

ACCELERATING DEACTIVATION

William A. Peiffer
B&W Hanford Company, S4-49
Post Office Box 1200
Richland, Washington 99352

John P. Hayfield Jr.
B&W Hanford Company, S4-49
Post Office Box 1200
Richland, Washington 99352

ABSTRACT

In recent years, the focus of the U.S. Department of Energy (DOE) complex has shifted from defense production to facility stabilization, decommissioning, and environmental restoration. This shift from production to cleanup requires a parallel shift from operations-focused management to project-focused management for an efficient facility deactivation. In the operation-focused management organization, activities are planned and executed based on production goals and are typically repetitive and cyclic. In the project-focused management environment, activities are based on a defined scope/end objective, start date, and completion date. Since the workforce used to perform production operations is also usually relied on to perform facility deactivation, it is important to shift from an operations management approach to a project management approach. It is best if this transition is accomplished quickly so the project can move forward and workers don't spend a lot of energy anticipating change. Therefore, it is essential that managers, planners, and other workers understand the key elements associated with planning a deactivation project.

This paper describes a planning approach that has been used successfully to plan deactivation projects consistent with the requirements provided in DOE Order 430.1A, *Life Cycle Asset Management* and the companion *Deactivation Implementation Guide*, G430.1A-3, while exceeding schedule expectations and reducing costs. Although the planning of a deactivation project closely mirrors the classic project planning for construction projects, there are unique variations associated with facility deactivation. The key elements of planning a deactivation project are discussed relative to scope, schedule, and cost. Management tools such as project metrics and histograms are discussed as desired outputs from the planning process. In addition, lessons learned from planning deactivation projects across the DOE complex are discussed relative to making the transition from operations management to project management and the implications for deactivation project planning.

BACKGROUND

The success and efficiency of any project is dependent on the degree of planning performed at the outset. Deactivation projects have become prominent in the DOE complex over the last 5-6 years as a means of safe, timely and effective reduction of the hazards and costs associated with former defense facilities. Although project planning for construction and decontamination and decommissioning (D&D) projects (particularly reactor facilities) is a relatively mature process, the planning for deactivation as a discrete and independent project is an evolving process with some unique considerations. The DOE has recognized the shift in project planning needs from a construction related dominance, as was reflected in the former DOE order 4700.1, *Project*

Management System, to a broader life cycle approach as is reflected in the current DOE Order 430.1A, *Life Cycle Asset Management (LCAM)*, and its companion implementing guides. Specifically, implementing guide G430.1A-3, *Deactivation Implementation Guide*, provides an acceptable process for developing deactivation plans that reflects good practices and lessons learned from field experience to help accelerate deactivation projects. This paper discusses the basic tenants of deactivation planning consistent with G430.1A and lessons learned in its application. The aspects of the planning process addressed in this paper include development and implementation of the deactivation project plan.

DEVELOPING DEACTIVATION PROJECT PLANS

Sound front-end planning is a key to the success and efficiency of any project. For deactivation projects, the results of the planning process is embodied in the project plan. The planning process can be viewed as addressing two discrete but interrelated elements, core elements and supporting elements. The core elements define the technical aspects of the project, and the supporting elements address management plans and strategies which will be used to facilitate, monitor, and control the project. The core elements, which comprise the technical baseline for the project, include scope definition, project specification definition, baseline definition, and safety integration. Each of these core elements is discussed in detail below. An outline for a deactivation project plan that addresses these elements is provided in Table I.

Table I. Deactivation Project Plan Outline

Section	Content
1.0 Introduction	Describes purpose and overview of the plan. Outlines purpose of PMP (summary strategy) vs. supporting appendices (details).
2.0 Project Objective	Describes the purpose of the project and the driving objectives.
3.0 Project Scope	Describes the facilities and major actions that comprise the project.
4.0 Project Organization	Describes the project organization, functional relationships and discusses the roles and responsibilities with respect to accomplishing project objectives.
5.0 Project Management	Summary descriptions of systems and processes used to manage and control the project (cost, schedule, scope, etc.)
6.0 Project Baseline	Roll up summary of WBS, schedule, proposed milestones, and cost estimate.
7.0 End Points	Description of end point development process.
8.0 Quality Assurance	Describes policies and procedures that will be used to meet quality assurance objectives (e.g., configuration management).
9.0 Regulatory	Provides an overview of the project regulatory drivers and proposed approaches to ensure compliance.
10.0 Safety and Health	Provides strategy and methods to be used for evaluating the hazards associated with project activities. The strategy includes integration of worker health and safety issues and protection of the public.
11.0 Communications	Outlines a plan for public/stakeholder outreach and involvement communications objectives and methods.
12.0 Project Risk	Outlines a method for performing project risk assessment.

Core Planning Elements

- **Scope Definition.** For deactivation projects the scope typically includes the target facility and supporting ancillary facilities. It is essential that the facility footprint be defined so that key interfaces with site infrastructure systems (e.g., electrical, steam, water, etc.) can be identified. Project scope is further developed within the Project Specification Definition and Baseline Definition elements.
- **Project Specification Definition.** A fundamental question of any deactivation project is “How do you know when you are done?” The end points specification method was developed specifically for deactivation projects so those broad project objectives could be translated into explicit actions that are readily understood by workers. Deactivation 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 final assessments (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).

