Opportunity for Improved Doe O 413.3 Guidance for D&D

C.A. Negin, C.S. Urland
Project Enhancement Corporation
20300 Century Boulevard, Suite 175, Germantown, MD 20874, USA

A.P. Szilagyi
U.S. Department of Energy
19901 Germantown Road, Germantown, MD 20874, USA

ABSTRACT

This paper suggests ways to improve guidance for Deactivation and Decommissioning projects subject to the Department of Energy's project management order, DOE O 413.3A. The ideas presented are based on insights gained from field experience with D&D projects. The venues for considering these suggestions are the development underway of guides to replace the DOE M 413.3 manual and revision to DOE's existing D&D guides.

BACKGROUND

Project management planning and approval within the Department of Energy (DOE) is driven by the DOE O 413.3A, *Program and Project Management for the Acquisition of Capital Assets.* Many Deactivation and Decommissioning (D&D) projects for which the total project cost is greater than $5M are subject to this order. This is the case, even when such projects are not funded as capital projects; that is, are more subject to annual changes in budgeting.

DOE Guidance for planning and conducting projects in accordance with the order is embodied in several manuals, guides, and web sites that include:

- A manual with the same title as the Order [1]. This manual is to be replaced in the 2007-2008 timeframe by a series of 19 or 20 guides [2].
- An OECM (DOE Office of Engineering and Construction Management) website for project management practices (http://oecm.energy.gov/Default.aspx?tabid=358), which provides guidance for requirements, practices, and examples for complying with the Order.

Guidance for planning and conduct of D&D projects are embodied in:

- A series of DOE Guides that address deactivated facility surveillance and maintenance [3], deactivation [4], decommissioning [5], and transition [6]. Some of this is dated, for example, transition refers to activities that are rarely conducted. Regardless, they remain useful for guidance.
- A DOE EM website titled "Excess Facility Transition to Deactivation and Decommissioning," http://web.em.doe.gov/deact/ that provides examples of planning conducted in the 1993-2000 period. This website is in effect an electronic elaboration of DOE's Deactivation Handbook [7]. As with the above guides, this is somewhat dated but nevertheless is a useful reference.

Of interest for this paper is that the D&D guidance was created prior to DOE O 413.3 and is not linked to the Order. On the other hand, OECM guidance, published after the D&D guidance, has been derived for the most part from practices applicable to new construction capital projects and is quite limited with regard to differences between D&D projects and capital construction projects.

PURPOSE AND PERSPECTIVE

Understanding significant differences between new construction and D&D projects can result in more relevant guidance and consequently better planning and more focused reviews. This paper points out several areas that can benefit from such guidance. This paper is primarily with regard to facilities where there is radioactive contamination and/or materials. It is these types of facilities that are most likely to exceed the $5 Million threshold for which DOE O 413.3 applies.

The objective here is to present observations of these differences to suggest or imply areas where guidance specific to D&D would be useful, and to stimulate interest in expanding these ideas. Actually providing the guidance should be done in the course of developing the Guide Topic #8 for DOE O 413.3 related to EM Cleanup Projects [2].

In this paper "facility" is used as an analog to a project; the ideas presented apply as well to remediation projects in which there may be no buildings and/or systems.

CHARACTERISTICS OF MANY D&D PROJECTS

D&D projects are quite different from new construction capital projects. In general, the following differences in characteristics are noted:

- There is relatively little design work of a construction nature. The amount of engineering leading to design drawings and specifications are usually very limited relative to the overall project scope. Such design efforts would be a minor factor in the critical decision process.
- D&D involves a significant amount of engineering. The type of engineering work, however, is for the most part very different from new construction engineering.
- Activities tend to be heavy in operations and services types of activities and sparse on fabrication or construction, resulting in a labor mix that is very different from construction.
- With exceptions, the need for new equipment is low. The need for materials can be heavily weighted towards consumable items that will be disposed as they become contaminated and treated as radioactive waste.
- Preexisting conditions are extremely variable from facility to facility because of differences in vintage of construction and nature of operations that have been conducted.
- There can be a substantial lack of knowledge of actual conditions either because records are not available or locations are not accessible. In many instances actual conditions will not be known until the project proceeds.

These subjects are further elaborated in the following paragraphs.

