheed Martin Utility Services, Inc.
M&O	management and operating
MOU	memoranda of understanding
NE-1	Office of Nuclear Energy
NE-40	Office of Facilities
PGDP	Paducah Gaseous Diffusion Plant
PORTS	Portsmouth Gaseous Diffusion Plant
PMP	UF_6 Cylinder Program Management Plan
SAR	Safety Analysis Report
SEMP	Systems Engineering Management Plan
SRD	System Requirements Document
WBS	work breakdown structure
WCS	work control structure
USEC	United States Enrichment Corporation

1. INTRODUCTION

The Department of Energy (DOE) owns an inventory of depleted uranium hexafluoride (UF_6). DOE established the UF_6 Cylinder Program to manage this inventory. The UF_6 Cylinder Program Engineering Development Plan (EDP) is one of four key technical and management planning documents used by the Lockheed Martin Energy Systems, Inc., (LMES) Environmental Management and Enrichment Facilities Technical Support Organization to manage the program.

1.1 BACKGROUND

The bulk of the inventory is 560,000 metric tons of depleted UF_6 with an assay of less than 0.71%. The balance of DOE's uranium managed by the UF_6 Cylinder Program includes small amounts of enrichment feed and "heels" between 0.71 and 5% assay. This material was produced by the gaseous diffusion uranium enrichment process while the plants were operated by DOE and its predecessors, the U. S. Atomic Energy Commission and the Energy Research and Development Administration. It is expected that the quantity of depleted UF_6 under the ownership of DOE will increase (less than 15%) in 1996 with the acquisition of depleted uranium produced by the United States Enrichment Corporation (USEC) since 1993.

The depleted UF_6 is stored as a crystalline solid under vacuum. The material is stored principally in 48-inch diameter, steel cylinders with rated capacities of 10 or 14 tons. Most of the cylinders have a nominal wall thickness of 5/16 inch and are pressure vessels manufactured to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. The 10- and 14- ton cylinders are stored at three DOE sites. The K-25 Site (K-25) in Oak Ridge, Tennessee, stores 4,683 depleted UF_6 cylinders; the Paducah Gaseous Diffusion Plant (PGDP) stores 28,351 cylinders; and the Portsmouth Gaseous Diffusion Plant (PORTS) stores 13,388 cylinders. The cylinders are stacked two high in double rows, outdoors, on wooden or concrete saddles. The cylinders are managed under DOE Directives and Orders derived from the Atomic Energy Act and other relevant laws.

During the development and operation of the enrichment process, containers, support equipment, and support facilities were designed, constructed, and used as a system to store, transport, and process the UF_6. After a significant inventory was produced, outdoor storage facilities ("cylinder yards") evolved independently at the sites. Cylinder yards are constructed of either concrete or compacted gravel. The handling equipment used to stack these cylinders has also evolved, from mobile cranes to specially designed machines that grasp and lift the cylinders with hydraulically actuated tines.

The congressional adjustment of DOE's mission from uranium enrichment to uranium inventory management (storage and utilization) has transformed the previous system from the design, construction, and operation phases to a storage or standby phase. The system for which DOE is responsible has been realigned to containment and use of a finite inventory of UF_6. The various types of construction and the subsequent deterioration of the yards has lead to substandard storage

for many of the cylinders. The variety of cylinder designs that have evolved over the years has also contributed to storage deterioration. These two main factors led to the need for long-term corrosion monitoring of the cylinders.

Until 1990, surveillance consisted of an annual nuclear materials inventory of the cylinders. The K-25 cylinder yards were surveyed in May 1990 to provide input for planning long-term corrosion monitoring of cylinders. Cylinder valves with corrosion and evidence of potential valve leakage were discovered. A subsequent valve survey in June 1990 at PORTS revealed two breached cylinders. Investigation of these cylinder breaches identified that they were initiated by mechanical tears resulting from impact by adjacent cylinder lifting lugs. Subsequent inspections of stored depleted UF_6 cylinders revealed four breached cylinders at K-25 and one breached cylinder at PGDP. Two of the K-25 breaches and the PGDP breach were attributed to handling damage. Two of the breached cylinders at K-25 were attributed to external corrosion resulting from substandard storage conditions.

The risks to personnel health and safety and the potential environmental impact posed by these cylinder breaches and valve leaks are low by nature of the system. The UF_6 is stored as a solid. When UF_6 is exposed to the atmosphere in the presence of the mild steel containers, reaction deposits are formed such that cracks and small breaches are self-sealing. The hazard potential of the depleted UF_6 is mostly chemotoxic, not radiological. These factors contribute to the low risk incurred from these and potential additional failures. This low risk was confirmed by analysis of air and soil samples collected near the breaches at PORTS and by subsequent weighing of the cylinders. Although the risk posed by these breaches is low, the existence of breached cylinders heightens the importance of a comprehensive, long-term, three-site cylinder management program.

After visiting LMES in 1995, the Defense Nuclear Facility Safety Board (DNFSB) issued Recommendation 95-1 and a supporting technical report.[1] That report (known as TECH 4) was issued May 5, 1995, and addressed the improved safety of cylinders containing depleted UF_6.

DNFSB "Recommendation 95-1 on Depleted Uranium" recommended the following:

- Start an early program to review the protective coating of cylinders containing the tails from the historical production of enriched uranium.
- Explore the possibility of additional measures to protect these cylinders from the damaging effects of exposure to the elements, as well as any additional handling that may be called for.
- Institute a study to determine whether a more suitable chemical form should be selected for long-term storage of the depleted uranium.

On June 29, 1995, DOE accepted Recommendation 95-1 and emphasized five focus areas for DOE response:

- removing cylinders from ground contact and keeping cylinders from further ground contact;
- relocating all cylinders into adequate inspection configuration;
- repainting cylinders as needed to avoid excessive corrosion;
- updating handling and inspection procedures and site-specific Safety Analysis Reports; and

- completing an ongoing study that will include an analysis of alternative chemical forms for the material.

On October 16, 1995, DOE submitted an Implementation Plan[2] that incorporated completed and near-term actions in accordance with these five focus areas. The Implementation Plan also committed to managing the UF_6 Cylinder Program using a Systems Engineering approach. The approach was developed concurrent with field response actions and was enhanced through an open dialogue among DNFSB staff and DOE and LMES personnel. The Implementation Plan specifies the following interim and final deliverables and defines their respective content to establish an operative Systems Engineering process for the continued improvement of depleted UF_6 management through the UF_6 Cylinder Program.

- System Requirements Document (SRD)–identifies the system requirements;
- System Engineering Management Plan (SEMP)–identifies organization, direction, and controls for system integration;
- Engineering Development Plan (EDP)–identifies development actions, costs, and schedules for technical improvements;
- UF_6 Cylinder Program Management Plan (PMP)–identifies costs, schedules, and controls for operating the system and implementing required actions; and
- Approved Safety Analysis Reports (SARs)–define the safety envelope.

1.2 PURPOSE

The purpose of the EDP is to identify development actions, costs, and schedules for completion needed to meet system and technical requirements. Some of these development actions are derived from a 'development' allocation of proposed actions contained in Appendix D of the SEMP. The EDP also documents the process used to manage development activity progress, cost, and schedule prior to field deployment. This management process is consistent with the PMP and ensures proper integration and sequencing with all program activities. Finally, the EDP provides a list of specific known development activity and their relationship to current system and technical requirements. The EDP serves then as a baseline plan to control development efforts in the program. This baseline is reviewed at least annually.

The EDP is a component of the Systems Engineering approach adopted for successful planning and management of the three-site UF_6 Cylinder Program. This approach was initiated by the development of the system requirements and issuance of the Systems Requirement Document.[3] The Systems Engineering Management Plan[4] specifies the methods for planning and controlling actions within the program. Figure 1.1 depicts the Systems Engineering approach for the UF_6 Cylinder Program.

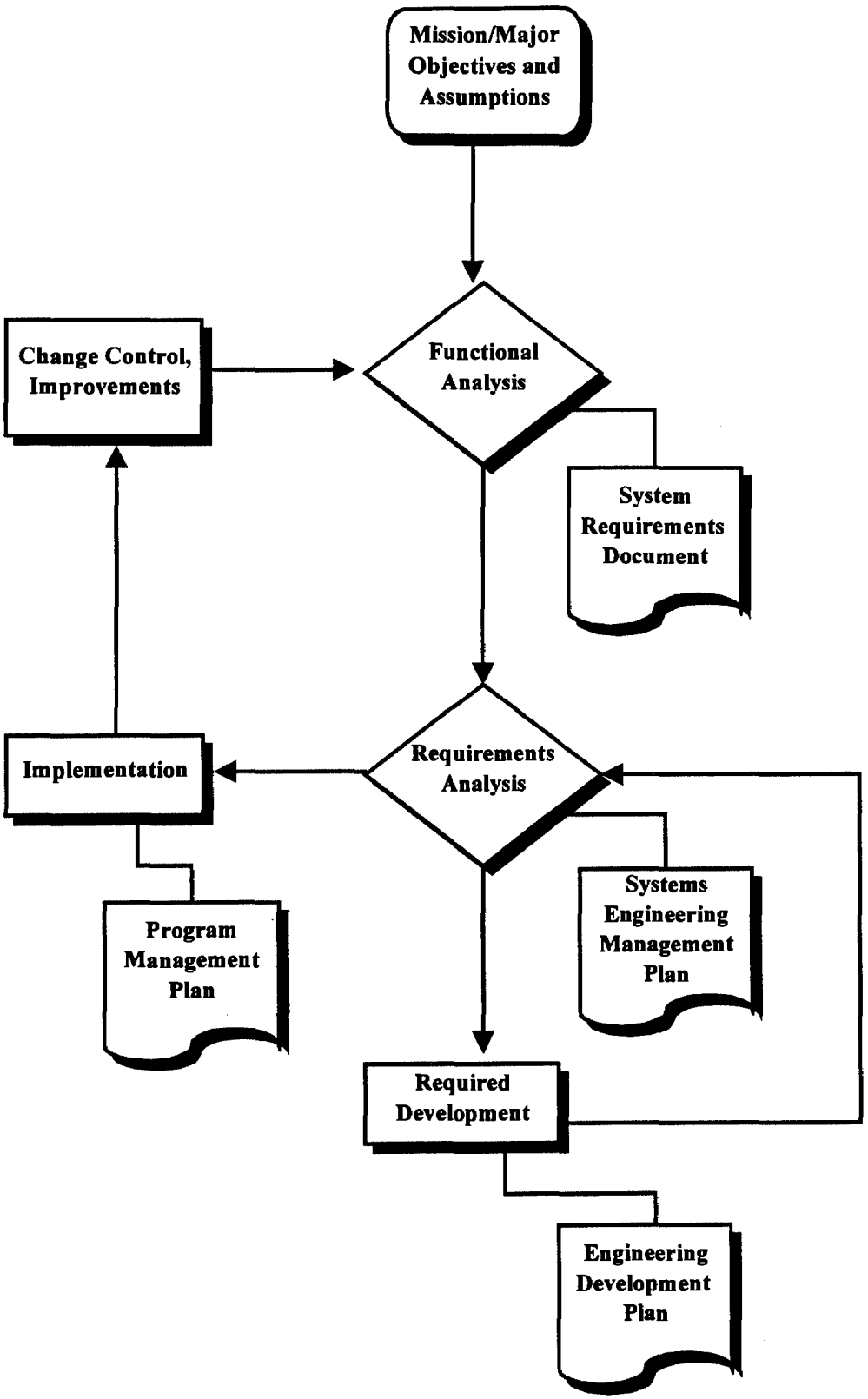

Fig. 1.1. Systems engineering approach.

1.3 SCOPE

The EDP documents the UF_6 Cylinder Program management process for identifying, implementing, and tracking progress of program or system development actions. The primary focus of the EDP is cost, schedule, and work plans for development activities. Current and future development actions are defined and authorized using the EDP process.

Required development actions are identified in the SEMP-defined requirements analysis. The analysis determines actions necessary to fulfill the requirements within the SRD. Actions that can be implemented immediately are managed through the PMP. Actions that require additional development prior to implementation are managed through the EDP. Proposed development activities, independent of system requirements and the SEMP requirements analysis, are documented and then analyzed against program needs and priorities as part of the EDP process.

The EDP is a sub-plan of the PMP. The PMP ensures development action integration and scheduling with program needs and priorities. The program work control structure (WCS) and aspects of configuration control are specified and controlled in the PMP. Development activities will have, as necessary, detailed development plans and documentation. These detailed plans are not part of the EDP but are used as appropriate during the development cycle.

1.4 DEVELOPMENT RATIONALE

Rationale for identification of UF_6 Cylinder Program development activities are necessary to fully meet the intent of the UF_6 Cylinder Program major objectives. These rationale include:

- development identified from the requirements analysis as necessary to satisfy system or technical requirements;
- development to clarify the technical basis where needed before changes to the configuration are implemented (e.g., safety, risk-related);
- development to optimize the configuration in the interest of reducing costs, risks, or time; and
- development in support of resolving a deficiency identified internally or externally through audits, assessments, or reviews.

