

## **INTEGRATED PROJECT MANAGEMENT PLANNING FOR THE DEACTIVATION OF THE SAVANNAH RIVER SITE F-CANYON COMPLEX**

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### **ABSTRACT**

The Department of Energy (DOE) faces an enormous task in the disposition of its excess facilities. As DOE facilities complete mission operations and are declared excess, they pass into a transition phase that ultimately prepares them for disposition. The disposition phase of a facility's life cycle usually includes deactivation, decommissioning, and surveillance and maintenance (S&M) activities. An important objective throughout transition and disposition is to maintain an integrated and seamless process linking transition, deactivation, decommissioning, and S&M with the previous life-cycle phases. Activities supporting facility transition and disposition must incorporate integrated safety management practices at all levels to provide cost effective protection of workers, the public, and the environment.

The DOE has developed four guides specific to the transition and disposition of contaminated, excess facilities to provide implementation guidance for requirements found in DOE Order 430.1A, Life-Cycle Asset Management (LCAM). The LCAM Order requires that a systematic method for detailed engineering planning and documentation be used to execute the preferred deactivation alternative. As such, a systems engineering approach has been recommended for use throughout this process to ensure the essential elements of facility deactivation are integrated at all appropriate levels. DOE Guide 430.1-3, Deactivation Implementation Guide, provides the recommended content and purpose of deactivation project management plans and documentation.

This paper explains the planning process that is being utilized by the Westinghouse Savannah River Company (WSRC) to take the F-Canyon Complex facilities from operations to a deactivated condition awaiting final decommissioning. Although papers have been presented in the past on similar projects at Hanford, the intent of this paper is to show how the transition process management and its planning tools have evolved. In addition, the unique and challenging application of these deactivation processes to the Savannah River Site's (SRS) F-Canyon Complex is discussed.

The paper discusses the:

- application of National Facility Deactivation Initiative (NFDI) planning tools at SRS,
- methodology used for planning the F-Canyon Complex deactivation,
- status of the F-Canyon Complex integrated project planning process, and
- unique challenges that are expected at the F-Canyon Complex during the multi-phased transition of a fully operational nuclear facility into the deactivated state.

These discussion topics have implications for deactivation and closure of other DOE facilities nationwide. The challenges encountered and the methods used to overcome these challenges during the planning of the F-Canyon deactivation are directly applicable to many other DOE complex locations. Sharing these "lessons learned" will help to assure DOE's overall goal of safe and cost effective site closures.

## **INTRODUCTION**

The evolution of DOE facilities from full-scale operation to a state of transition awaiting deactivation is not new to the DOE Complex. In the last 5 years, several major nuclear facilities have been deactivated. The first of these facilities was the Hanford Purex facility. Subsequent to Purex, additional successful deactivations have been completed at Hanford's B Plant and Rocky Flats Environmental Technology Site (RFETS) 771 Building. In addition, substantial progress has been made at Hanford's Plutonium Finishing Plant (PFP) in the development of a deactivation strategy and plan as part of their development of a Deactivation Project Management Plan. Initial efforts to provide a disposition process model for use at other DOE facilities started at Purex and over time have evolved to the plan developed at PFP. The evolving disposition process model resulting from the completion of the Hanford and Rocky Flats projects has served as the basis for the approach discussed in the DOE Order 430.1 (LCAM Order) and its implementing guide, DOE G 430.1-3. The LCAM order's overall objective was to establish an integrated and seamless disposition process linking transition, deactivation, S&M, and decommissioning. The disposition process model to accomplish this objective has been discussed at previous meetings and is summarized below and in Figure 4.

Disposition of a DOE facility begins when the DOE terminates facility operations for a defense, research, or other mission and declares the facility excess (including process equipment and all associated assets) to the Department's needs. Once this determination is made, a series of phases begins that will ultimately "dispose" of the facility. These phases include transition from operations, deactivation, Surveillance and Maintenance, decommissioning, and close out. For many facilities (e.g., F-Canyon) the disposition process will be quite costly and require significant time to accomplish. It is safe to assume that the facility will remain in the S&M mode for an extended period as final disposition is arranged. For this reason, it is imperative that on-going S&M activities be reduced to a minimum so that on-going costs are also minimized. Deactivation is the process that transforms the facility from a safe-shutdown mode to a minimum state S&M mode. The overall strategy and specific work required to make this transformation are discussed in the SRS F-Canyon Complex Integrated Project Management Plan (IPMP).

## **BACKGROUND**

Efforts to define a disposition process for SRS facilities commenced in 1998 in response to a Defense Nuclear Facilities Safety Board (DNFSB) review of DOE Complex Canyon Missions. This review caused DOE-SR to request WSRC to evaluate and develop a plan to address DNFSB concerns. This plan was referred to as the "Phased Canyon Strategy." This study was completed in September of 1998. It contained the preliminary development of plans for the completion of stabilization missions and the deactivation of

the Nuclear Material Stabilization and Storage (NMS&S) facilities in the F and H Areas. Although this study addressed the deactivation of the facilities, it did not contain any detailed deactivation planning information. Therefore, to further develop deactivation planning for NMS&S facilities, DOE-SR and WSRC entered into a Performance Based Incentive (PBI) WSRC FY00 PBI 01D for the development of a more comprehensive management plan. The product from this PBI would detail the strategy, vision, and objectives for the deactivation in the F-Canyon and FB-Line facilities.