SUBJECTS TO ADDRESS FOR D&D PROJECT GUIDANCE

What follows is a listing of topics for D&D projects that set them aside from construction projects. This list should not be considered complete. Rather, this is an initial "strawman" to stimulate thinking on the part of those who will be developing future guidance.

Critical Decision Process

The sequence of Critical Decisions (CDs) prior to significant field work (CD-0 through CD-3) anticipates two to three phases of design, with stepwise approval of the project baseline as the design becomes more detailed and the project schedule and estimated costs become better understood. CD-1 (Approve

Alternative Selection and Cost Range) normally occurs at 35% design stage, CD-2 (Approve Performance Baseline) at 65% design, and CD-3 is the approval to begin field work. For D&D projects in which there is generally very little traditional design work, and/or the design work is not critical to the project schedule or cost, it makes sense to combine CD-2 and CD-3. Combining critical decision is recognized in current guidance, however, it is suggested that for D&D projects it be considered more the norm than the exception. To combine CDs, the project definition, schedule, and estimate would need to be known with sufficient detail and certainty such that further effort will not significantly change the results of planning.

The differences for CD-4 (Approve Start of Operations or Project Closeout) are significant. For a new construction project, the activities leading to CD-4 can be quite comprehensive. For a D&D project, the primary objective is to verify that specified conditions have been achieved.

Critical Decision Constraints

The most important element of planning for D&D projects is the degree to which conditions are known and information is available regarding a facility's physical characteristics along with knowledge of contaminants and hazards both accessible and inaccessible. In some cases detailed planning can only be completed as progress is made. Thus, a major focus of the critical decision process should be the uncertainties associated with such conditions and how they affect the proposed project baseline.

Guidance should address the possibility that a project cannot be completely planned with certainty until partial D&D is conducted for access, or that significant up-front investment may be required for additional characterization. Characterization includes intrusive data gathering, sampling, testing, lab analyses, evaluations of data, etc. Such a case can be compared with a new construction project in which a "CD-3A" decision is made to procure long lead-time equipment or materials well before CD-2 for the rest of the project. For D&D, authorizing a substantial characterization effort could be subject of CD-3A.

Conceptual Design

The conceptual planning of a D&D project is conducted to initiate the detailed engineering and baseline development. The Conceptual Design Report is to address alternatives, among other topics. When considering alternatives for a D&D project, some important considerations are:

- D&D can have several phases such as shutdown, deactivation, long-term surveillance and maintenance while deactivated, demolition, soil remediation, etc. Each phase can be distinguished by the types of activities it encompasses. But, any specific project may encompass one or more of these phases or types of activities. For example, deactivation can be combined with demolition, in which case the project would be quite different from conducting them with an interval of years between the two. Quite often this scope decision is made a-priori based on strategic considerations, such as the need to recapture the space occupied by a facility for future uses. The "no action" alternative is moot because the mission is to decommission.
- The impact on contiguous or nearby facilities may be important. This is especially the case if there are attached facilities for which operations will be impacted by the project.
- There can be situations in which knowledge of the physical and contamination conditions of the facilities are insufficient to schedule and estimate a D&D project with confidence. Further, the effort to obtain the needed information can be costly. In such situations, it may be prudent to authorize an initial project phase to conduct the requisite characterization prior to planning the entire project in detail.
- The vision of the physical end state for each alternative being considered. The end state may be driven by safety or environmental requirements as well as management judgment.
- Approval per NEPA/CERCLA can be a major endeavor for the final stage of decommissioning (demolition, in-situ decommissioning) or for a project with a unique type of contaminants. The

significance of the effort to obtain environmental approvals needs to be recognized in providing guidance for the content of the project's conceptual design report.

It is recommended that conceptual design guidance provide examples of how these subjects can be presented, noting that they will be very different for deactivation vs. demolition vs. in-situ decommissioning.

Use of End Points

The End Points method [7, 8] is a very important process for specifying the conditions to be achieved for a D&D project. The end points method was derived for DOE projects in the 1990's as a systematic way to specify facility deactivation because construction specifications for the most part do not apply. End points can also be specifications for demolition and in-situ decommissioning projects. End points for deactivation or in-situ decommissioning will generally be more elaborate than for demolition.