Based on the above rationale, development actions that meet and address the cylinder program major objectives have been identified in the SEMP. These same criteria can be used to validate new development actions arising from new requirements or information. The work breakdown structure (WBS) is used to associate development activities to the most applicable part of the system or program.

1.5 EDP INTEGRATION AND INTERFACE

Development activities managed by the EDP are derived from the SEMP and requirements analysis to identify actions. Once these development activities are completed, the development findings are subjected to the SEMP requirements analysis disposition (i.e., implementation, termination, further development). For implementation of development findings, tasks must be integrated with other system activities, including those in operations, administration, and possibly with other development tasks. The system interfaces and method of integration is initially established in the planning stages of development.

The tool for ensuring integration of a development action with the rest of the system is verification. Specifically, verification ensures that the development task is focused on satisfying system and technical requirements. There are two verification steps in the EDP management process: scope verification and results verification.

The tool for managing interfaces of a particular development task with other system activities is the WCS (Fig. 1.2). The WCS requires that related tasks be identified. For the development portion of the WBS, this is accomplished by relating the development elements to Operations and Administrative branches of the WBS. The specification tree and performance tree also play key roles in managing the interface of development tasks.

The WBS development portion facilitates the control of program resources applied to further developing the existing system.

1.6 ORGANIZATION OF THE EDP

This document is organized as follows:

Section 1. Introduction: Provides background information on organizational structure of the cylinder program; a description of the UF_6 inventory; history of DNFSB Recommendation 95-1 and the DOE response contained in the Implementation Plan. Presents the purpose and scope of the EDP is with the rationale for development in the Cylinder Program and the need for integration with other cylinder program components.

Section 2. Development Phases: Describes the EDP development process phases. The WCS (WBS, performance tree, and specification tree), specified in the PMP, is described in terms of development activity. The rationale for WBS assignment for development activities is presented. Describes the requirements for completion of each development phase.

Section 3. Organization, Planning, and Control: The EDP process flow of the development phases is summarized. Cylinder Program roles and responsibilities as applicable to development activities is presented. Describes the configuration management process. Presents the interface of the EDP process to the SEMP and integration with the PMP.

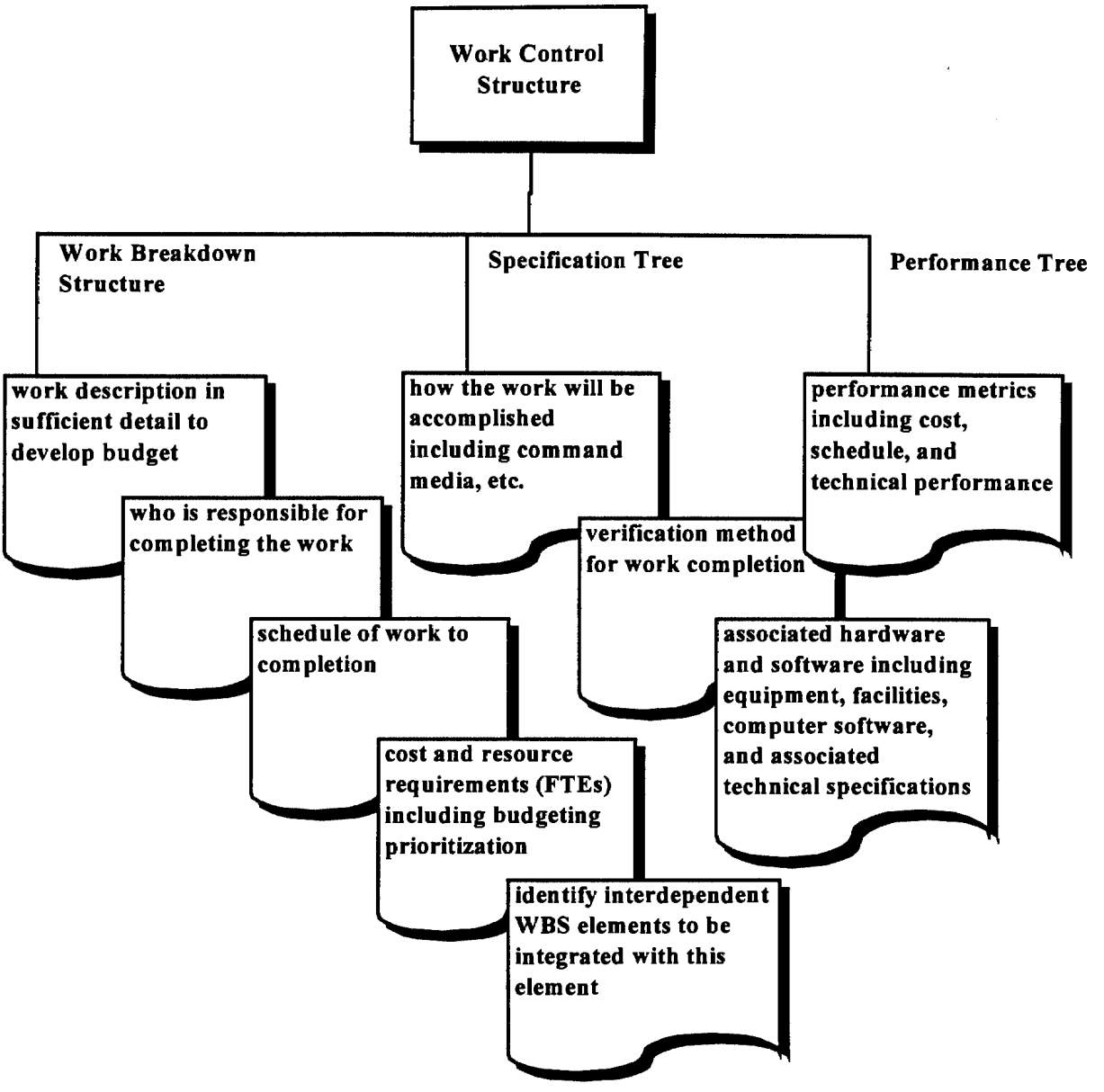

Fig. 1.2. Work control structure definition.

Section 4. Summary and Status of Development Plans: Summarizes, in table form, the ongoing and funded development activities in the UF_6 Cylinder Program. Describes the relationship and correlation of current development activities to the Needed Actions identified in the SEMP.

Appendix A: EDP Activity WCS Forms for Current Activities: Presents a WCS Form for each Cylinder Program development activity that is funded.

Appendix B: EDP Activity WCS Form and Instructions: Presents the blank WCS Form and instructions.

Appendix C: Correspondence of SEMP Needed Actions to EDP Activities: The "Needed Actions" from the SEMP Appendix D that pertain to development are summarized in table form. Descriptions of Actions is reproduced with WBS elements assigned to each development action.

2. DEVELOPMENT PHASES

The EDP development process is broken into distinct sequential steps. The phased development process provides the ability to control development as the need is verified, specified, then integrated into the program as a development activity. Documentation of all phases of development activities includes:

- verification of activity proposal against known program requirements, priorities, and schedules;
- monitoring of activity performance, cost, and schedule; and
- verification of final development results against most current program requirements.

For control of development activities, a WCS Form (Appendix B) has been created. After this WCS Form is completed, it is static and becomes the development activity contract. It specifies boundaries, scope, and expected results. Once this form is approved for an activity, the UF_6 Cylinder Program configuration control process, (described in the PMP and SEMP) will control changes to the form and the development activity.

In practical application, the WCS Form is completed in phases, increasing in detail and definition from the proposal phase to initiation of the development activity. The completed WCS Form is used as the work control document for the development activity and ensures activities are prioritized and scheduled appropriately.

The development process and the development phases are consistent with the PMP in that the development activity is a special case of regular programmatic activity where new information is needed before implementation. The process flow described in the next five sections is shown in Fig. 2.1.

2.1 ACTIVITY PROPOSAL

The EDP process begins with identified potential development activities. These activities are identified through audits; surveillance; cylinder yard walkdowns; development of procedures; reviews; new technical and/or compliance requirements; technological breakthroughs; or new ideas on technical, financial, or program management. The technical program manager receives a request or proposal. The initial documentation (on the WCS Form) is completed to solicit program resources and to request verification of program needs relative to existing activities, including other development.

Activities proposed because of new information (e.g., audits, new information) but not a requirements analysis will likely propose a technical or system requirement reference and subsequent requirement analysis. A rigorous scope verification is still required to verify integration with other

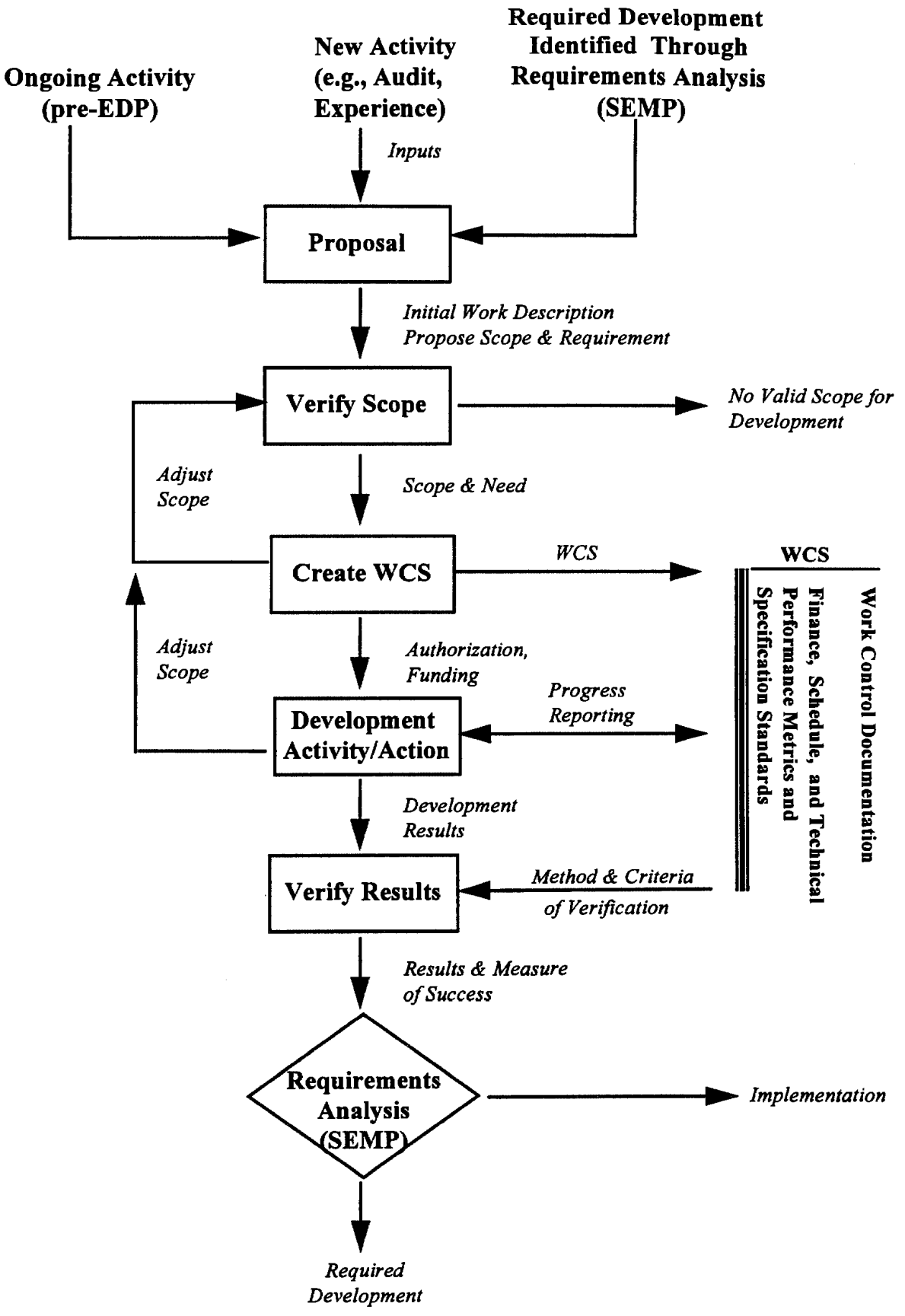

Fig. 2.1. Development process.

program activities, components, systems, and requirements. Ongoing and existing activities will be documented initially as proposed activities until requirements and scope are formally verified. Completion of the WCS Form as a work control document will follow quickly. A proposed action as a result of a requirements analysis may have the appropriate scope developed. The proposal phase then documents the activity as development, with an appropriate WBS element assigned in subsequent phases of this process. (See Development Process Fig. 2.1).

2.2 SCOPE VERIFICATION

The scope verification phase will (1) determine if the proposed work plan is properly related to system and technical requirements, (2) evaluate if and how the proposed work plan is integrated with other elements of the system (development and implementation such as interfacing components and operations), and (3) establish a results verification statement and method.