The end point specification method is considered the cornerstone of sound deactivation 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 typically 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.

The 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. The relationship between the end points and the project planning process is depicted in Figure 1.

How End Points Fit in a Project

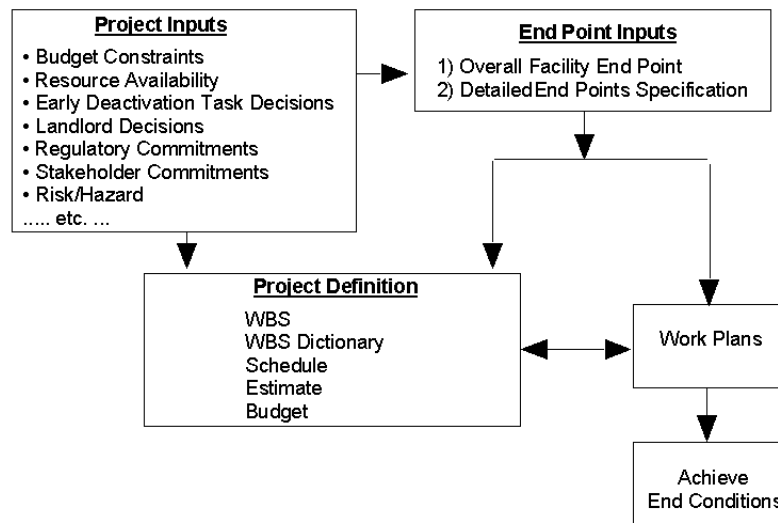


Fig. 1. End Point and Project Planning Relationship

- **Baseline Definition.** Once the project end point specifications have been defined, the project schedule and cost baselines can be established by application of standard project management techniques as follows:
 - Determine the WBS consistent with the end points.
 - Identify the activities necessary to achieve the end points. These activities are then sequenced with logic ties depicting the inter- and intra-activity dependencies. Activity definition and sequencing can be effectively and efficiently performed in highly structured and facilitated sessions with a team of operations, maintenance, technical, and safety personnel. These planning teams are typically assembled for 1-3 day sessions with the results being schedules with less uncertainty and a high level of worker confidence and “buy-in.” These sessions can be repeated periodically throughout the project to update the baseline and develop micro level schedules for selected activities.
 - The necessary resources (people, materials, and equipment) are identified to accomplish each activity. These resource estimates are used to develop the project cost estimate. The cost estimate can be developed using the team approach discussed previously.
 - Based upon the available resources and other constraints (e.g. safety documentation approval cycles), the duration of activities are estimated and the combination of activity sequences, duration, and resources are used to prepare the baseline schedule.

- The baseline schedule and cost estimate information are then used to develop an overall project budget profile.

- **Safety Integration**

Protection of the worker, the public, and the environment is a top priority for deactivation projects, and protection systems and methods must be incorporated in the project planning. The DOE policy regarding integration of a safety management system into management and work activities is provided in DOE Policy 450.4, *Safety Management System Policy*. Further guidance for establishing safety standards applicable to facility deactivation activities is provided in DOE-STD-1120-98, *Integration of Safety and Health into Facility Disposition Activities*. Consistent with the policy and guide, the major mechanism for integrating safety and health into deactivation activities is the work planning process during which existing safety documentation is reviewed and evaluated, deactivation activities are identified and evaluated against existing controls, and modification to controls are identified as required. A key principle is that worker involvement, in all levels of safety and hazard analysis required to plan and perform deactivation activities, is essential to make all elements of deactivation effective. These principles should be communicated and committed to in the project management plan.

Supporting Elements

In conjunction with the core project plan elements discussed above, deactivation project plans should address the key supporting or facilitating project management elements discussed below.

- **Project Organization and Interfaces** – describes the project organization, functional relationships, roles and responsibilities and the major internal and external organizational interfaces.
- **Project Management** – provides a summary description of systems and processes used to manage and control the project baseline. This section should include project status reporting, configuration control, and issue resolution and decision making processes.
- **Regulatory Strategy** – identifies a regulatory framework and strategy for the project. This includes project regulatory drivers and approaches to ensure compliance and regulatory agency involvement/concurrence with regulatory issue resolution.
- **Safety and Health** – provides the strategy and methods to be used for evaluating the hazards associated with project activities. This strategy should include integration of worker health and safety issues and protection of the public.
- **Communications** – outlines a plan for public and stakeholder outreach and involvement to ensure adequate opportunity for deactivation planning input. Included are communication objectives and methods.
- **Risk Management** – describes a method for identification, control, and management of project baseline risk. The cost, schedule, and technical scope baselines should be evaluated

with regard to risk factors such as technology requirements, complexity of interfaces, funding stability, regulatory involvement, number of key participants, and other factors considered appropriate by the project management team. Both the probability and consequence of risk manifestation should be examined and quantified as much as possible to facilitate development of appropriate risk management actions. This assessment can be most effective if performed as a collaborative team effort between the deactivation contractor and the key customers and stakeholders.