The current SRS F-Canyon Complex NMS&S program includes processing of existing on-site "at risk" nuclear materials into stable forms. These forms will be suitable for long term interim storage pending final disposition through future Material Disposition decisions. NMS&S operations will implement decisions recorded in the Interim Management of Nuclear Materials (IMNM) Environmental Impact Statement (EIS) and the Spent Nuclear Fuel (SNF) EIS. Also SRS NMS&S Operations personnel are committed to performing material stabilization missions contained in the Secretary of Energy's DNFSB Recommendation 94-1 Implementation Plan, as well as the Plutonium and HEU Vulnerability Assessments. Specifically the NMS&S F-Canyon Complex Program mission is:

- Provide safe interim storage of in-process nuclear material in solutions (e.g., depleted Uranium (DU), plutonium (Pu), americium/curium (Am/Cm)) and residues in solid form (e.g., scrap, sand/slag/crucible (SS&C), turnings and sweepings) now stored in the various facilities;
- Conduct stabilization operations transforming these "at risk" materials into forms suitable for long term interim storage in accordance with applicable DOE Product and Storage Standards (e.g., DOE-STD-3013 for plutonium);
- Continue safe interim storage of stabilized materials pending disposition decisions; and
- De-inventory remaining hazardous materials and stabilize facilities not needed to execute future material disposition decisions.

In addition to the on-site inventories, the stabilization mission may increase in scope and duration if DOE elects to utilize SRS capability to expedite de-inventory of other sites. Missions will eventually be completed and the facility will be transitioned into deactivation activities. Deactivation efforts are planned to immediately follow the current de-inventory process and thereby reduce S&M costs to a minimum until final disposition decisions are made for each facility.

The details presented in the SRS F-Canyon Complex IPMP may or may not be consistent with the DOE's current operating strategy for the F-Canyon and FB-Line. The IPMP was developed using the best available mission information at the time. However, adjustments and revisions to the IPMP may be necessary if significant strategy changes are made. The F-Canyon Complex IPMP covers work and planning required to deactivate the F-Canyon complex and is based on the projected stated missions at the time the plan was developed. This may change as additional work scope is developed or

funding issues arise. However, every effort has been made to generate results in this planning effort that can be adjusted should the planned missions change.

## **DEACTIVATION PLANNING TOOLS**

Decisions on DOE facility disposition approach and sequencing for disposition will be a major factor in the ultimate cost. As a result, the DOE Office of Environmental Management, through NFDI, has sponsored the development of tools and methods targeting the specific needs of transition projects. Some of these tools and methods have demonstrated high value in planning or executing previous transition projects across the DOE complex. Although NFDI deactivation planning tools have been discussed at previous conferences, a short discussion of three key tools utilized at SRS has been included here to provide the audience with the background information necessary to understand the F-Canyon Complex IPMP development process.

### **End Points Specification Method And Program**

The end points specification method was developed specifically for transition projects so broad project objectives could be translated into explicit actions that are readily understood by workers and specifically define the deactivation scope of work. Transition end points are essentially analogous to design specifications for a construction project and are developed using proven systems engineering principles. The end point specifications typically include specific field actions (seal, blank, flush, isolate, etc.), administrative actions (safety document update, preparation of surveillance and maintenance plans, etc.) and required engineering studies (asbestos inspection, confined space identification, etc.). This paper will not discuss the mechanics of the end point development process. However, a handbook has been developed to assist with this effort (DOE/EM-0318, United States Department of Energy, Office of Nuclear Material and Facility Stabilization, Facility Deactivation Guide - Methods and Practices Handbook, Emphasizing End Points Implementation, 12/96). Additionally, a software program (EndPoints) has been developed and is available to aid project managers in the preparation of end point specifications. This software is in wide use across the DOE complex as a tool to quickly prepare end point specifications.

The end point specification method is considered the cornerstone of sound transition planning and its proper application is essential to avoiding the scope and cost creep associated with trying to meet ambiguous, unrealistic, or unnecessary project objectives. Additionally, end point development will help identify issues that need further resolution (e.g., additional characterization or regulatory information) or technical decisions that need to be made (e.g., material disposition paths) prior to establishing a definitive end point. Alternatives generation, coupled with trade or value engineering studies, are typically used to support the decision making process.

End point specifications are used to drive the development of the project baseline and its core elements such as the Work Breakdown Structure (WBS), schedule, and cost estimate.

### **Planning, Optimization, Waste Estimating and Resourcing Tool (POWERtool)**

POWERtool is a field estimating software program and a relational database loaded onto a hand-held computer. The tool includes a task structure and "work unit library" developed to systematically estimate the scope and plan the decontamination, dismantlement, and waste disposal for contaminated systems and facilities. The program indicates when alternative methods might be used to optimize between important project attributes including; labor and material costs, waste disposal, and schedule. Different cases can be estimated to explore the effect of alternate work approaches so the best tradeoff can be selected as the baseline for the project. This tool has been used in planning the dismantlement of the 771 facility at Rocky Flats and the PFP at Hanford.

The strength of the POWERtool is its ability to be deployed directly in the field by individuals with experience and knowledge of the work being estimated. The individuals are prompted to enter the specific estimates using a small, handheld personal computer. These data are then compiled and incorporated into the overall project estimate. The software produces various reports and comparisons and allows project management issues and inquiries to be addressed. The output of the POWERtool can be fed into such standard project management software as the Primavera schedule/estimating program currently in use at SRS.

### **Requirement Based Surveillance and Maintenance (RBSM)**

Since transition project activities will be competing with ongoing facility S&M activities for resources (people and money), any reduction of S&M activities that can be technically justified will provide resources and funding that can be used to accomplish deactivation work scope. Therefore, S&M savings can accelerate a facility deactivation project. By focusing on the overall life-cycle costs for a given facility, the benefits of early transition and reduction of S&M operations activities are evident and can be significant. A systematic and iterative method has been developed that can be applied to identify S&M reduction opportunities. Ongoing S&M activities and their driving requirements are carefully analyzed for instances where compliance can be maintained with a reduced level of effort. In general this method consists of the following elements.

- Determine the existing suite of S&M activities and supporting administrative systems.
- Determine the drivers and requirements for the S&M activities and supporting systems.
- Perform an applicability analysis to identify "trigger" points for eliminating or reducing the S&M activities and support systems. The "trigger" points are typically driven by completion of one or more transition end points.

The results of the analysis performed above should be factored into the life-cycle project schedules and cost estimate. The analysis should be reviewed and updated periodically to maintain focus on reduction and elimination of S&M activities and supporting administrative systems. The DOE has developed this formal process that can be used to assist facilities in identifying S&M reduction targets.