The scope verification phase may be repeated if, in the course of the development, circumstances necessitate the development plan be revised in scope. Circumstances may include the revision of a requirement, the integration of the new development activity, or unexpected interim results of the development activity.

The scope verification phase is the responsibility of the Technical Program Manager. The manager has full authority to complete this phase and assign a Lead Developer. To facilitate completion of this phase, the Technical Program Manager may call upon the UF_6 Cylinder Program Configuration Control Board, individual members or the board, or any competent individual knowledgeable of the system and development action(s).

2.3 WORK CONTROL STRUCTURE FORMULATION

The WCS defines the tasks within the system, as well as necessary hardware, software, processes, responsible persons, work control documents, and resources needed to accomplish the mission of the UF_6 Cylinder Program. The WCS consists of a WBS, a specification tree, and a performance tree. The UF_6 Cylinder PMP establishes and defines the WCS and includes the control structure necessary for the development activities. This section further defines the WBS elements and the specification and performance trees as relevant to the development activities.

2.3.1 Work Breakdown Structure

The WBS is a multi-level framework that organizes and graphically displays elements representing work to be accomplished in logical relationships. All the work contained in the WBS must be estimated, scheduled, and budgeted. The basic function of the WBS is to isolate costs to the lowest meaningful level in order that the costs associated with a single component or activity can be identified.

The WBS was created by collecting the SEMP actions into logical packets of work. The overall UF_6 Cylinder Program WBS is defined and controlled in the PMP.

The top level of the UF_6 Cylinder Program WBS is:

1.1 Cylinder Stabilization and Storage Improvement
1.2 Surveillance and Maintenance
1.3 Development
1.4 Conduct of Operations
1.5 System Administration

The entire WBS diagram is shown in Fig. 2.2.

The Development element of the WBS is divided into three sub-elements: Technical, Engineering, and System. These are defined as follows:

- **Technical Development** creates and documents the basis or foundation for program activities or components. Specification boundaries for activities or components are identified and documented.

  Examples of Technical Development
  - structural analysis to determine boundary conditions for cylinder performance.
  - safety analysis
  - non- routine information gathering and analysis
  - field and laboratory studies

- **Engineering Development** uses existing requirements, specifications, or the results of Technical Development to create operational or design specifications for a component or activity.

  Examples of Engineering Development
  - development of a physical or specific product
  - development of cylinder yard slope criteria to assure acceptable yard drainage

- **Systems Development** integrates technical or engineering development results into existing UF_6 Cylinder Program configuration and activities. It also includes modification, optimization, and integration of the existing UF_6 Cylinder Program configuration and activities.

  Examples of System Development
  - Quality assurance aspects related to cylinder yard slope construction and contractor selection required to meet yard drainage criteria
  - Integration of cylinder yard maintenance activities to ensure acceptable yard drainage is maintained

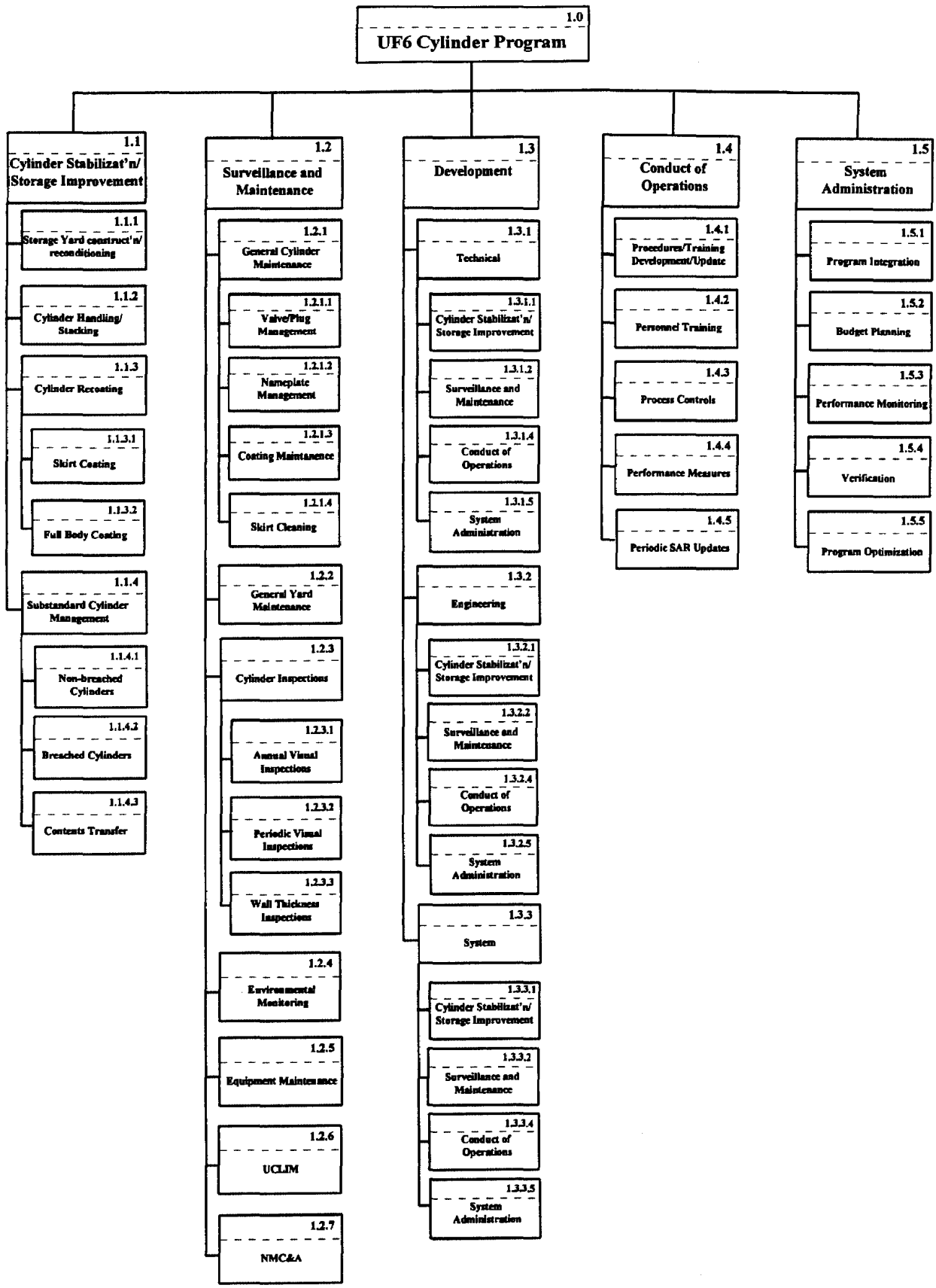

Fig. 2.2. Work breakdown structure diagram.

Development activities are assigned a WBS number by the UF_6 Cylinder Program Manager. The numbering scheme associated with the EDP activities is as follows. When an activity is proposed and the scope is verified, it is categorized into one of the three sub-elements, (technical, engineering, or system) as defined above. Then the activity is evaluated to determine where within the program WBS the majority of the development results will be implemented. Many development activities will encompass more than one program WBS element, but a management judgement will be made to determine the element that is the major driver for the development activity. A WBS number is then assigned to the activity such that it is indicative of the sub-element category and the related major WBS category. Fig. 2.3 shows the relationship between the numbering scheme for activities and the WBS top level elements.

Development	Operations		Administration	
1.3 Development	1.1 Cylinder Stabilization/ Storage Improvement	1.2 Surveillance and Maintenance	1.4 Conduct of Operations	1.5 System Administration
1.3.1 Technical (T)	1.3.1.1	1.3.1.2	1.3.1.4	1.3.1.5
1.3.2 Engineering (E)	1.3.2.1	1.3.2.2	1.3.2.4	1.3.2.4
1.3.3 System (S)	1.3.3.1	1.3.3.2	1.3.3.4	1.3.3.5

Fig. 2.3. Development WBS matrix.

2.3.2 Specification Tree

Specifications of an element dictate/show how work is to be performed and define the expectations of the product. Specifications identify hardware, software, and work control documents (contracts, interface working group charters, work plans, procedures, etc.) necessary to accomplish a given development activity. Specification components unique to development activities indicate the acceptable boundaries necessary for the development activity result. This is reflected in the work description and the anticipated deliverable sections of the EDP Activity WCS Form (Appendix B). Development activity specifications are requirements oriented and include the determination of the verification method and evaluation criteria that designate product acceptability. Objectives of including specifications in the development activity control process are to enhance clarification across diverse and dispersed activities. Because specifications are part of the controlled development activity process, the opportunity is created to minimize duplication of development intent and ensure comprehensive response to system needs. At the program level, specifications are developed for activities or development actions identified by the SRD functional analysis and the SEMP

requirements analysis. Management level specifications, including funding and reporting requirements are derived from the PMP.

2.3.3 Performance Tree

The WCS also includes performance measurements for individual development activity and the system as a whole. The EDP Activity WCS Form facilitates the designation of performance metrics for each development activity, if warranted. These determinations will be made for each development activity during review. It is expected that, at a minimum, budget and schedule will be tracked. Performance objectives will quantify performance against expectations to the extent it is possible to make a decision regarding use of the final development product. The program as a whole will track development progress at the specified frequency to quantify how the system has benefited from development activity in terms of system cost and schedule "savings" or impacts. The Technical Program Manager and the Lead Developer work with the UF_6 Cylinder Program Manager to develop appropriate schedules for completion, including intermediate deliverables.

2.4 DEVELOPMENT ACTION

The Development Action portion of the EDP process indicates the actual accomplishment of the development activity. Development proceeds as stated on the WCS Form and in specific detailed development plans. Development progress reporting allows development progress to be communicated to the UF_6 Cylinder Program Manager for adjustments or verification in the integrated program activities and priorities. It also allows for communication of new or changing program requirements to the development activities. In circumstances where program requirements have significant changes or interim development results (good or bad) are unexpected, the overall cylinder program can be adjusted.

Requirements for routine progress reporting are determined by parameters specified by the program configuration control. Additional interim reporting requirements could be imposed in cases of high risk development in terms of program schedule, program priorities, or cost limitations. Some development activities of short duration, small resource requirements, or low risk may not necessitate interim reporting. Interim reporting of development progress includes a technical, schedule, and budgetary comparison between actual and expected performance as specified on the WCS Form. Progress reporting allows the UF_6 Cylinder Program Manager to compare development activity progress relative to other program activities in terms of cost, schedule, and development results.

2.5 RESULTS VERIFICATION

The results verification phase is completed after the development is finished. The results verification statement and method that were determined as part of the WCS Form specification before the development began (see Section 2.2) are used to complete this verification phase. The

possible outcomes of the results verification phase are: (1) intent wholly satisfied, (2) intent partially satisfied, (3) intent not satisfied.

Upon completing the results verification phase, development findings are documented and then controlled (see Configuration Management section). The SEMP decision process determines the disposition and use of development results. This decision-making process is managed through the configuration control board. A "intent partially satisfied" result requires constraints on the implementation be specified for resolution by the SEMP requirements analysis process before implementation. A "intent not satisfied" outcome requires an analysis of alternative methods for complying with the system and technical requirements. Alternative methods may be suggested by the Lead Developer.

The Technical Program Manager has responsibility and authority for the results verification phase. To facilitate completion of this phase he/she may call upon the UF_6 Cylinder Program Configuration Control Board, individual members of the control board, or any competent individual knowledgeable of the system and development action(s). The results verification may be integrated into the final steps of the development activity. However, the Technical Program Manager must approve the outcome of the results verification (i.e., intent wholly satisfied, intent partially satisfied, intent not satisfied).

3. ORGANIZATION, PLANNING, AND CONTROL

3.1 EDP PROCESS

The EDP process begins with the identification of a need for development. The development need is documented in the program as a proposal with a suggested work scope and a potential unaddressed system requirement via the WCS Form and instructions in Appendix B. A development activity owner is designated as Lead Developer by UF_6 Cylinder Program Manager or the Technical Program Manager. The Lead Developer is then tasked to prepare the EDP worksheet for submittal to the Technical Program Manager for scope verification. An initial assessment of program priorities and availability of resources may be made as part of the scope verification.

Progression through the development process is guided by signature authority, which verifies performance and completion of each process element. In some cases, additional verification is warranted by a team or working group of technical experts or management. The development elements and processes are consistent with the PMP and conform to program configuration control. The development process accommodates required development actions as well as current ongoing activities. Current development activities are entered into the process at the proposal phase. The current work scope is verified against existing program requirements and adjusted as necessary. Development continues as indicated by the scope verification.

The completed WCS Form is used as a work control document for the development activity. At the completion of the WCS Formulation phase, program management and technical experts have verified the need and priority for the development activity. The methods and test matrix are created and documented which will measure progress and success. The development is then scheduled, funds are authorized, and the Lead Developer initiates the development activity.

The development activity is monitored throughout the development cycle. Development progress and cost are reported to the UF_6 Cylinder Program Manager per the milestones and schedules set forth in the WCS Form. Intermediate deliverables are used to track progress and possibly extract interim useful results for implementation.