A project plan prepared in accordance with the core and supporting project planning elements described above will be consistent with the guidance provided in LCAM implementing guide G430.1A-3. The plan should be prepared such that it becomes the “body of knowledge” for the project; however, a balance is required so that the plan does not become a “catchall” in an attempt to solve all project issues and concerns. The plan should be concise and clearly communicate the project technical baseline and management strategies, methods, and systems. Finally, a graded approach should be applied to customize the project plan consistent with the size and complexity of the project.

Integrating Surveillance and Maintenance Operations

Since deactivation project activities will be competing with ongoing facility surveillance and maintenance (S&M) activities for resources (people and money), the rampdown of S&M activities must be carefully factored in to deactivation project planning. Reducing S&M and other support activities allows reallocation of resources to deactivation activities, thereby accelerating the deactivation project. Project schedules and cost estimates should include S&M operations activities so that the impacts of these activities on project performance are identified and understood.

A systematic and iterative method can be applied to identify and implement S&M reduction opportunities. In general this method consists of the following elements:

- Determine the existing suite of S&M activities and supporting administrative systems. A team of facility experts can best develop a comprehensive list.
- 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 deactivation end points.

The results of the analysis performed above should be factored into the project schedules and cost estimate. The results of 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 a formal process that can be used to assist facilities in identifying S&M reduction targets. This process is provided in DOE/EM-0341, *The Requirements-Based Surveillance and Maintenance Review Guide*.

IMPLEMENTING AND MANAGING THE PLAN

During the final phases of project plan preparation, management should begin to consider a strategy for effectively implementing and managing the plan. Many elements of the implementation are described in the project plan and systems can be quickly established for elements such as change control, reporting, interface management, etc. However, establishing systems to implement the plan does not mean the plan will be effectively implemented. Management must be diligent in ensuring that the plan is communicated to and accepted by the work force and that the right information is being assimilated and analyzed to monitor the health of the project. This section briefly discusses two key aspects of successful implementation and management of the deactivation project plan, establishing a project focus and monitoring plan performance.

Establishing a Project Focus

The workforce associated with previous facility operations is uniquely qualified and should be retained to perform the deactivation work. This assertion carries particular significance since these workers understand the facility risks and hazards and how best to safely accomplish the work. However, one potential drawback is that these former production workers may not be prepared to work in a highly structured project environment (i.e., work towards a goal that eliminates their job). A key to effective implementation of the deactivation project plan is to quickly transition from a production operations environment to a project environment. Considering the following actions can facilitate this transition.

- Project management training of key personnel (primarily managers and supervisors but should also include technical and bargaining unit staff).
- Development of project teams with dedicated resources rather than performing the work within operations-focused functional organizations.
- Disciplined application of project management fundamentals. Management must be willing to hold people accountable for project cost and schedule performance as well as fieldwork execution.
- Identification of the benefits to facility personnel. Management must show facility personnel the benefit in working themselves out of a job (as is typical of project work but not typical of production work with a seemingly unlimited horizon). This is difficult but can be communicated in terms of benefits such as job skill development, intent to retain core skills for application at other deactivation projects, and transferability of skills to other projects (deactivation and non-deactivation related).

Monitoring Plan Performance

A key principle in managing the performance of any activity is “you do what you measure.” With this principle in mind, it follows that establishing project metrics and performance indicators is an important aspect of project plan implementation. Project metrics and

performance indicators should be developed to focus management on the “critical few” indicators, which can be used to quickly and accurately, determine project performance. The term “critical few” should be interpreted literally to limit the metrics and performance indicators to those that truly are critical and escape the information overload trap. Some of indicators to be considered include the following.

- Actual and projected costs versus allocated or approved budget.
- Schedule performance measured in terms of positive or negative critical path float.
- Field performance of critical path activities. This can be expressed graphically in terms of quantities of hazardous materials removed over time, facility system flushes completed versus total required, etc.
- Actual number of end points closed versus end points scheduled for closure.
- Personnel performance affecting safety such as contamination incidents, injuries, and safety infractions.
- Project milestone performance.

Although the list of potential performance indicators and metrics given above is not all inclusive, the intent is to give a flavor of the types of indicators which have been used successfully in the past and provide a starting point for development of an expanded set of indicators.

CONCLUSIONS

The DOE is developing standards, methods, and systems for effective planning deactivation projects. The requirement to prepare a project plan for deactivation projects is provided in DOE Order 430.1A, *Life Cycle Asset Management*, and detailed plan preparation guidance is provided in the companion guide G430.1A-3, *Deactivation Implementation Guide*. The key to effective deactivation planning is the up-front determination of the project end points. The end points are then used to drive the preparation of the project work breakdown structure, schedules, cost estimates, and work plans. Completion of the project plan does not ensure successful implementation. Key in the successful implementation is establishing a project focus with the workforce, and developing and monitoring the proper set of metrics and performance indicators.

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