## **DEVELOPMENT OF SRS F-CANYON COMPLEX IPMP**

### **Performance Incentive**

WSRC was selected by DOE-SR to carry out the project management responsibilities for the initial F-Canyon complex deactivation IPMP. This study was prepared with direct support from subject matter experts having deactivation experience at other DOE sites. The work incentivized by PBI WSRC FY00 PBI 01D was intended to perform two actions:

- Demonstrate positive, concrete progress towards eventual deactivation and cleanup of the DOE nuclear reprocessing canyons, and
- Provide SRS personnel with experience in planning and scoping deactivation of a portion of a complex nuclear facility, which will provide a basis for future SRS deactivation activities.

The deactivation of the F-Canyon complex was envisioned to be performed in phases over a period of several years as portions of the facilities complete their missions and become available for deactivation. The DOE experience has shown that deactivation activities properly planned and timed with the end of operating missions can be executed much more efficiently and effectively than those involving long periods of post-operation inactivity. It is estimated that correctly managing the deactivation portion of the facility life cycle can result in significant overall savings. This "seamless" transition from facility operation to the deactivation process requires significant investment in planning prior to the end of operations. Since a portion of the F-Canyon complex had an expected end of mission within three to five years and the deactivation planning process could require several years to effectively complete, DOE-SR chartered a preliminary IPMP development effort during fiscal year FY00. This effort was to gain experience with currently available tools and techniques that can assist in deactivation planning. To accomplish this goal a Memorandum of Understanding (MOU) was developed between respective participants (DOE-SR, DOE-HQ, WSRC, and Sub-Contractors) to describe a mutually agreeable strategy that would be used to complete the IPMP. This MOU described the administrative, procedural, and communication protocols; requirements to be satisfied in accomplishing the work; and the roles/responsibilities of the involved parties in performing the work.

### **MOU Development**

The scope of the FY00 F-Canyon Complex deactivation planning work required contributions and interfaces with a number of organizations. In order to define clearly the working relationships, responsibilities, and deliverables for each participant, an MOU was drafted. The MOU documented the scope of the work to be performed and specifically how each organization would contribute to the successful completion of the work. In addition, the MOU provided a vehicle to formalize and document the PBI scope at a very detailed level. Signatures of contributing organizations and DOE-SR indicate agreement with the scope and endorsement of the work completion strategy. Also

documented in the MOU were administrative and procedural requirements as well as communication protocol.

### **Deactivation Strategy/End State**

WSRC manages excess/inactive facilities and associated equipment in accordance with applicable DOE Orders, Guides, and contractual agreements. All related activities are performed in a cost-effective manner through systematic planning, scheduling, execution, evaluation, and documentation to ensure the health and safety of the worker, the public, and the environment.

The planning and execution for the administration of excess facilities and/or associated equipment are conducted using project management principles with a graded approach through the life cycle phases. The WSRC 1C Manual outlines the SRS Excess Facility Disposition Program as mandated by the DOE O 430.1A, Life Cycle Asset Management, and the WSRC 1-01 Management Policies Manual MP 5.24, "Excess Facility Disposition." In addition, project planning and execution were to be performed in accordance with the Project Management Improvement Plan (PMIP) recently adopted at WSRC.

At the completion of the current DOE mission for the F-Canyon complex, the process equipment and support systems will be in an operational mode with a level of S&M activity equivalent to normal operations. After shutdown and declaration of the facility as excess, the implementation of the deactivation project will place the F-Canyon complex into an End State that can be described as "cold and dark." The facilities will not be routinely occupied and the ventilation system will be reduced or shut down. Operation of systems and equipment will be reduced to the greatest degree possible, leaving only those systems that minimize the uncontrolled spread of contamination and those that protect the workers, the public, and the environment from the remaining hazards. In addition, operation of some equipment (e.g., instrumented exhaust systems) may be required to meet regulatory monitoring requirements.

The deactivation strategy for the facility is to control transferable radioactive contamination including material in hold-up, by confinement, isolation, removal, or fixing techniques. All possible pathways for the migration of contamination out of the facility into the environment will be sealed or controlled. Any equipment remaining in the facility with no identified use or salvage value will be retired in-place (i.e., abandoned) once its end point has been achieved. The facility will be locked and de-energized. Utilities will be isolated at points outside the facility boundaries. New independent utility services may be necessary to allow operation of systems needed to meet safety, regulatory, or contamination control requirements and support required surveillances.

S&M of the F-Canyon complex will consist of periodic inspections to ensure that it remains in a safe, stable, passive condition, so that:

- water intrusion is under control,
- the structure is not compromised,
- contamination migration remains controlled,
- non-routine fugitive emissions are eliminated or monitored, and
- entry by animals and unauthorized persons is precluded.

Inspections will also be conducted if judged necessary as a result of a severe natural event such as earthquake, hurricane, or tornado. S&M of the systems that remain operable will be performed on a scheduled basis consistent with their operating regimen. It is important to note that the end goal of the deactivation process will be a non-operating facility with no attempt to preserve any processing capability. Many of the DOE Orders, Guides, SRS Site Manuals, site and facility procedures provide requirements and direction for operating facilities. With deactivation of a given facility and an associated reduction in S&M costs as a goal, the compliance strategy for a facility can be modified using a graded approach in a deactivated state. For example, as hazards associated with residual inventories are reduced, S&M activities to maintain compliant programs to control these inventories may be able to be revised and lessened.

### **IPMP Development**

The IPMP development was accomplished using a systematic technique employed at other DOE sites to specify desired end points after completion of the deactivation work. This technique is an application of the Systems Engineering methodology coupled with the use of the EndPoints software program. Each facility, system, and space was assigned a desired end state that was compared to the expected condition at the end of the applicable operating missions. Once this comparison was performed, a series of tasks was identified which, when completed, would leave the system or space in the desired end state. The scope of the deactivation effort was defined by these tasks. These tasks were then integrated into the mission schedule for the facilities. A funding profile to support the deactivation work was developed based on this schedule.