Upon completion of the development activity, results will be reviewed by the UF_6 Cylinder Program Manager and the management team will verify development results meet the specifications set forth in the initial WCS and the results are still relevant to current program activities and requirements. Development results, as appropriate, will be scheduled for implementation.

3.2 METHOD OF SYSTEM INTEGRATION

Overall system integration relies on the same elements detailed in Section 2.0, Development Phases, for each development activity. Upon completion and verification of a particular development activity resulting in a change to the system (as depicted in the WBS), the action is added to the system through the WCS process. Responsibility is specified via work control

documents such as memoranda of understanding (MOUs) or contracts that include activity or product specifications and verification methods. Required funds are estimated and specified if they are or can be made available in the current year budget. The action is added, as appropriate, to the UF_6 Cylinder Program WBS. If funds are not available, the action is accumulated in the PMP revision (or change) file with others to be proposed in the next budget cycle and subsequently added to the WBS. Performance measurements for the action and that relate the action to the overall system performance may include cost, schedule, and technical aspects of the action and system. These are developed, specified, and documented during completion of the WCS Form.

3.3 ROLES AND RESPONSIBILITIES

3.3.1 DOE

Management of DOE's depleted, natural, and enriched uranium is the responsibility of the Office of Nuclear Energy (NE-1) and the Office of Facilities (NE-40). The Director of NE is responsible for executing DOE's obligations with respect to materials not transferred to or generated by USEC in accordance with Energy Policy Act of 1992. The Director of NE reports to the Secretary of Energy and is also responsible for ensuring execution of DOE's 1995 Implementation Plan commitments to DNFSB. Overall program policy, planning, and management with particular emphasis on maintaining integration in support of ultimate material disposition are carried out by the Director, a principal subordinate in the Office of Facilities, or a designee (the Assistant Manager for Enrichment Facilities).

3.3.2 UF_6 Cylinder Program Organization

The UF_6 Cylinder Program organization is shown in Fig. 3.1. The organization includes functions that report to the management and operating (M&O) contractor program manager (three-site UF_6 Cylinder Program Manager). The UF_6 Cylinder Program Manager receives direction from the Assistant Manager for Enrichment Facilities, DOE-ORO, and his designee. The matrix organization is composed of central staff—along with operations, maintenance, and compliance support—defined by MOUs or contracts between Lockheed Martin organizations (such as LMES, LMER, LMUS) and subcontractors. A small central UF_6 Cylinder Program staff assists the UF_6 Cylinder Program Manager with technical and financial planning and monitoring, reporting results to the DOE customer, and providing program guidance to the three sites. These staff members represent various technical and compliance organizations at the K-25 Site, PORTS, PGDP, and the Oak Ridge National Laboratory. Cylinder yard operations are led by a site UF_6 Cylinder Program Manager at each of the three sites. Operations and maintenance support are provided directly (or through MOU) by Lockheed Martin organizations at the three sites. Health, Safety, Environmental, and Quality support are provided similarly. Technical staff in each organization is committed to the UF_6 Cylinder Program via the MOU which specifies quality, performance and knowledge required for each task. This enables the Program Manager and Technical Manager to accomplish each task in an expeditious manner and apply the best expertise to completion of the task.

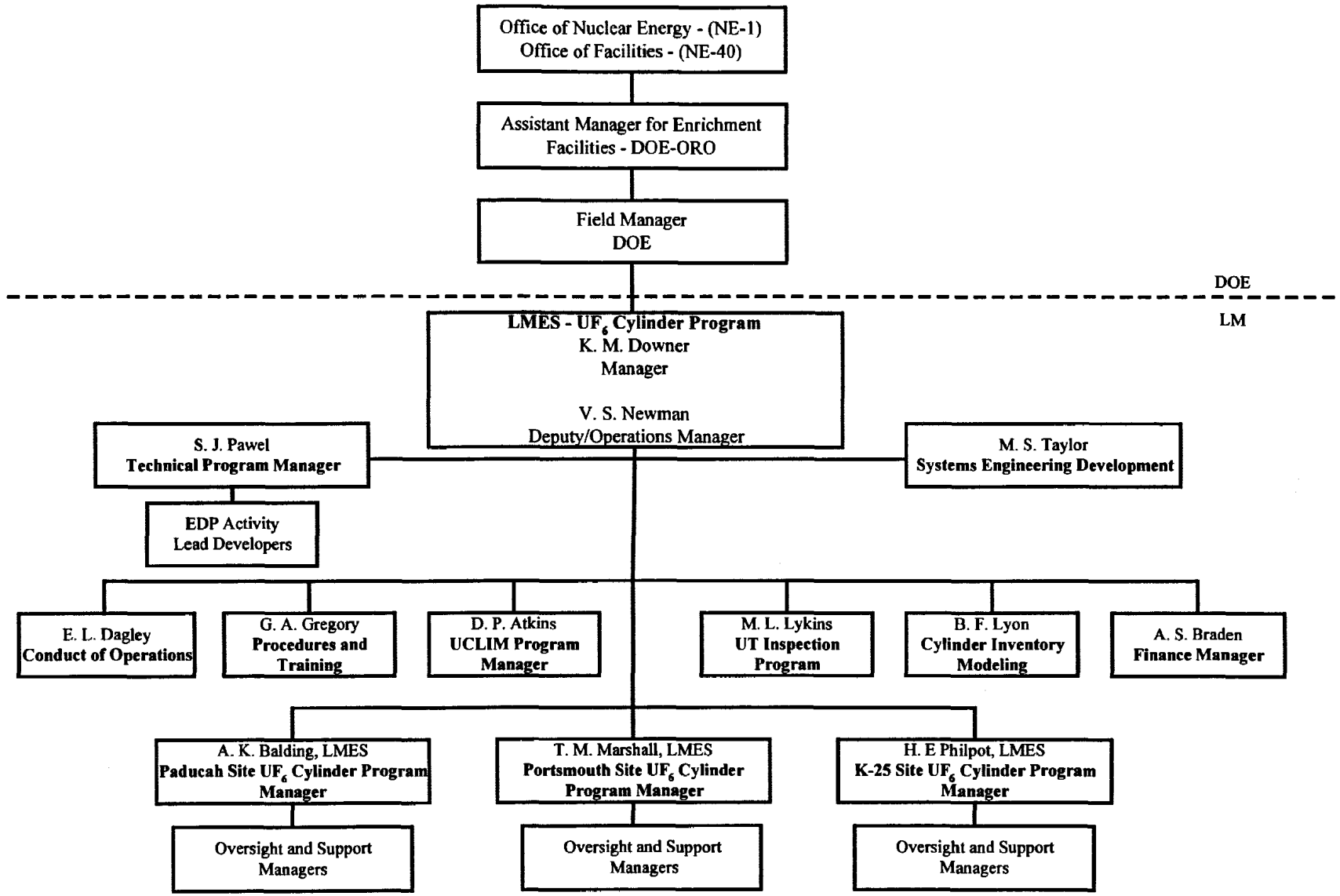

Fig. 3.1. Program organization chart.

3.3.3 UF_6 Cylinder Program Manager

The UF_6 Cylinder Program Manager is responsible for approval of all phases of the development activities. The approval signature is required at the completion of each development phase before proceeding to the next phase. The UF_6 Cylinder Program Manager will rely on information provided by the Technical Program Manager, the Lead Developers, or other designated persons who are knowledgeable about the system process and the development activity.

When the scope verification of a development activity is completed, the UF_6 Cylinder Program Manager prioritizes this activity against other program activities and then funds are authorized. When funding has been authorized, the UF_6 Cylinder Program assigns a WBS number to the activity and signs the "WCS Complete", indicating authorization for the development activity to proceed as scheduled on the WCS Form.

Upon completion of a development activity, the UF_6 Cylinder Program Manager and any necessary management team members will review the results to determine the relevancy to other program activities, such as requirements; physical, functions, and financial configurations; and program documents such as procedures. Once this review is completed, it is the responsibility of the UF_6 Cylinder Program to ensure that the results are appropriately incorporated into the program.

3.3.4 Technical Program Manager

As the need for new engineering development activities is identified, the Technical Program Manager initiates the engineering development process. The Technical Program Manager prepares the EDP Activity WCS Form (See Appendix B) and submits it to the UF_6 Cylinder Program Manager for approval.

The Technical Program Manager is responsible for scope verification. The manager has full authority to call upon the UF_6 Cylinder Program Configuration Control Board; individual members of the control board (e.g., the UF_6 Cylinder Program Manager); or any competent individual knowledgeable of the system and development activities. As part of scope verification, the Technical Program Manager assigns a Lead Developer to the development activity. When the Technical Program Manager has completed scope verification, the information is presented to the UF_6 Cylinder Program Manager for signature that scope verification has been satisfactorily completed.

Once the Lead Developer has been assigned and scope verification approved, the role of the Technical Program Manager becomes predominantly one of oversight. The Technical Program Manager coordinates and approves specification parameters and references, including verification method and evaluation criteria. The Technical Program Manager is responsible for following the progress of the activity and overseeing the Lead Developer in the completion of the WCS Form and the completion of the actual development activity. The Technical Program Manager is also responsible for compiling the status of the various development activities and reporting this status to the UF_6 Cylinder Program Manager per the milestones and schedules set in the WCS Form.

Upon completion of the development activity, the Technical Program Manager is responsible for verification of the results. Again, the Technical Program Manager has full authority to call upon the UF_6 Cylinder Program Configuration Control Board; individual members of the control board (e.g., the UF_6 Cylinder Program Manager); or any competent individual knowledgeable of the system and development activities. The Technical Program Manager completes the results verification phase by completing the WCS Form and submits the form to the UF_6 Cylinder Program Manager for approval and closure.

3.3.5 Lead Developer

The Lead Developer is responsible for working with the Technical Program Manager to define the scope of a development activity. Each development activity may have a different Lead Developer or one Lead Developer may be responsible for several development activities. Before the WCS Form is submitted to the UF_6 Cylinder Program Manager for prioritization, the Lead Developer must identify the specification, evaluation criteria, cost and schedule. The Lead Developer must coordinate with other program functions to develop appropriate metrics for cost, schedule, and performance to ensure that the development expectations are met. The Lead Developer is responsible for carrying out the actual development work and reporting status to the Technical Program Manager per the milestones and schedules set in the WCS Form.

3.3.6 Advisory Working Group

The Advisory Working Group will report to and advise the UF_6 Cylinder Program Manager, LMES-OR. It will undertake review and evaluation of program activities as assigned by the Program Manager. The Advisory Working Group will be composed of members selected by the Program Manager based on specific expertise in the cylinder program activity. For development, the objectives of the group may include:

- facilitate sequencing, interrelationship and integration of development activities and results;
- verify that actions address the system and technical requirements and meet the intent of mission and major ojectives;
- evaluate program change proposals;
- review and evaluate work descriptions to ensure proper scope, subtasks, allocated resources, and associated specifications; and
- review and evaluate work descriptions for appropriate application of specialty engineering expertise to meet program requirements.

3.3.7 Configuration Control Board

The Configuration Control Board is appointed by the UF_6 Cylinder Program Manager for the purpose of reviewing and approving or disapproving proposed changes to the physical and functional configuration. The configuration control board consists of a representative from each of the following disciplines: Program Management (Chairman), Systems Engineering, Operations, Environmental Safety and Health, Quality Assurance, Technical (metallurgy), and Risk Assessment.

3.4 CONFIGURATION MANAGEMENT

Configuration Management ensures that consistency among the physical, functional, and financial configuration, the requirements, and the related documentation is established and maintained throughout the systems' life cycle with special emphasis on control of changes. Configuration Management is an integral part of the Systems Engineering process for system definition and control. Its role is to:

- identify the configuration items (CIs) to be maintained throughout the system's life cycle;
- control changes to those CIs (including documentation); and
- access development and implementation status of the baseline.

The financial configuration is the system operational milestones and associated financial requirements. The financial configuration provides the business management baseline expectations of the program that operates the system. (See the SEMP for a discussion of financial configuration and the financial configuration control process.)

Changes to the physical or functional configuration can be authorized only by the Configuration Control Board. Proposed changes to design are classified as either Class I, Class II, or Class III changes. Class I changes are those pertaining to the system safety basis and system requirements and need DOE approval. Class II changes affect form, fit, function, or three-site consistency and do not alter the system's safety basis. Class I and Class II changes must be approved by the three-site configuration control board. All other changes are Class III changes; site Configuration Control Boards generally authorize Class III changes. Changes are prioritized as "emergency, urgent, or routine" and processed according to the priority of the change. Emergency changes should be processed before urgent changes and routine changes.

Any proposed changes in the physical, functional, or financial configuration of the UF_6 Cylinder System will be reviewed for relevancy to the EDP and development activities and the need to revise the EDP and/or adjust development activity scope will be determined. Similarly, changes in the EDP and results of development activities will be reviewed for relevancy to the physical, functional, and financial configurations, and necessary revisions will be made.