Detailed end point specifications are appropriate to CD-1 and inclusion in the Project Execution Plan. The end point method initially applied to PUREX in the early 1990's has evolved over the years and a variety of content and formats have been used. The method of application has been simplified somewhat from the very early versions. It is essential that any project guidance for D&D projects should address the need to specify end points and provide examples of how that can be done.

Engineering and Design

Normally there will be relatively little design work of a traditional type for D&D projects and the scope of design can usually be recognized early in project planning. Where design is required for D&D, the same degree of discipline and review should be applied as required for new construction; and in some instance increased hazards warrant a greater degree of review. Design tasks for D&D are typically:

- Reconfiguration of plant systems and spaces to achieve the deactivation end points; e.g., ventilation and power.
- Facility isolation from services and utilities prior to demolition and possible rerouting of site systems such as water, power, gas, and telecommunications.
- One time use systems such as those to support decontamination, processing of waste materials or contaminated solutions, etc. An example is a size reduction enclosure.
- Temporary systems, such as local filtered ventilation, to support cleanout and worker protection.
- Structural assessment to support demolition sequence planning, possibly followed by structural reinforcement design for selected locations.
- Engineered enclosures for buildings or waste.

Aside from design, there can be a significant amount of engineering for D&D that does not result in design deliverables. A few examples are assessment of roof integrity for the duration of a deactivated period, fire hazards analyses to justify deactivating a wet pipe fire system, calculation of material volumes, etc. The resources, schedule, and cost for this engineering needs to be recognized in developing the project baseline.

DOE projects of the past 5 years can provide a comprehensive list of typical design and engineering tasks to include in the guidance. This experience would be useful input to developing D&D project guidance.

Materials and Waste Management

The primary product of D&D projects are waste and scrap/salvage. Waste and material planning and management are essential for all but the simplest project. The planning can be complex because of factors such as the variability in waste constituents, limited choice of disposal sites, landfill regulations

that apply to other than radioactive waste, transport through local communities, the DOE metals moratorium, and others. With the large number of waste shipments that can be expected for some of these projects, it may be necessary for a project to have a dedicated staff to manage, coordinate, and schedule material shipments. Guidance for the content of waste and material planning is necessary.

Progress and Earned Value Metrics

For a project where there are of the order of 100 or more end points specifications, they provide a natural metric for a D&D project. In addition, at Rocky Flats the "Work Sets" approach for building cleanout that was used to track progress can also be used for progress metrics. A work set is a definition of a bounded incremental scope of work; for example, removal of a set of equipment in a given area of a building. It is suggested that use of these two methods by incorporated in the earned value system for D&D projects.

The guidance could also suggest work sets/metrics characteristic of D&D projects; that is, units of measure relevant to specific activities. Examples include volume (cubic yards) of soil removed, area (square feet) of asbestos-containing Transite siding removed; individual or numbers of equipment removed such as gloveboxes and hoods, etc.

Worker Health and Safety

Many older buildings and their internals are in poor condition, which poses potential safety issues to workers in and around them. The presence of asbestos, lead, PCB-based oils and paint, and other hazardous materials are significant industrial health challenges. In addition, verification of electrical isolation is difficult, putting workers at risk for exposure to electric shock.

Building demolition is an activity that presents many hazardous work conditions with the potential for a variety of industrial accidents, in most cases similar to construction (i.e., slips, trips, and falls; sprains and strains; cuts and abrasions; pinch points; and contact with falling objects). Typical worker safety and protection requirements for these projects include eye protection, hard hats, safety footwear and hand wear, tie-off above 6 feet in elevation, and reflective vests for all personnel within the work-zone boundary. Additional personal protective equipment requirements are imposed when radioactive and hazardous material contamination is present.

There can be considerably more types of worker hazards for D&D projects than for construction projects. And, the focus for new construction often relates to subjects such as nuclear safety. These differences should be recognized in any guidance that is put forth regarding project health and safety plans.

Quality Assurance (QA)

For D&D, examples of the types of activities subject to QA procedures are:

- Waste characterization, radioactive waste disposal manifesting and disposal site acceptance criteria.
- Systems isolation, especially for electrical systems.
- Design activities, such as for structural analyses for demolition, and others.
- Software for which the results are used for worker protection or waste disposal.
- Analyses related to safety, for example, to downgrade a facility's nuclear or hazard category.
- Data (i.e., MARSSIM surveys) and analysis to close out the project.