These schedules were based on the best knowledge available regarding the F-Canyon and F B-Line mission plans. Consistent with agreements between DOE-SR and WSRC, the missions that are assumed for the deactivation schedule and funding profile were used by WSRC to develop a "visionary roadmap" to consolidate all the missions of related facilities. In order to schedule and determine the cost of the deactivation work on a system level, the engineering team subdivided the facility(ies) into systems/major equipment groupings.

The missions on the "visionary roadmap" were analyzed and divided/grouped into generic missions such as: "dissolve fuel in F-Canyon dissolvers and make buttons." Then using facility knowledge, each generic mission was matched with the equipment that is required to complete it. Once this was performed, the specific programs/missions from

the visionary roadmap were logically linked with the specific required systems/equipment needed to implement them.

Using these multiple crosswalk relationships, the team could establish links between the missions shown on the "visionary roadmap" and their specific equipment needs. In addition, these relationships defined the structure for building a schedule logic allowing deactivation activities for each system to be loaded in scheduling software with predecessor activities representing the completion of the specific "visionary roadmap" missions they support. This places the deactivation of specific facility systems along a time-line according to mission needs. Figure 1 below illustrates of this process.

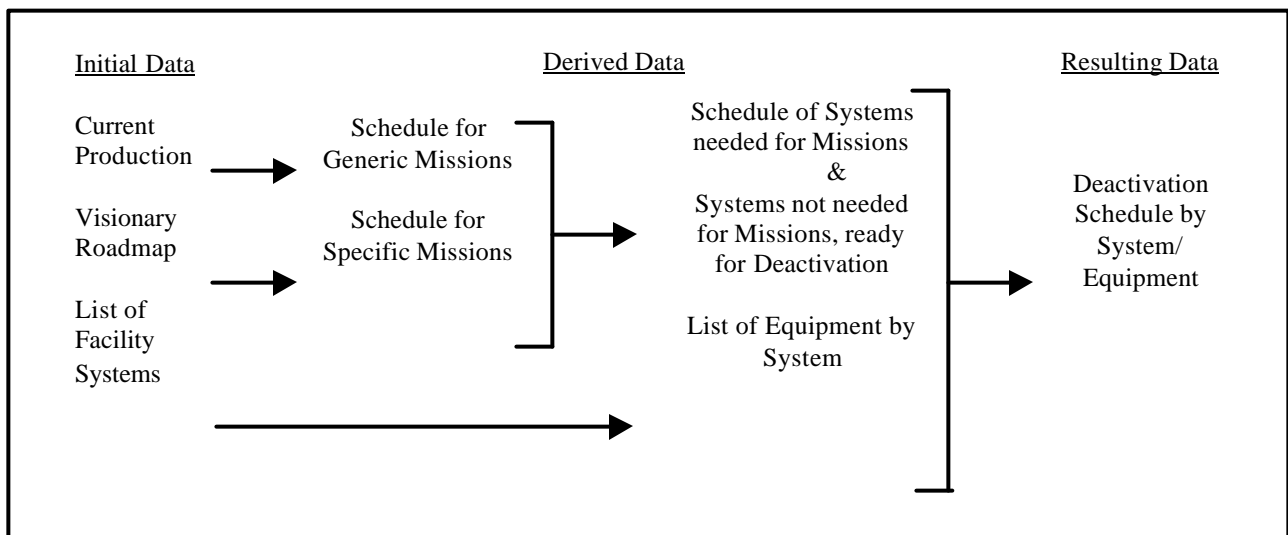


Fig. 1. Determining Systems Required for Planned Missions

In order to scope the activities for deactivation of these systems, the results of the end points analysis was used. A comparison of the anticipated condition at the beginning of deactivation was made to the end point description of the desired condition after deactivation. This allowed engineering personnel to specify what work would need to be accomplished (scope, duration, and activity sequence) for each system/equipment to achieve system deactivation. These details were loaded into the scheduling software to specify the deactivation tasks.

Finally, the scheduling software generated a schedule of the deactivation tasks and determined early start/finish dates for the deactivation work by system. This is the deactivation schedule and is included as an Appendix to the IPMP. Since each activity has been estimated in terms of manpower and material costs, the scheduling software also totals the expected expenditures over time. This is the required funding profile for the work and also is included as an Appendix to the IPMP. A summary schedule and a summary cost projection are shown below:

### Schedule Summary

	FY01				FY02				FY03				FY04				FY05				FY06				FY07				FY08				FY09				FY10				FY11			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
<b>F Canyon</b>																																												
Plan F CAN Deactivation																																												
Deact A-Line/outside facilities																																												
Deact HAW/2U/1st cycle																																												
Deact 2Pu/Disslvr/LAW																																												
Stabilize/Store nuclear mat'l																																												
Deact facility services/HVAC																																												
F Can Deact ORR																																												

<b>FB-Line</b>																																										
Plan FBL Deactivation																																										
Stabilize mat'l																																										
Deact liquid processes																																										
Deact Mech Line																																										
Characterize/Pack/Store mat'l																																										
Remove mat'l																																										
Deact facility services/HVAC																																										
FBL Deact ORR																																										