The EDP is categorized as an "essential document" for sustaining the system, (see the SEMP for further discussion of UF_6 Cylinder Program Configuration Management process) and is considered a configuration item and placed under configuration management. Controlled copies will be distributed to program and line personnel who need a controlled copy. This will ensure that recipients have copies of the most current controlled issue. Controlled copies will be identified with unique numbers and will be distributed via controlled copy management, including a change control system.

4. SUMMARY AND STATUS OF DEVELOPMENT PLANS

The following table summarizes existing and currently funded development activities. Table information includes deliverable description, SEMP Appendix D reference, development responsibility, scheduled completion dates, WBS number, and estimated costs. All ongoing and existing activities are documented as being in the proposal phase. Once the EDP process is finalized and published, these ongoing activities will be processed through a formal scope verification and the WCS form completed through the "Create WCS" phase. The scope verification phase will ensure the complete and appropriate actions from SEMP Appendix D referenced for each development activity.

Activities include development of management systems (such as the configuration management process for the cylinder program to the conduct of technical studies), and computer analyses and modeling (such as corrosion studies, inventory modeling, and stress analyses of the various cylinder types). As new requirements and technological improvement opportunities are introduced into the program, they will be processed through the EDP process described in this document. Information from the individual development activities will provide sound, basic information for cylinder program planning and budgeting. This EDP provides the framework to capture the development activities and associated costs that are key to continued successful maintenance of cylinder integrity and the UF_6 inventory.

A cross-reference table in Appendix C, Correspondence of SEMP Needed Actions to EDP Activities, provides a listing of the SEMP Appendix D Needed Actions that pertain to development activity. That table lists the Needed Action number and description for (1) all Needed Actions originally allocated in the SEMP as development, (2) Needed Actions originally allocated to development, but changed to implementation after review for the EDP, and (3) Needed Actions changed from implementation to development after review for the EDP. For each Needed Action, the origin of the action and status of assignment to development activity is noted. Current development activities which address DNFSB/TECH-4 concerns are also noted.

Additional information on the development activities listed in the Section 4 table and the Appendix C table is provided in the Appendix A table, EDP Activity WCS Forms for Current Activities.

Development Activity Summary

Deliverable	SEMP App. D Reference	Responsibility (organization/owner)	Schedule (completion date)	Deliverables WBS Number	Cost
Activity Title: Configuration Management Plan					
Prepare draft Configuration Management Plan	3.1.1.3.1.1	E. L. Dagley	06/26/96	1.3.2.4.2	$38K
Prepare final Configuration Management Plan			07/31/96		
Activity Title: Laboratory Performance Evaluation for Pilot Coating System[a]					
Receive final report summarizing results	2.1.1.2.1	S. J. Pawel	03/15/97	1.3.2.1.2	
Accept final report			04/15/97		$45K
Activity Title: Field Performance Evaluation for Pilot Coating System[a]					
Complete pilot painting effort	2.1.1.2.7, 2.1.1.3.4, 2.1.2.3.3	S. J. Pawel	10/31/96	1.3.2.1.1	
Conduct initial 6-month exposure inspection			05/01/97		$6.5K
Report on initial inspection			07/01/97		$6.5K
Conduct 2-year exposure inspection			11/01/98		$6.5K
Report on 2-year inspection			01/01/99		$6.5K
Activity Title: Optimization Analysis for Cylinder Recoating Activities					
Issue initial model results	2.1.1.2.4	P. C. Stumb	02/01/96	1.3.2.1.5	$30K
Issue final report			06/15/96		$20K

Development Activity Summary (continued)

Deliverable	SEMP App. D Reference	Responsibility (organization/owner)	Schedule (completion date)	Deliverables WBS Number	Cost
Activity Title: Saddle Design[a]					
Prepare evaluation report regarding feasibility of use of saddle	2.1.2.2.2, 2.1.2.2.3, 2.2.1.2.4.1	B. H. Howard	08/30/96	1.3.2.1.4	$30K
Activity Title: Evaluate Alternative Measures to Mitigate Damage to Cylinders[a]					
Prepare budget totals and phasing	2.2.1.2.4	B. H. Howard	09/30/96	1.3.2.1.3	[b]
Prepare evaluation report					
Activity Title: Inventory Modeling[a]					
Update inventory model	1.2.2.2.1.2	B. F. Lyon	07/31/96	1.3.1.2.1	$38K
Update 1 in 10 sampling plan			07/31/96		$25K
Activity Title: Cylinder Condition Categorization[a]					
Prepare results summary report	4.2.1.2.2	B. F. Lyon	09/30/96	1.3.1.2.2	$25K
Activity Title: Ultrasonic Thickness Measurement Program[a]					
Evaluate 1100 cylinders at the sites	4.1.2.2.4.4	M. L. Lykins	09/30/96	1.3.1.2.4	$453K
Procure P-Scan System			09/30/96		$498K

Development Activity Summary (continued)

Deliverable	SEMP App. D Reference	Responsibility (organization/owner)	Schedule (completion date)	Deliverables WBS Number	Cost
Activity Title: ASME Code Interpretations					
Evaluate 10- and 14-ton UF_6 storage cylinders (initial report)	4.1.2.2.2, 4.1.2.2.2.1	M. L. Lykins	03/25/96	1.3.1.2.3	$150K
Evaluate 10- and 14-ton UF_6 storage cylinders (final report)			09/30/96		
Evaluate 12.8- and 19-ton (CV) UF_6 storage cylinders			09/30/96		
Evaluate 2½-ton (30A) UF_6 storage cylinders			09/30/96		
Activity Title: Storage and Handling Guide					
Prepare draft document	2.2.1.2.1, 2.2.1.2.2, 2.2.1.2.3, 2.2.1.2.3.1	R. E. Dorning	09/15/96	1.3.1.5.1	$160K
Activity Title: Cylinder Inspection Requirements[a]					
Evaluate various inspection requirements and identify areas of duplication	4.1.2.2.2, 4.1.2.2.4	C. K. Stalnaker	9/30/96	1.3.3.2.2	$25K

Development Activity Summary (continued)

Deliverable	SEMP App. D Reference	Responsibility (organization/owner)	Schedule (completion date)	Deliverables WBS Number	Cost
Activity Title: Stress Analysis on all Cylinder Types					
Determine filling and post-fill cyl. handling stresses	2.2.1.2.3.1, 2.2.1.2.4	J. A. Horak	09/30/96	1.3.1.1.1	$100K
Activity Title: Prepare Safety Analysis Report for UF_6 Cylinder Operations at K-25, PGDP, and PORTS[a]					
Complete SARs/TSRs	1.1.2.2.2, 1.1.2.2.3, 1.1.2.3.1	W. R. Brock	09/30/96	1.3.2.4.1	$850K
Complete Environmental Assessments			09/30/96		$150K
Activity Title: Cylinder Valve/Plug Management[a]					
Develop valve/plug management program	2.1.5.2.1, 2.1.5.2.2, 2.1.5.2.4, 2.1.5.2.4.1, 2.1.5.2.4.2, 2.1.5.2.4.3	C. K. Stalnaker	9/30/96	1.3.3.2.1	$62.5K

[a]This Development Activity addresses a DNFSB/TECH-4 concern.
[b]Cost are shown in the Saddle Design Development activity.

REFERENCES

1. *Integrity of Uranium Hexafluoride Cylinders*, DNFSB/TECH-4, Defense Nuclear Facilities Safety Board, May 5, 1995.

2. H. R. O'Leary, U. S. Department of Energy, *Implementation Plan,* letter to J. T. Conway, Defense Nuclear Facilities Safety Board, October 16, 1995.

3. *UF_6 Cylinder Program System Requirements Document,* K/TSO-001, Rev. 2, Lockheed Martin Energy Systems, Inc., EM and Enrichment Facilities Technical Support Organization, April 26, 1996.

4. *UF_6 Cylinder Program Systems Engineering Management Plan,* K/TSO-017, Lockheed Martin Energy Systems, Inc., EM and Enrichment Facilities Technical Support Organization, March 1996.

APPENDIX A
EDP Activity WCS Forms for Current Activities

WCS Forms for current Cylinder Program development activities are presented on the following pages. All current development activities have a WCS Form and are stated to be in the "Proposed" phase of the EDP process outlined in this document. As the EDP document and process is approved, these development activities will be conformed to the EDP process to verify scope and appropriate completion of the WCS. Completion of the WCS Form through the "Create WCS" phase of the EDP process will ensure proper documentation and control for the development activity.

REFERENCE

ACTIVITY TITLE: Configuration Management Plan **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 3.1.1.3.1.1 SEMP Rev/Date: K/TSO-017, Rev.0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.2.4.2 Owner: E. L. Dagley

Related WBS Elements: 1.4.3, 1.4.4, 1.4.5, 1.5.3, 1.5.4, 1.5.5

WORK DESCRIPTION: The Configuration Management Plan (CM) will be prepared and CM initiated for the three-site cylinder program. CM will include the financial configuration, the technical configuration (physical and functional), and the change control process.

Current Status: CM Plan being developed concurrently with PMP. Selection of Technical Assistance staff currently in progress.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Configuration Management Plan	0.3 FTE	7/31/96	On Schedule
Prepare draft Configuration Management Plan		6/26/96	
Prepare final Configuration Management Plan		7/31/96	
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: DOE 1324.2A, 1324.4A, 1324.5B, 1360.2B, 5480.19, 5480.20A, 5480.23, 4330.4B, 5633.3B, 5700.6C, 6430.1, 10 CFR 830.120, 10 CFR 835,

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS: Configuration Management managers at K-25 Site, Portsmouth, and Paducah; Dr. Charles Hall, retired Lockheed Martin Plant Manager, independent consultant.

VERIFICATION METHOD AND EVALUATION CRITERIA: Method: Audits, independent assessments of configuration control, document control, and records management. Evaluation criteria: 1) Are design basis documents integrated with safety analysis? 2) Are changes to system components and process control documents controlled? 3) Are the necessary disciplines involved with reviewing and approving configuration changes? 4) Does a records management system exist that provides records protection and retrievability?

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Laboratory Performance Evaluation for Pilot Coating System **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 2.1.1.2.1 SEMP Rev/Date: K/TSO/-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.2.1.2 Owner: S. J. Pawel

Related WBS Elements: _____

WORK DESCRIPTION: Collect accelerated weathering test data for the pilot coating system along with several other systems offered in response to the original request for proposal. Deliverable is a report document in technical format detailing tests and results.

CURRENT STATUS: Outside testing laboratory has been requested to draft proposal and statement of work.

Deliverables Schedule			Cost/FTEs	Deliverable Due Date	Milestone/ Status
Receive final report summarizing results				1/15/96	On Schedule
Acceptance of final report				1/15/96	On Schedule
Development Complete:					
Projected Costs:	Outside lab	$30-35K			
	Technical oversight and review	$5-10K	$35-45K		
Results Verification Complete					

SPECIFICATIONS

CONTROL DOCUMENTS:
(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: Review and acceptance of final report by the 3-site technical manager.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Field Performance Evaluation for Pilot Coating System **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 2.1.1.2.7; 2.1.1.3.4; 2.1.2.3.3 SEMP Rev/Date: K/TSO-017, Rev. 0 , March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____ Results Verified: _____

Scope Verified: _____ Development Complete: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.2.1.1 Owner: S. J. Pawel

Related WBS Elements: _____

WORK DESCRIPTION: Field surveillance and inspection of the pilot coating system. Inspection primarily visual assessment of performance - initially after six months and again at 2-3 year intervals as results dictate. Deliverable is a summary report of surveillance/inspection results.

CURRENT STATUS: Awaiting start of painting activities.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Completion of pilot painting effort		10/31/96	On Schedule
Initial six month exposure inspection		5/1/97	
Report on initial investigation		6/1/96	
Two year exposure inspection		11/1/98	
Report on two year inspection		12/1/98	
Development Complete: Projected Costs: Travel to PGDP/perform inspections (2 @ $5K) $10K Generation of report (2 @ $5K) $10K Assistance from PGDP personnel 6 man-days at $1K/day $ 6K	$26K		

SPECIFICATIONS

CONTROL DOCUMENTS:
(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: Acceptance of report(s) by deputy 3-site program manager.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

EDP Activity WCS Form

REFERENCE

ACTIVITY TITLE: An Optimization Analysis for Cylinder Re-Coating Activities **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 2.1.1.2.4 SEMP Rev/Date: K/TSO-017, Rev 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.2.1.5 Owner: P. C. Stumb

Related WBS Elements: _____

WORK DESCRIPTION: The focus of this optimization project is to develop a robust model that can be used to assist the site cylinder program managers in scheduling cylinder re-coating activities. Specifically, the model is designed to take certain user specified parameters (e.g. target yards, budget limits...) and generate an optimal schedule that defines both the number of cylinders to be painted per year and the priority selection scheme - by which the cylinders should be chosen.

Cylinder Activity Optimization: Optimization of cylinder painting and moving through use of "fuzzy goal programming".

CURRENT STATUS: An Optimization model has been developed and applied to the PGDP Cylinder Yards. Initial model results have been generated but these results have not yet been reviewed or verified by the responsible program managers., e.g. Downer/Newman/Balding.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Initial model results	$30K	2/1/96	Complete
Final Report	$20K	6/1/96	On Schedule 6/1/96
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: None

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: Final report will be scrutinized/refereed by a cross-functional team of senior academic advisors from the University of Tennessee.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Saddle Design **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 2.1.2.2.2; 2.1.2.2.3; 2.2.1.2.4.1 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____ Results Verified: _____

Scope Verified: _____ Development Complete: _____ ☐ intent wholly satisfied

☐ intent partially satisfied

☐ intent not satisfied

WBS

WBS Element: 1.3.2.1.4 Owner: B. H. Howard

Related WBS Elements: _____

WORK DESCRIPTION: Design a concrete saddle to support 10T and 14T UF_6 cylinders on their stiffener rings. An evaluation report to determine the feasibility of this activity is in progress.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Evaluation Report	$30K	8/30/96	On Schedule
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: N/A

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS: Central Engineering

VERIFICATION METHOD AND EVALUATION CRITERIA: Review and comment..

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Evaluate Alternative Measures to Mitigate Damage to Cylinders **REV:** 0

Development Activity Rank: ____

SEMP Action Item Number(s): 2.2.1.2.4 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____ Results Verified: _____

Scope Verified: _____ Development Complete: _____ ☐ intent wholly satisfied

☐ intent partially satisfied

☐ intent not satisfied

WBS

WBS Element: 1.3.2.1.3 Owner: B. H. Howard

Related WBS Elements: _____

WORK DESCRIPTION: Evaluate alternative measures for mitigating (or minimizing damage to cylinders); 1) lifting lug protectors, 2) weep hole drilling fixture, 3) saddle for 10T and 14T cylinder to prevent body contact, and 4) 30" cylinder end protectors.

Current Status: An evaluation report to determine the feasibility of this activity is in progress

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Budget totals and phasing	$50K		
Evaluation Report	*	9/30/96	
*Cost for this activity are included in Saddle Design Development Action			
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: N/A

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: Review and comment.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Inventory Modeling **REV:** 0

Development Activity Rank: ___

SEMP Action Item Number(s): 1.2.2.2.1.2 SEMP Rev/Date: K/TSO-17, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.1.2.1 Owner: B. F. Lyon

Related WBS Elements: _____

WORK DESCRIPTION: Conduct site specific corrosion coupon, corrosion probe and time-of-wetness studies and supporting ultrasonic thickness data collection. The coupon, probes and wetness studies are in the close-out phase with final reports due this fiscal year.

The ultrasonic thickness measurement program is ongoing with periodic updates of the Inventory Model. In addition, the program is to provide a statistically based UT sampling program - update the "1 in 10" moved philosophy currently being performed.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Update inventory model	.5 FTE	7/31/96	
Update 1 in 10 sampling plan	.5 FTE	7/31/96	
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS:
(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA:

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Cylinder Condition Categorization **REV:** 0

Development Activity Rank: ___

SEMP Action Item Number(s): 4.2.1.2.2 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.1.2.2 Owner: B. F. Lyon

Related WBS Elements: _____

WORK DESCRIPTION: Utilization of Inventory model information and cylinder history to individually categorize each cylinder into bins by thickness/condition.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Report summarizing results		TBD	
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS:
(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA:

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Ultrasonic Thickness Measurement Program **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 4.1.2.2.4.4 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.1.2.4 Owner: M. L. Lykins

Related WBS Elements: _____

WORK DESCRIPTION: The ultrasonic thickness (UT) measurement program is under way at the sites. Cylinder evaluations are conducted using an automated P-Scan system and hand-held UT measurements. The data are to be used in the Cylinder Inventory Model and the Corrosion Model. The program provides a statistical approach to the sampling plan required for the cylinder evaluations.

A second P-Scan system will be purchased that can be used at the three sites.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Evaluate 1100 cylinders at the sites	$453K	9/30/96	253 as of 4/30/96
Procure P-Scan System	$498K	9/30/96	In process
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS:
(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: The cylinder evaluations are being conducted by certified technicians in ultrasonics. A final report will be issued that describes the results of the cylinder evaluations.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: ASME Code Interpretations **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 4.1.2.2.2; 4.1.2.2.2.1 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.1.2.3 Owner: M. L. Lykins

Related WBS Elements: _____

WORK DESCRIPTION: The 10- and 14-ton UF_6 storage cylinders have been built in accordance to the ASME Boiler and Pressure Vessel Code, Section VII, Division 1. This program was developed to determine how the cylinders can maintain ASME code status. The interpretations will be used to assist program functions and supply information to the development of the UF_6 Storage and Handling Guide.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
ASME Code Interpretations Program		6/30/96	
Conduct evaluations on 10- and 14-ton UF_6 storage cylinders (initial report)		3/25/96	Complete
Conduct evaluations on 10- and 14-ton UF_6 storage cylinders (final report)		9/30/96	In process
Conduct evaluations on 12.8 and 19-ton (CV) UF_6 storage cylinders		9/30/96	In process
Conduct evaluations on 2 ½ ton (30A) UF_6 storage cylinders		9/30/96	In process
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS:
(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: A definitive document will be published by the independent consultant at the completion of the ASME Code Interpretations. The document will provide information regarding the original design requirements for the UF_6 storage cylinders.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Storage and Handling Guide **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 2.2.1.2.1; 2.2.1.2.2; 2.2.1.2.3; 2.2.1.2.3.1 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.1.5.1 Owner: R. E. Dorning/H. Henson

Related WBS Elements: _____

WORK DESCRIPTION: To deliver a draft guidance document to focus on storage and handling (during storage) of depleted uranium hexafluoride cylinders. This document will include information on a) cylinders used for storage, b) storage yard criteria, c) both periodic and in-service (handling) inspections, d) procedures for cylinder handling and 3) transport (on a one-time rather than a routine basis). The document will include technical discussion of storage options and concerns. The document will include or reference existing documentation and current work, but will, for most intents and purposes, stand alone.

CURRENT STATUS: Development process.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Draft document	$160K	9/15/96	Technical approval
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: Purchase Order 12K-DGD-94V

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: Technical review and approval.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Cylinder Inspection Requirements **REV:** 0

.Development Activity Rank: _____

SEMP Action Item Number(s): 4.1.2.2.2; 4.1.2.2.4 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____ Results Verified: _____

Scope Verified: _____ Development Complete: _____ ☐ intent wholly satisfied

☐ intent partially satisfied

☐ intent not satisfied

WBS

WBS Element: 1.3.3.2.2 Owner: C. K. Stalnaker

Related WBS Elements: Technical Development

WORK DESCRIPTION: Existing and planned inspections of cylinders include relocation, in-storage, valves, plugs, contamination monitoring, etc. A review will be conducted and documented that compares the various requirements and identifies areas of duplication and inconsistency for resolution.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
	.2 FTE	9/30/96	
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: K/TSO-17, EM & EF P2400, EM & EM P2402

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: Cylinder Inspection Requirements Report

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Stress Analysis on all Cylinder Types **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 2.2.1.2..3.1; 2.2.1.2.4 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____ Results Verified: _____

Scope Verified: _____ Development Complete: _____ ☐ intent wholly satisfied

☐ intent partially satisfied

☐ intent not satisfied

WBS

WBS Element: 1.3.1.1.1 Owner: S. J. Pawel/J. A. Horak

Related WBS Elements: Technical Development

WORK DESCRIPTION: To cover movement of cylinders with different types of handling equipment. Perform stress analysis for each cylinder type with lifting equipment described in handling procedures.

CURRENT STATUS: Development process.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
To determine filling and post-fill cylinder handling stresses	$100K	9/30/96	data package
To validate extension of the above measurements to degraded cylinders	$50K	5/30/97	data package
To determine maximum transient stresses during cylinder handling	$5K	9/30/97	data package
To formulate storage criteria	$25K	7/30/97	Report
Structural Analysis of UF_6 Cylinders	$100K	12/30/96	
Insitu Corrosion of UF_6 Cylinders	$30K	9/30/96	
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: TBD

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: TBD

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Prepare Safety Analysis for UF_6 Cylinder Operations at K-25, PGDP, and PORTS **REV:** 0

Development Activity Rank: _____

SEMP Action Item Number(s): 1.1.2.2.2; 1.1.2.2.3; 1.1.2.3.1 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____

Scope Verified: _____ Development Complete: _____

Results Verified: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.2.4.1 Owner: W. R. Brock

Related WBS Elements: 1.2.1.2 Safety Analysis

WORK DESCRIPTION: Produce Safety Analysis Reports for K-25, PGDP, and PORTS UF_6 Cylinder Yard operations.

CURRENT STATUS: All SARs are under way. The SAR for the K-25 Cylinder Yards will be facility specific and of stand alone quality. For PGDP and PORTS the DOE-retained cylinder yards will be addressed as part of the site-wide SARs. The SAR scopes are consistent with DOE Orders 5480.22 and .23 and DOE STD 3009-94. They will include environmental analysis, be complete and the results verified by 9/30/96.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
SARs/TSRs	$850K	9/30/96	
Environmental Assessments	$150K	9/30/96	
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: DOE Orders 5480.22 and .23 and DOE STD 3009-94.

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: LMES Internal Technical Review/Comment Resolution and DOE/ORO Technical Review/Comment Resolution.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

REFERENCE

ACTIVITY TITLE: Cylinder Valve/Plug Management **REV:** 0

2.1.5.2.1; 2.1.5.2.2; 2.1.5.2.4 Development Activity Rank: _____

SEMP Action Item Number(s): 2.1.5.2.4.1; 2.1.5.2.4.2; 2.1.5.2.4.3 SEMP Rev/Date: K/TSO-017, Rev. 0, March 1996

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____ Results Verified: _____

Scope Verified: _____ Development Complete: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: 1.3.3.2.1 Owner: C. K. Stalnaker

Related WBS Elements: Technical Development

WORK DESCRIPTION: A three-site plan and/or procedure(s) will be developed to specify requirements for the management of valve and plug defects. The procedure will include inspection, HF monitoring, and criteria for use in determining when a valve/plug must be changed or repaired.

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
	.5 FTE	9/30/96	On Schedule
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS: K/TSO-17, EM & EF P2400, EM & EF P2402

(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA: Performance evaluation of procedure implementation.

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

APPENDIX B
EDP Activity WCS Form and Instructions

The EDP Activity WCS Form consolidates the EDP process information into a single form and procedure for the development process. Completion of the WCS information accomplishes a specification for the development activity results and a work control document to facilitate management of the development. Proper completion of the form allows traceability of the need for development back to the UF_6 Cylinder Program system and technical requirements as indicated in the SRD and SEMP.

Summary instructions for the WCS Form are provided. Additional information related to each phase of development is contained in the text of the EDP.

REFERENCE

ACTIVITY TITLE: _____ REV.: ____

Development Activity Rank: _____

SEMP Action Item Number(s): _____ SEMP Rev/Date: _____

STATUS (signature/date)

Activity Proposal: _____ WCS Complete: _____ Results Verified: _____

Scope Verified: _____ Development Complete: _____

- ☐ intent wholly satisfied
- ☐ intent partially satisfied
- ☐ intent not satisfied

WBS

WBS Element: _____ Owner: _____

Related WBS Elements: _____

WORK DESCRIPTION:

Deliverables Schedule	Cost/FTEs	Deliverable Due Date	Milestone/ Status
Development Complete			
Results Verification Complete			

SPECIFICATIONS

CONTROL DOCUMENTS:
(e.g., command media, contracts, technical specifications, work plans, procedures)

ASSOCIATED RESOURCES AND SPECIFICATIONS:

VERIFICATION METHOD AND EVALUATION CRITERIA:

PERFORMANCE (IF APPLICABLE)

Budget Metrics: _____

Schedule Metrics: _____

Technical Metrics: _____

INSTRUCTIONS FOR EDP ACTIVITY WCS FORM

The summary information entered on the EDP Activity WCS Form is described in Section 2.0. Each development activity may have a separate detailed development activity plan referenced in the Work Description section. Instructions in the STATUS section outline the form completion process and requirements for each section. The Cylinder Program Manager has approval responsibility for all phases of development. Completion of the WCS Form ensures integration with ongoing or existing activities, including development.

REFERENCE SECTION

The reference sections provides summary information for tracking the development activity and requirements that are being addressed by the activity.

Activity Title

The short title describing the activity is initially provided by the proposer, and finalized as part of the scope verification.

WCS Form Revision Number (REV)

The form revision number indicates along with the Activity Title and WBS element number, a revision of the form. Forms are revised to adjust scope, budget, etc.

Development Activity Rank

The development activity rank is assigned by program management as a means of prioritizing program resources for different activities. The Cylinder Program Manager assigns Activity Rank as part of the WCS Formulation. Priority is defined priority relative to other program activities, including development.