### Cost Profile Summary

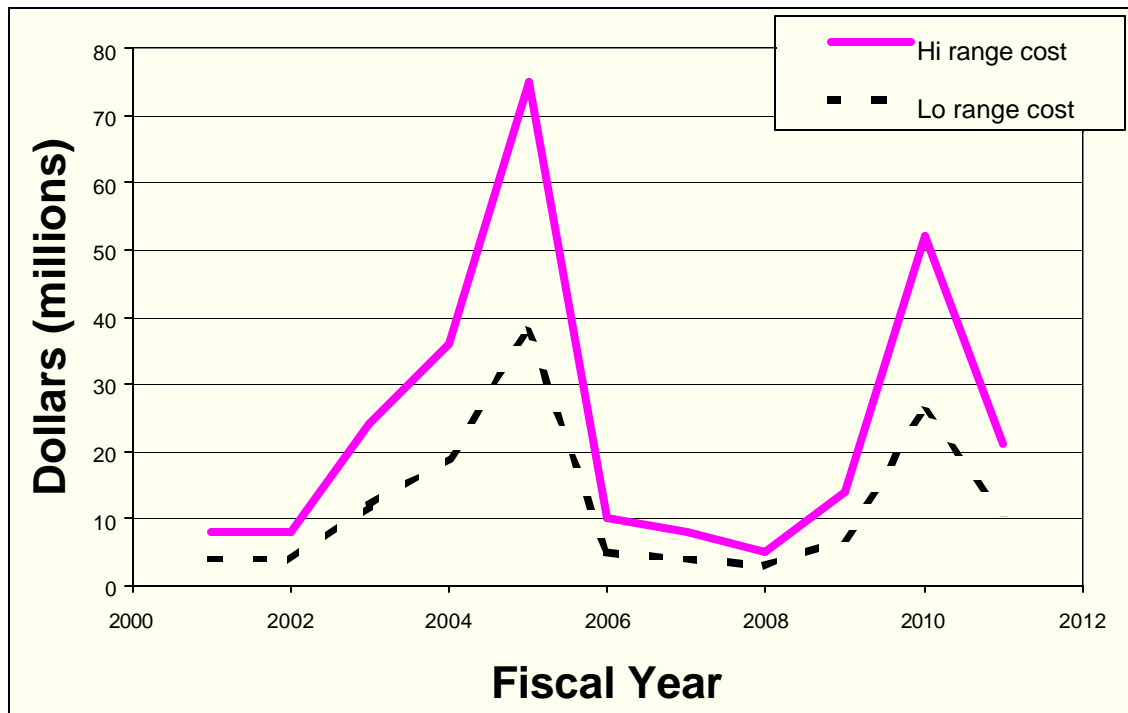


Fig. 2. Projected F CANYON / F B-LINE Deactivation Schedule & Costs

The above cost profile is based on the work scoped during this planning effort and the current projections for missions for the F-Canyon and F B-Line facilities. In accordance with direction developed during the PBI negotiations, deactivation activities are scheduled and, therefore, funded as soon as planning is complete and the affected systems are available to undergo deactivation. No attempt has been made to match the resulting funding profile with expected funding levels in the indicated years. In addition, no attempt has been made to "level" the funding expenditure to minimize gross differences between required funds from one year to the next.

The final estimate for completion of the projected work to deactivate the F-Canyon and F B-Line facilities is between 133 and 260 million dollars over eleven years.

### End Points Method

End Points for the F Canyon/FB Line deactivation were developed using the process defined in DOE/EM 0318, *Facility Deactivation Methods and Practices Handbook*. This process is depicted in Fig. 3. End Point Determination.

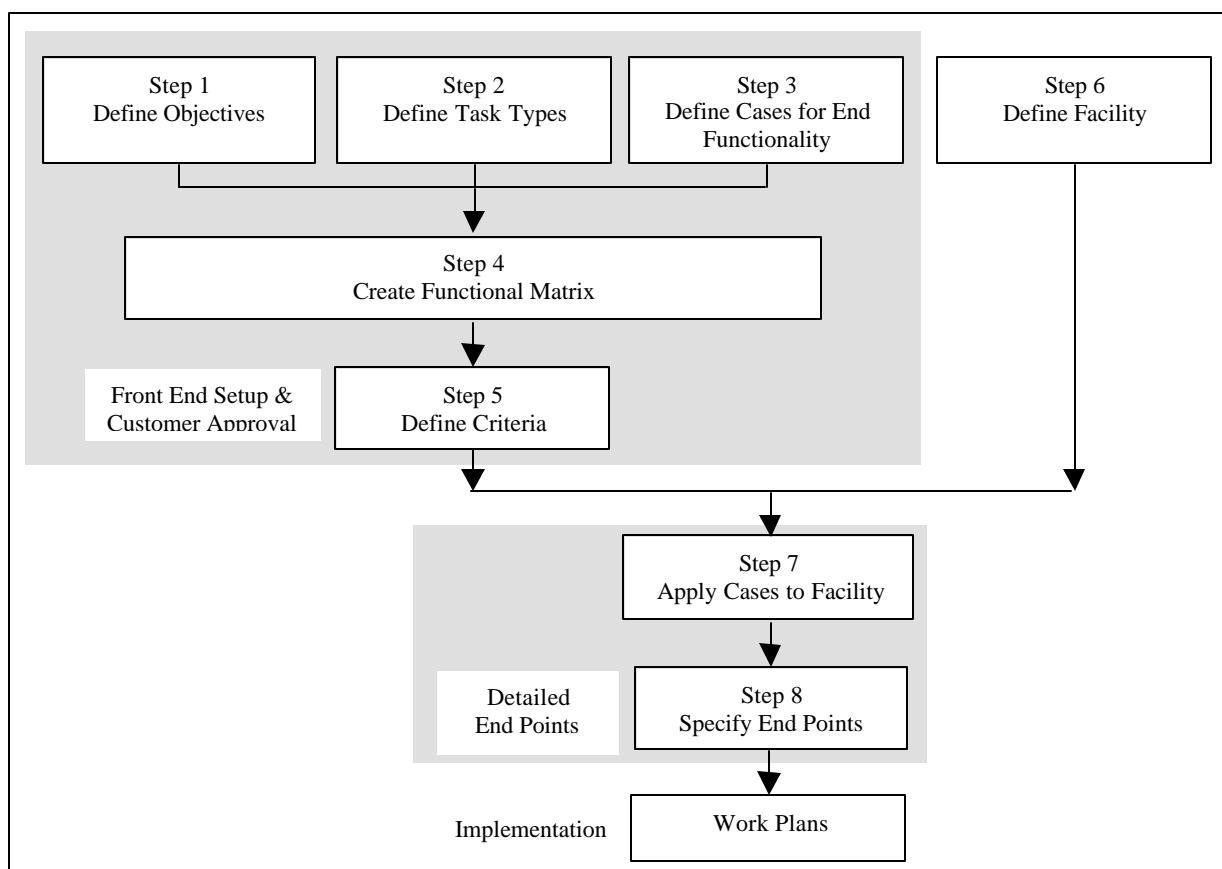


Fig. 3. End Point Determination

This process was developed during the PUREX deactivation project at Hanford, and was further refined and implemented during the Hanford B Plant deactivation project. Since

inception, the End Points process and program has been applied at many of the DOE sites and continues to be enhanced based on lessons learned from those applications.