SEMP Action Item Numbers

One or more SEMP action item numbers will be indicated that require this development activity. SEMP Action numbers may be suggested at the time an activity is proposed, but will be verified during the scope verification phase. Specific technical and system requirements from the SRD will be identified as appropriate.

SEMP REV/Date

The revision of the SEMP will be provided as a reference to relevant requirements.

STATUS SECTION

The status section indicates by signature and date the completion of a particular development phase. Development activity phases in sequence: Proposal, Scope Verification, WCS Complete, Development Activity, Results Verification.

Activity Proposal

At the activity proposal phase, the activity title is proposed with a Work Description estimate. An estimate of the scope with a citation of requirement is provided.

The work description begins as proposal text at the proposal phase. During scope verification the work description is finalized during scope verification and will include the identified scope of the development work.

Deliverables Table / Cost ($ or FTE) / Completion Dates / Priority
The Technical Program Manager works with the Lead Developer to create reporting requirements for tracking development activity progress. As a minimum, a scheduled date of completion, and estimated cost of the development activity is enter here.

SPECIFICATION SECTION
This section will be completed by the Lead Developer as part of the development activity WCS creation. Programmatic specifications, such as needed for cost and schedule, will be reviewed by the Finance Manager. Specialized technical information related to the development activity should be reviewed by the Technical Program Manager or other competent technical experts.

Control Documents
Enter references that will determine how and to what detail the development activity will be controlled and performed. Control documents are part of the PMP Specification Tree. Control documents could reference groups of consolidated requirements or standards which address specific areas of activity control.

Associated Resources
Descriptions and controlling specifications of equipment and facilities associated with the development activity are entered here. Detailed descriptions can be appropriately referenced or attached.

Verification Method(s) (of Development Activity Results)
Enter verification methods and criteria that will verify development activity results are correct. Detailed descriptions can be appropriately referenced or attached.

PERFORMANCE SECTION
Budget (totals and phasing)
Schedule (metrics and deliverables)
Technical (specific to activity)

The metrics that will be used to verify development activity performance and progress through the development phases are entered here during the documentation of the development activity WCS. This section is competed by the Lead Developer and approved by the Technical Program Manager. Program requirements for activity progress monitoring are part of the PMP.

APPENDIX C
Correspondence of SEMP Needed Actions to EDP Activities
–SEMP "E" Needed Actions to EDP WBS Elements–

Actions listed in the SEMP Appendix D were given a proposed assignment to the PMP for implementation or to the EDP for development. EDP Appendix C lists Needed Actions from the SEMP Appendix D that are related to development activity. Review of the SEMP Appendix D Needed Actions and correlation to current development activity and the WBS resulted in the following categories of Needed Actions listed in this appendix:

- Allocated to the EDP for development and has an identified Cylinder Program development activity that is in progress. The activity has been assigned a WBS element number. Activities in this category also have an EDP activity WCS Form in Appendix A.

- Allocated to the EDP for development but does not have a related current Cylinder Program development activity identified. The development action has not been verified in scope nor is it funded. The action (denoted as TBD) will be incorporated into a development activity by invoking the EDP process (i.e., scope verification, WCS creation, etc.).

- Allocated for development in the EDP but it has been determined after careful review the action (denoted as P) is ready for implementation and will be managed in the PMP.

- Allocated for implementation in the PMP, but it has been determined after careful review that the action (denoted as (P)E) requires additional development and will be managed in the EDP.

All current development activities are in the "Proposed" phase of the EDP process regardless of progress made towards completion of the activity. All development activities will be subjected to the EDP process defined in this document for proposal, scope verification, and WCS creation.

Correspondence of SEMP Needed Actions to EDP Activities

Action Number	SEMP "Needed Action" Description	WBS Number[a]
1.1.1.2.1	Identify and document all flow-down from the program objectives to components, activities, and subsystems.	1.3.2.4.1
1.1.1.2.2	Identify and document all functions, subfunctions, and interfaces needed to meet objectives. (Develop functional flow diagrams and interface diagrams.) [1.1.1.a]	1.3.1.2.3
1.1.1.2.2.1	Integrate the purpose of cylinder inspection functions including code inspections, periodic visual inspections, handling, transport, maintenance, and contents transfer functional acceptance inspections.	P
1.1.1.2.2.2	Integrate the functional flow of cylinder inspections, degradation studies, degradation factor monitoring, and cylinder maintenance.	P
1.1.2.2	Define the baseline configuration.	1.3.2.4.1
1.1.2.2.1	Identify the industrial, chemical, and radiological hazards within the program configuration (see requirement 1.1.1). [1.1.2.a]	1.3.2.4.1
1.1.2.2.2	Perform process hazards analysis (see requirement 1.1.1). [1.1.2.a]	1.3.2.4.1
I.1.2.2.3	Grade hazards to identify program emphasis areas for detailed analysis and development of controls. [1.1.2.a]	1.3.2.4.1
1.1.2.2.3.1	Record the hazard analyses in the safety envelope documentation. [1.1.2.a]	1.3.2.4.1
1.1.2.2.4	Determine required baseline maintenance including methods for keeping the hazards analysis current. [1.1.2.b]	P
1.1.2.2.4.1	Determine the periodicity of hazards re-assessment of program operations/conditions. [1.1.2.b]	P
1.1.2.2.4.2	Identify controls for triggering hazards assessment for new/modified operations. [1.1.2.b]	P
1.1.3.1	An analysis of optional methods includes the analysis of eliminating the risks(s) or controlling the risk(s).	1.3.2.4.1
1.1.3.2	Define baseline configuration.	1.3.2.4.1
1.1.3.2.1	Identify program risks relative to the configuration defined in requirement 1.1.1. Use identified standards for determining the relevance of program risks to other DOE and industry risks. [1.1.3.b]	1.3.2.4.1

[a]P = This action was allocated in the SEMP for development. Careful review indicates that further development is not needed; the action will be implemented in the PMP. (P)E = This action was allocated in the SEMP for implementation in the PMP. Careful review indicates that additional development is needed. TBD = This action was allocated in the SEMP as a development action but it has not been verified in scope nor is it funded. The action will be incorporated into development activity by invoking the EDP process (i.e., scope verification, WCS creation, etc.)

Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
1.1.3.2.1.1	Identify plausible accident scenarios given identified functional hazards. Plausible accident scenarios to be identified will include scenarios stemming from cylinder breaches into the ullage space and degraded cylinder conditions as possible initiators. [1.1.3.b]	1.3.2.4.1
1.1.3.2.1.2	Determine the probability of accidents scenarios occurring.	1.3.2.4.1
1.1.3.2.2	Determine controls necessary to decrease the probability of occurrence for accidents with unacceptable consequences to a tolerable level (ALARA). Controls are determined for anticipated operational states. [1.1.3.a, 1.1.3.b, 1.1.3.f]	1.3.2.4.1
1.1.3.2.3	Complete the risk analysis and risk control sections of the SAR relative to the program. [1.1.3.b]	1.3.2.4.1
1.1.3.2.3.1	Document the risk management matrix.	1.3.2.4.1
1.2.1.1	Perform an analysis of optional methods including the analysis of eliminating the risk(s) or controlling the risk(s).	1.3.2.4.1
1.2.1.2	Define baseline configuration.	1.3.2.4.1
1.2.1.2.1	Develop all program risk controls in accordance with the system configuration (see requirement 1.1.1). Integrate the development of risk controls with site requirements.	P
1.2.1.3.1	Identify current risks that are above acceptable program risks.	(P)E
1.2.1.3.2	Develop risk reduction actions.	P
1.2.2.2	Define baseline configuration.	1.3.2.4.2
1.2.2.2.1	Identify and select risk monitoring and evaluation tools to be used in the program. These tools will include technical and operational performance monitoring, company, corporate and industry lessons learned sharing, and investigations of occurrences. [1.2.2.b]	(P)E
1.2.2.2.1.2	Model corrosion to project cylinder integrity.	1.3.1.2.1; 1.3.1.2.2

[a]P = This action was allocated in the SEMP for development. Careful review indicates that further development is not needed; the action will be implemented in the PMP. (P)E = This action was allocated in the SEMP for implementation in the PMP. Careful review indicates that additional development is needed. TBD = This action was allocated in the SEMP as a development action but it has not been verified in scope nor is it funded. The action will be incorporated into development activity by invoking the EDP process (i.e., scope verification, WCS creation, etc.)

Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
1.2.2.2.2	Define standards for when and how these risk monitoring and evaluation tools will be used.	TBD
1.2.2.2.4	Determine method to verify baseline meets requirement.	TDB
2.1.1.2	Define baseline configuration.	1.3.2.4.2
2.1.1.2.1	Define performance objectives for coating (toughness, adhesion, porosity, repairability, life expectancy). [2.1.1.a, 2.1.1.c]	1.3.2.1.1; 1.3.2.1.2; 1.3.1.2.2; 1.3.2.1.5
2.1.1.2.2	Select coating.	1.3.2.1.1
2.1.1.2.3	Develop coating method including surface preparation, coating application, and curing.	1.3.2.1.1; 1.3.2.1.2
2.1.1.2.4	Establish a coating work plan and schedule that prioritizes cylinders on the basis of condition.	1.3.2.1.5
2.1.1.2.5	Test coating method.	1.3.2.1.1; 1.3.2.1.2
2.1.1.2.6	Determine method to verify baseline meets requirement. [2.1.1.c]	P
2.1.1.2.7	Determine the coating inspection and maintenance intent, method and frequency.	P
2.1.2.1	Analyze options to reduce cylinder time of wetness caused by cylinder structural features.	1.3.2.1.3
2.1.2.2	Define the baseline configuration.	1.3.2.4.2
2.1.2.2.2	Identify all cylinder structural features that retain water beyond acceptable time of wetness.	1.3.2.1.3
2.1.2.2.2.1	Define performance objectives of the cylinder structural features relative to the surveillance and maintenance function.	P

[a]P = This action was allocated in the SEMP for development. Careful review indicates that further development is not needed; the action will be implemented in the PMP. (P)E = This action was allocated in the SEMP for implementation in the PMP. Careful review indicates that additional development is needed. TBD = This action was allocated in the SEMP as a development action but it has not been verified in scope nor is it funded. The action will be incorporated into development activity by invoking the EDP process (i.e., scope verification, WCS creation, etc.)

Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
2.1.2.2.2.2	Integrate the structural feature performance for the surveillance and maintenance function with performance objectives for the other system functions.	P
2.1.2.2.3	Identify and evaluate modifications to cylinder structural features that retain water to allow drainage.	1.3.2.1.3
2.1.2.2.4	Develop a structural feature inspection and maintenance plan to maintain compliance with this requirement, and integrate the plan with the program.	P
2.1.2.2.5	Determine cylinder inspection/acceptance requirements for transitioning cylinders from one function to another if one cylinder acceptance criteria is not adopted for all functions.	P
2.1.2.2.6	Determine method to verify baseline meets requirement.	P
2.1.3.1	Analyze cylinder support structure options to minimize cylinder time of wetness and accomplish other system performance objectives.	1.3.2.1.3
2.1.3.2	Define baseline configuration.	1.3.2.4.2
2.1.3.2.1	Define performance objectives of cylinder support structures with respect to system functions including the interface with cylinder coatings, periodic inspections, and water drainage. [2.1.3.1, 2.1.3.b]	P
2.1.3.2.2	Identify cylinder support structures that do not meet performance objectives.	P
2.1.3.2.3	Identify and evaluate modifications to cylinder support structures to meet cylinder time of wetness performance objectives.	P
2.1.3.2.3.1	Assess current designs to determine their capacity to drain water.	1.3.2.1.3; 1.3.2.1.4
2.1.3.2.4	Determine inspection and maintenance methods to maintain compliance with this requirement.	P
2.1.3.2.5	Determine method to verify baseline meets requirement.	P
2.1.4.2	Define the baseline configuration.	1.3.2.4.2

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Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
2.1.4.2.1	Define, using technical basis, storage facility performance objectives including retention of moisture, operational use, and expected life. [2.1.4a, 2.1.4.b]	TBD
2.1.4.2.2	Identify storage facility features that retain water beyond acceptable time of wetness performance objectives.	1.3.2.1.3
2.1.4.2.3	Identify and evaluate modifications to existing storage facilities and new storage facility designs so that performance objectives are met.	TBD
2.1.4.2.3.I	Assess current storage facilities for deficiencies in meeting performance objectives.	1.3.2.1.4
2.1.4.2.4.1	Integrate storage array design with system functions including anticipated surveillance and maintenance of cylinders. [2.1.4.c]	TBD
2.1.4.2.5	Determine inspection and maintenance of storage facilities to maintain compliance with this requirement.	P
2.1.4.2.6	Determine method to verify baseline meets requirement.	P
2.1.5.2	Define the baseline configuration.	1.3.2.4.2
2.1.5.2.1	Identify performance objectives for cylinder valve and plugs for each system function under the anticipated operational states. Define performance in terms of industry standards to the extent possible.	1.3.3.2.1
2.1.5.2.2	Integrate these performance objectives with the required configuration f the valve and plug (packing, port and packing nut condition, valve body, threads showing, stem seat, torque, thread to boss interface including the presence of tape).	1.3.3.2.1
2.1.5.2.3	Determine inspection/acceptance requirements for transitioning from one function to another if one valve and plug baseline configuration is not implemented. [2.1.5.a, 2.1.5.b]	1.3.3.2.1
2.1.5.2.4	Develop a valve and plug management program to ensure that performance objectives are met. [2.1.5.a]	1.3.3.2.1
2.1.5.2.4.1	Determine the necessary periodic surveillance and preventive maintenance of valves and plugs. [2.1.5.a, 2.1.5.b]	1.3.3.2.1
2.1.5.2.4.2	Determine methods and when valves and plugs should be repaired/replaced as corrective maintenance. [2.1.5.b]	1.3.3.2.1

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Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
2.1.5.2.4.3	Determine methods and frequencies for valve and plug surveillance and preventive maintenance. [2.1.5.a]	1.3.3.2.1
2.1.5.2.5	Determine method to verify baseline meets requirement.	1.3.3.2.1
2.2.1.1	Analyze options that would prevent cylinder damage (including new or modified equipment) during handling, processing, and transporting operations.	1.3.2.1.3; 1.3.2.1.4; 1.3.1.5.1
2.2.1.2	Define the baseline configuration.	1.3.2.4.2
2.2.1.2.1	Identify equipment performance objectives relative to handling, processing, and transport operations. [2.2.1.e]	1.3.1.5.1
2.2.1.2.2	Identify methods and equipment to be used to handle, process, and transport cylinders and their contents.	TBD
2.2.1.2.3	Identify performance objectives for cylinders, support structures, and storage facilities relative to handling, processing, and transporting methods and equipment. [2.2.1.f]	P
2.2.1.2.3.1	Define acceptable cylinder integrity, incorporating cylinder degradation concerns, for handling, processing, and transport.	1.3.1.1.1
2.2.1.2.4	Identify engineered control(s) for each function that are needed to prevent, reduce, and mitigate cylinder and coating damage.	1.3.1.5.1; 1.3.2.1.2; 1.3.2.1.1
2.2.1.2.4.1	Integrate the protection of cylinder coatings into the saddle design. [2.2.1.f]	1.3.2.1.4
2.2.1.2.4.2	Incorporate into new handling equipment design additional engineered controls to prevent coating damage from the equipment and damage when placing cylinder on support structures. [2.2.1.d]	1.3.2.1.3
2.2.1.2.4.3	Evaluate engineered controls to mitigate damage to cylinders and coatings from the use of existing equipment. [2.2.1.e]	1.3.2.1.3
2.2.1.2.5	Identify operational control(s) for each function that are needed to prevent, reduce, and mitigate cylinder damage during test/demonstration, start-up, routine, emergency, off-normal, and standby states of operation.	TBD

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Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
2.2.1.2.5.1	Define methods for handling, processing and transporting cylinders and corroded cylinders to meet system performance objectives. [2.2.1.a; 2.2.1.g]	P
2.2.1.2.5.2	Establish movement and processing authorization requirements. [2.2.1.h]	P
2.2.1.2.5.3	Determine handling route specifications. [2.2.1.c]	P
2.2.1.2.6	Identify necessary inspection and maintenance of equipment and operations to ensure compliance with this requirement and ensure non-conforming and non-compliant cylinders are managed safely. [2.2.1.b]	P
2.2.1.2.7	Determine method to verify baseline meets requirement.	P
2.2.2.2	Define the baseline configuration.	1.3.2.4.2
2.2.2.2.1	Identify all handling, processing, and transporting equipment and the tasks to be performed.	P
2.2.2.2.2	Perform a job task analysis for each operation.	P
2.2.2.2.2.1	Define the training objectives and their relationship to operational procedures.	P
2.2.2.2.3	Identify potential consequences associated with each operation.	P
2.2.2.2.4	Establish training program for cylinder handling, processing, and transporting equipment operators and support crews.	P
2.2.2.2.5	Determine operator and support crew evaluation and retraining methods and frequencies.	P
2.2.2.2.6	Determine method to verify baseline meets requirement.	P
2.3.1.2	Define the baseline configuration.	1.3.2.4.2
2.3.1.2.2	Identify required spare parts inventory and procurement capacity and duration.	P

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Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
2.3.1.2.3	Document design specifications for replacement parts that include materials, tolerances, and manufacturing procedures that are acceptable in meeting the expected service life, reliability, and performance objectives. Incorporate industry standards into design specifications.	P
2.3.1.2.4	Establish a procurement quality control program to ensure specifications are met.	P
2.3.1.2.5	Identify qualified vendors.	P
2.3.1.2.6	Determine method to verify baseline meets requirement.	P
2.3.2.1	Analyze option to automate operations involving deteriorated cylinders.	TBD
2.3.2.2	Define baseline configuration.	1.3.2.4.2
2.3.2.2.1	Identify and document hazards of cylinders for identified conditions and the level of skill and knowledge necessary to perform tasks on or around those cylinders.	1.3.2.4.1
2.3.2.2.2	Include cylinder conditions, associated hazards, and required experience and training as a part of project command media, including: training, procedures, contracts, etc.	1.3.2.4.1
2.3.2.2.4	Determine required retraining frequency. [2.3.2.a]	P
2.3.2.2.5	Determine method to verify baseline meets requirement.	P
2.3.3.1	Analyze alternatives to repairing/replacing breached, thinned, and other expected non-conforming cylinder conditions.	TBD
2.3.3.2	Define baseline configuration.	1.3.2.4.2
2.3.3.2.1	Document program cylinder standards.	P
2.3.3.2.2	Develop immediate response methods for expected non-compliant cylinders.	P

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Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
2.3.3.2.3	Develop repair/replacement and disposition methods and procedures that are commensurate with cylinder program risks, standards, and where applicable industry standards. [2.3.3.b]	P
2.3.3.2.5	Prioritize and schedule cylinders in need of repair/replacement according to risk.	P
2.3.3.2.7	Determine method to verify baseline meets requirement.	P
3.1.1.3.1.1	Identify configuration items for configuration control.	1.3.2.4.2
3.1.2.2	Define the baseline configuration. The physical, functional, and document baselines are defined under requirement 1.1.1 actions.	1.3.2.4.2
3.1.2.2.1	Identify the work controls to be used by the system and their intent including the specification of resources, responsibilities, work methods, work performance, and verification.	P
3.2.1.1	Analyze the options for integration of procedures with training and determine criteria for development based on tasks.	P
4.1.1.2	Define baseline configuration.	TBD
4.1.1.2.1	Identify potential pathways of exposure to the environment due to failure of containment integrity.	(P)E
4.1.1.2.2	Develop methods for identifying and quantifying releases to the environment and the effects of releases. The extent of these methods for determining releases is to be commensurate with decontamination and decommissioning of the system. [4.1.1.a, 4.1.1.b]	TBD
4.1.1.2.3	Determine the required frequency for performing the monitoring methods, and for periodic assessments of methods and data. [4.1.1.b]	TBD
4.1.1.2.4	Determine a method to verify that all potential pathways of exposure to the environment are being monitored.	TBD
4.1.2.1	Analyze the integration of cylinder storage array with periodic monitoring to determine system configuration options.	TBD
4.1.2.2	Define the baseline configuration.	1.3.1.2.2
4.1.2.2.1	Identify all cylinder monitoring performance objectives.	P

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Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
4.1.2.2.1.1	Perform laboratory studies and other analyses to support the definition of cylinder integrity criteria.	1.3.1.2.2
4.1.2.2.1.2	Perform structural analysis in support of the developing functional acceptance criteria.	1.3.1.1.1
4.1.2.2.2	Define cylinder functional acceptance criteria based upon applicable industrial standards and cylinder performance objectives. [4.1.2.a, 4.1.2.b]	1.3.1.2.2
4.1.2.2.2.1	Develop code case(s) to demonstrate compliance with industry standards. [4.1.2.b, 4.1.2.c]	1.3.1.2.3
4.1.2.2.3	Identify factors that make cylinders non-conforming and identify constraints necessary to maintain compliance with the safety envelop (non-conformance may be based on non-certified volumes, exceedance of fill limits, etc.). [4.1.2.a]	1.3.1.2.3; 1.3.1.5.1
4.1.2.2.4	Establish inspection/evaluation methods for determining the acceptability of cylinders relative functional criteria. [4.1.2.d]	1.3.3.2.2
4.1.2.2.4.1	Determine a technically acceptable risk-based periodicity to perform inspections and evaluations for determining the acceptability of cylinders' relative functional criteria. [4.1.2.e]	1.3.1.5.1
4.1.2.2.4.2	Specify the extent to which cylinder anomalies identified during inspections will be documented. The extent of documentation includes the precision for which anomalies will be measured and their location defined (i.e., a dent on the right side of the cylinder versus a ½" deep, 3" circumferential dent located 5" from the valve side of the valve-end stiffener at the 3 o'clock position).	P
4.1.2.2.4.3	Develop the visual inspection/quantitative evaluation integration (the use of visual inspections to select cylinders and general surface areas for obtaining quantitative data to verify compliance with functional criteria).	P
4.1.2.2.4.4	Define ultrasonic thickness techniques and their application (i.e., how many points, and extent of area to measure thickness to verify compliance with functional criteria).	1.3.1.2.4
4.1.2.2.4.6	Integrate the periodic inspection performance objectives with cylinder accessibility. [4.1.2.f]	P
4.1.2.2.4.7	Perform laboratory studies to support the cylinder functional acceptance criteria and the cylinder monitoring evaluation techniques.	TBD
4.1.2.2.5	Determine method to verify that the baseline configuration meets the requirement.	P

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Correspondence of SEMP Needed Actions to EDP Activities (continued)

Action Number	SEMP "Needed Action" Description	WBS Number[a]
4.1.3.1	Analyze optional storage configuration to reduce or eliminate degradation factors.	TBD
4.1.3.2	Define baseline configuration.	1.3.1.2.2
4.1.3.2.1	Identify, and grade for severity, factors that could degrade cylinder integrity. [4.1.3.a]	TBD
4.1.3.2.2	Develop a database for tracking degradation factor monitoring data.	TBD
4.1.3.2.3	Develop methods to monitor the degradation factors for the collection of timely and reliable data that is useful in forecasting cylinder condition. Monitoring method is based on applicable degradation factor. [4.1.3.b]	TBD
4.1.3.2.4	Develop a monitoring plan, incorporating the methods and frequencies for performing those methods.	TBD
4.1.3.2.5	Determine the intent and frequency for audits, assessments, and reviews of degradation factor monitoring.	1.3.3.2.2
4.1.3.2.6	Determine methods to verify the baseline meets the requirement.	TBD
4.2.1.2	Define baseline configuration.	1.3.1.2.2
4.2.1.2.1	Review the cylinder functional criteria and degradation factors.	1.3.1.2.2
4.2.1.2.2	Define and describe categories in terms of cylinder functional criteria and/or factors that could adversely impact cylinder integrity.	1.3.1.2.2
4.2.1.2.3	Develop procedures for grouping cylinders and storage environments in the defined categories.	P
4.2.1.2.4	Develop a method for tracking cylinders and storage environments according to their categories.	P
4.2.1.2.5	Determine a method to verify the baseline configuration.	P
4.2.2.2	Define baseline configuration.	1.3.1.2.1; 1.3.1.2.2
4.2.2.2.1	Review the data collected as a result of monitoring containment integrity.	P

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Action Number	SEMP "Needed Action" Description	WBS Number[a]
4.2.2.2.2	Identify which cylinder condition elements are to be forecasted. Elements are to be selected based on intended future use of the cylinders.	1.3.1.2.2
4.2.2.2.2.1	Integrate cylinder condition elements to be forecasted with cylinder categorization. [4.2.2.a]	TBD
4.2.2.2.3	Identify which collected data will be used in the forecasting. Integrate forecasting with monitoring efforts. [4.2.2.a]	1.3.1.2.1; 1.3.1.2.2
4.2.2.2.4	Define procedures for forecasting cylinder condition. Using these procedures will identify specific cylinders in need of specific surveillance and maintenance.	1.3.1.2.1; 1.3.1.2.2
4.2.2.2.5	Develop a database system to capture the forecasting information. [4.2.2.b]	TBD
4.2.2.2.6	Establish a process to periodically review forecasting results with the performance objectives through the use of performance indicators. [4.2.2.b]	TBD
4.2.2.2.7	Determine a method to verify the baseline configuration.	TBD
5.1.1.2.1	Develop a standard, systematic method for estimating level of effort within the system to support standard cost estimates.	P
5.1.1.2.2	Identify the critical path of system activities (tasks).	P
5.2.2.1	Trade study alternatives/options of life-cycle projections.	TBD
5.2.2.2.5	Develop a method for identifying and controlling the interfaces between organizations, functions, subsystems, components and activities.	TBD
5.2.2.3.3	Identify the interfaces within the system configuration.	1.3.2.4.2

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