As indicated by Fig. 3. End Point Determination, objectives for the F-Canyon / F B-Line deactivation were defined to reflect the key objectives described in the DOE G 430.1-3, *Deactivation Implementation Guide*, Section 3 that apply to all deactivation projects. These objectives are:

- Protect the public and the environment,
- Protect the S&M worker,
- Reduce S&M costs, and
- Facilitate decommissioning.

Underlying these objectives is the inherent need to comply with regulatory and DOE requirements, and to implement agreements reached between the DOE and stakeholders regarding the deactivation of the F Area facilities.

Because the F-Canyon / F B-Line deactivation is similar to past deactivation projects in which endpoints were developed; previously developed task types, cases for end functionality, and functional matrices were evaluated and determined to be applicable to the project. The functional matrices associate the objectives and task types of the project to the appropriate case for end functionality of each facility space and system. The functional matrices are then used to determine for which objectives and for which task types criteria and subsequent endpoints must be developed.

The following are the six cases for end state functionality determined to be appropriate for the F-Canyon / F B-Line deactivation:

- Case 1: Internal Spaces, Routine Access Expected
- Case 2: Internal Spaces, Routine Access Not Expected
- Case 3: External Spaces and Building Exteriors
- Case 4: Operational Systems
- Case 5: Mothballed Systems
- Case 6: Systems to be Abandoned In Place

The F-Canyon / F B-Line facilities were broken down into appropriate geographical or spatial areas and related systems or spaces. The division was based on hazards and conditions and/or unique characteristics that currently exist in the facilities or will exist at completion of facility processing missions. This breakdown of spaces and systems was completed with the assistance of knowledgeable facility personnel. The spaces and systems were then classified in cases one through six based on their expected end functionality. Based on these classifications and using the appropriate functional matrices, criteria and end points appropriate to the deactivation of the respective systems and spaces were determined.

As an example, consider a Case 1 space that will require routine access to conduct S&M activities. To achieve the objective of "Protect the S&M Worker," chemical hazards present in the space are identified and must be mitigated to minimize exposure to the S&M worker. When the space is walked down during development of the criteria and end points for the space, an observation is made that asbestos insulation has been used on piping in the space. In these instances, criteria and end points would be established to ensure protection of the S&M worker from these hazards. In this example, the following criteria and end points would be established:

- Ensure compliance with asbestos program in accordance with site procedures and regulatory requirements.
- Conduct an asbestos assessment of the space and encapsulate/remove friable asbestos.
- Document compliance with asbestos program for inclusion in the deactivation completion package.

To satisfy these end points, the condition of the asbestos is assessed before completion of deactivation activities. This is done to allow workers to enter the facility to conduct S&M activities with confidence that the asbestos hazard is adequately controlled.

### **RBSM Pilot**

S&M activities in the DOE Environmental Management (EM) Program consume a significant portion of total annual budget resources. These activities are necessary to manage and disposition nuclear materials, facilities and wastes. S&M consequently requires an extensive amount of fiscal and personnel resources to maintain adequate worker, public and environmental safety.

Accelerating a site cleanup to reduce facility risks to the workers, the public and the environment during a time of declining federal budgets represents a significant technical and economic challenge to DOE Operations Offices and their respective contractors. A significant portion of a facility's costs is associated with routine, long-term S&M activities. Although, ongoing S&M programs control hazards, they do nothing to reduce risks directly. For this reason, S&M programs without positive intervention will continue to require at least a constant level of funding and resources.

Reducing S&M costs is particularly significant to SRS facility management. Specifically, the expeditious reallocation of SRS resources to mission direct activities will support the timely completion of SRS material stabilization, retrieval, and closure milestones; the reduction of risks to workers and the public and impacts to the environment; and the reduction of the facility mortgage. As such SRS F-Canyon Complex management conducted a RBSM review of the F-Canyon Complex Radiological Controls Habitability Surveys and Routine Tasks to pilot this process for future use in identifying transition, deactivation and decommissioning S&M reduction opportunities in all functional areas.

The RBSM process is a bottoms-up evaluation of activities actually performed against the requirements for conducting the activities, particularly the frequency of performance. The RBSM process is conducted in two phases.

Phase 1: The surveillance activities associated with a nuclear facility are baselined and include the determination of associated requirements and the allocation of respective costs. This qualitative process identifies discrete surveillance tasks that are conducted on a routine basis by facility personnel and compares these activities to their corresponding requirements (drivers). Interviews are conducted with individuals responsible for conducting the work, as well as with their supervision. Evaluations are made in an attempt to determine why these individuals conduct work at the current frequency. A review is then performed to determine the actual drivers that should control the frequency of these activities.

The application of the RBSM process disposes the respective surveillance activities into one of four categories: cancellation, deferral or frequency change, further evaluation and no further evaluation. The product of this phase is a detailed analysis of the current facility surveillance activities, the related requirements and their associated costs. Table 1 provides a synopsis of the distinguishing characteristics of each disposition category.

Table I. Disposition Category Distinguishing Characteristics

Category	Category Name	Category Distinguishing Characteristic
1	Candidate for Cancellation	<ul style="list-style-type: none"> <li>• No driver can be found for activity</li> <li>• Facility conditions have changed making activity unnecessary</li> <li>• Current or future mission of facility makes activity unnecessary</li> <li>• Strong criteria exists to support evaluation</li> </ul>
2	Candidate for "Deferral or Frequency Change"	<ul style="list-style-type: none"> <li>• Activity was being performed more frequently than specified by driver</li> <li>• Strong criteria exists to support evaluation</li> </ul>
3	Candidate for Further Evaluation	<ul style="list-style-type: none"> <li>• Limited information on actual driver was available</li> <li>• Driver may not be appropriate for activity reviewed</li> <li>• Indeterminate criteria exists to support evaluation</li> <li>• Regulatory relief could or should be sought for activity</li> <li>• Driver interpretation may be incorrect</li> </ul>
4	No Further Evaluation	<ul style="list-style-type: none"> <li>• Activity scope and frequency was found to be valid</li> </ul>

Activities that are dispositioned into Category 1 and 2 can (in most cases) be quickly implemented with little or no more than simple procedural changes. Category 3 recommendations generally will require that Management and/or Engineering personnel perform cost benefit studies or the initiation of a tracking and trending program to measure potential facility impacts. Once the information from Phase 1 is collected and verified, these data are entered into a database for report generation.

Phase 2: The data from the database are analyzed with a spreadsheet. This allows the reviewer to evaluate activities individually, or in discrete groups, depending on the reviewer's needs.

The results of the F-Canyon Complex evaluation were typical of other such evaluations performed on radiological controls programs at other DOE sites. Approximately 56,000 labor-hours of habitability and routine task hours were reviewed with approximately 21,600 (or 38%) of those hours recommended for potential reallocation. Of the hours recommended for potential reallocation, Category 1 and 2 recommendations comprised approximately 9,500 hours. Further review by the facility Radiological Control organization confirmed that approximately 5,500 hours of activities could be restructured to save implementing resources. The facility continues to study approximately 2,100 hours of activities that may also be restructured for savings.

## **CURRENT STATUS AND FUTURE IPMP ACTIVITIES**

This IPMP documents the planning and work effort required for the deactivation of the F-Canyon complex to a level required to satisfy PBI WSRC FY00 PBI 01D. The IPMP defines this deactivation effort and forms the basis for a future Deactivation Project Plan to be developed and implemented at a later time. This IPMP is not a deliverable identified in the site deactivation procedures (WSRC Manual 1C). It was created specifically as an interim deliverable to the formal Manual 1C Deactivation Project Plan with content sufficient to satisfy the scope of the FY00 PBI. It is the intent of the authors that the content of the IPMP will be augmented, updated and later used to produce the Deactivation Project Plan and other deactivation project documents. Figure 4 - Excess Facility Disposition identifies the additional documents required by WSRC Facility Disposition Manual (Manual 1C).

At the time this paper was prepared, no funding or resources had been allocated to continue the detailed deactivation planning for the F-Canyon Complex. The engineering team that generated the IPMP made every effort to use a methodology to produce study results that could be adjusted should funding availability or mission changes occur. If future canyon strategies include near term deactivation efforts, the IPMP can be used as a planning basis for these efforts.

## EXCESS FACILITY DISPOSITION

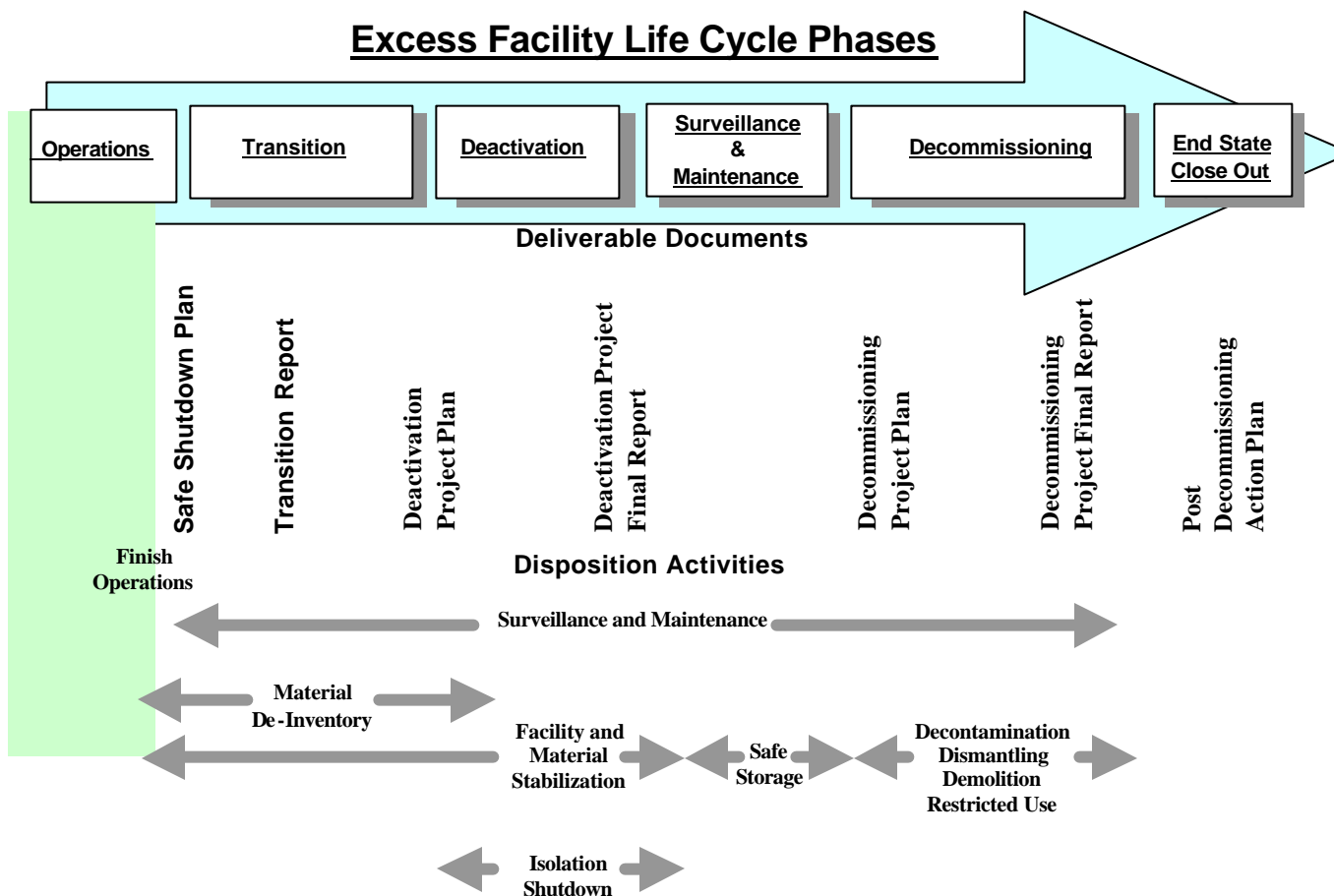


Fig. 4. Facility Disposition Process

### CHALLENGES FACING SRS

Deactivation of a large nuclear facility such as the F-Canyon Complex is a significant challenge regardless of the context in which the work is performed. However, F-Canyon deactivation also faces a number of unique challenges.

Probably the most significant challenge is the integration of deactivation work with continuing operations. Since the Canyon Complex is currently operating, seamless deactivation will require careful isolation of processes to be deactivated from operating processes. Unless these deactivation "blocks" of work are carefully selected, seamless deactivation could be very expensive and pose significant risks to the workers and the environment. The team that performed the FY00 planning developed a concept called "right sizing" by which deactivation of an operating facility is divided into blocks of work that are optimized for employee safety and cost effectiveness based on the system operating status. This concept is particularly applicable to facility services such as cooling water, steam, or the like. If portions of these systems were to be deactivated as

soon as the missions allowed, significant effort would be required to isolate the deactivated portion from the remaining active portion. However, if the service was deactivated at the conclusion of the facility mission, it could be taken down in its entirety eliminating the need for much of the isolation work.

Another challenge facing F-Canyon/ F B-Line deactivation is the continuity of provided services to other SRS facilities. F-Canyon provides many services to the other site facilities such as liquid waste treatment, emergency electrical power, effluent air filtering, etc. These services will continue to be needed through and after deactivation of the canyon. It will be necessary to analyze and substitute alternative ways for providing these services.

Deactivation planning of the F-Canyon facility in the high humidity environment of South Carolina represents another unique challenge. Other similar facilities that have been deactivated at Hanford and Rocky Flats were deactivated without too much concern for the naturally occurring moisture that can transport radioactive contamination. Large concrete buildings are susceptible to interior condensation from the high relative humidity at SRS. In addition, although F-Canyon was built in a location that is far above the naturally occurring water table, ground water and rain inleakage pose significant potential problems. The deactivated facility will require routine surveillances to ensure facility integrity can control these sources of water.

Finally, F-Canyon and F B-Line are an integral, integrated facility whose anticipated shutdown schedule spans over 11 years. During that time, F-Canyon and F B-Line must perform deactivation tasks, operations activities, and shutdown tasks concurrently. This is an extremely long, drawn out time frame to maintain technical and operational continuity.

## **SUMMARY**

The deactivation planning effort chartered by DOE-SR resulted in the following:

- Continued evolution of the NFDI deactivation planning tools;
- Improved and expanded experience of SRS personnel in the use of NFDI deactivation planning tools;
- Significant development of documented planning bases for deactivation of the F-Canyon complex; and
- Expanded experience of NFDI subcontractor personnel in the deactivation planning of an operating facility.

In addition, some very valuable lessons were learned during this deactivation planning effort:

- In some cases immediate deactivation of a portion of a facility such as the F-Canyon may in fact require significant work to isolate from continuing operations. In these cases it may be more economical to delay deactivation of

- these systems until more of the facility can be deactivated. In other words, “seamless” deactivation should be taken to mean that deactivation planning is completed for a facility prior to the end of its mission life and each facility system should be deactivated at the optimum point in time to provide the greatest savings without compromising facility safety (i.e., “right sized” deactivation work units)
- It is crucial that deactivation planning be performed by the engineering, operations, and maintenance personnel who have operated the facility being deactivated and are familiar with facility hazards and system operation. Planning by any other persons significantly increases the risk to facility deactivation workers and the environment. In addition, an approach using personnel without facility experience requires substantial investment in learning the facility and its associated hazards.
  - Deactivation planning should be initiated approximately 3 years before deactivation work is begun. If planning is delayed until closer to the end of a facility’s active mission, insufficient time may exist for deactivation planning to be accomplished without adversely affecting the facility schedule. Conversely, planning deactivation too far in advance of facility shutdown has several disadvantages (many of these plagued the F-Canyon / F B-Line deactivation planning):
    - Lack of interest/support by the facility staff due to perceived lack of urgency for deactivation and competition with more immediately pressing operational priorities.
    - High probability that planning efforts will be rendered out-dated and will have to be repeated as mission plans change. For example, the planning sequence for taking facility systems out of service may well have to be re-established based on new information. This particular disadvantage is exacerbated by longer delay times between planning and execution.
    - Loss of continuity between deactivation planning personnel and deactivation execution personnel. Ideally, personnel that had been part of the operating staff for a facility would perform both the deactivation planning and execution. However, as time passes these facility resources are moved to other assignments and execution of the plan falls to people who may not have the benefit of having participated in the plan development.
  - For deactivation planning within a security area, all personnel should be cleared for access prior to beginning work. The complications and inefficiencies of providing information and facility access to uncleared personnel generally outweigh the benefits derived from staff augmentation by such personnel.
  - Resources participating in the deactivation planning of facilities should be stationed near to the facilities being deactivated. For the F-Canyon / F B-Line deactivation planning effort, WSRC employed subcontractor resources to augment the operations staff assigned to perform the planning. The subcontractor personnel were stationed in three remote locations: Washington, D. C., Washington state, and California. This proved to be more detrimental than originally anticipated because of:
    - the lack of face-to-face contact,

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- delays in clearing documents for transmittal to the subcontractors (required for information leaving SRS),
- the need to provide multiple copies of facility information to multiple locations, and
- the inability of remotely stationed personnel to freely and conveniently access the involved facilities.