Suggested guidance is to address when QA requirements for D&D projects and examples of the types of activities to which project-specific QA procedures are anticipated to be needed. As much of this is related to data needs, the Data Quality Objectives (DQO) process should be cited.

Project Risks Associated with D&D Projects

D&D projects involve field work methods that are established and understood. Thus, the uncertainties related to many of the work activities are not great. In contrast, many D&D risks relate to factors external to the project or the facility itself. Some examples are:

- The inability of the local landfill to accommodate voluminous quantities of demolition waste requires wastes to be shipped further.
- The traffic and noise impact of a large number of trucks to transport waste and materials.
- Political sensitivities that prohibit disposal of DOE facility waste in local landfills.
- Limited availability of a sufficient number of workers with security clearances.
- A limited pool of radiation work qualified subcontractors.
- Reliance on existing facility equipment (e.g., overhead cranes) that may be unreliable due to age.
- Limited availability of decontamination and/or demolition equipment.
- Isolation of building electrical and/or mechanical systems affects adjacent buildings.
- Vibration, noise, and/or dust from demolition activities may adversely affect close proximity operating facilities.

A major risk directly associated with the facilities in the project is finding greater than expected levels of radioactive or hazardous contamination levels; or encountering hidden physical conditions that were not readily apparent during planning. In the past, this uncertainty was addressed by assuming a healthy estimating contingency; 25% to 35% was not unusual. Current practice is to derive contingency directly from a risk assessment, but results of such derivations never approach this magnitude. Ideally, guidance could state a range of contingency based on the degree to which conditions are known or not known. This may not be feasible, but as a minimum should be a topic of discussion in the development of guidance.

Baseline Development

For new construction projects, the schedule and cost baseline starts with the facility and system designs. There is much reference data that provide unit rates and adjustment factors for estimating the cost of materials and construction. In contrast, creating the baseline for a decommissioning project relies almost entirely on the extant conditions of the facility and information that is available regarding past operations. There is so much variability among DOE's facilities; unit costs are generally hard to apply except for estimating at a parametric level. As pointed out earlier, a large fraction of the cost is operational and support labor, and much of that is level-of-effort. Typical level-of-effort resources are for ES&H oversight, security, QA, radiation protection oversight, procurement, and project controls, among others. Further, waste management (a non issue for new construction planning) usually constitutes a large fraction of a D&D project's activities, schedule, and cost; a third of the project cost would not be unusual.

In addition, because D&D projects generally are not capitalized, they are at risk to changes in annual appropriations. Delaying or stringing out a deactivation or demolition projects for budgeting management is not an unusual occurrence, which will necessarily lead to a change in an established baseline.

These and other important differences in baseline development need to be recognized and should be emphasized in guidance development.

CONCLUSIONS

Current 413.3 guidance mentions several subjects relevant to D&D, but there is very little specific guidance in this area. This paper suggests some areas where there exists an opportunity for improved

guidance and specifically to address D&D projects differences compared with other types of projects. A systematic evaluation should be conducted to decide what to include. Providing the guidance should be done in the course of developing Guide Topic #8 for DOE O 413.3 related to EM Cleanup Projects [2], schedule for accomplishment in the 2007-2008 timeframe.

In addition, the existing DOE guides related to D&D that address excess facility surveillance and maintenance, deactivation, and decommissioning, should be modified such that they apply via DOE O 413.3. This is currently in EM's plans.

In either of these cases for creating guidance, it is essential that the EM experience from the major D&D projects completed over the past 5 years be incorporated. This necessarily needs to be done by involving individuals who have experience with those projects.

REFERENCES

[1] DOE M 413.3 M, Project Management for the Acquisition of Capital Assets, 03/28/2003

[2] Makepeace, J. and Santana, C., DOE Order 413.3A and the New Guides, http://www.oecm.energy.gov/Default.aspx?tabid=377, November 14, 2006.

[3] DOE G 430.1-2, Implementation Guide for Surveillance and Maintenance during Facility Transition and Disposition, 9/29/1999.

[4] DOE G 430.1-3, Deactivation Implementation Guide, 9/29/1999.

[5] DOE G 430.1-4, Decommissioning Implementation Guide, 9/29/1999.

[6] DOE G 430.1-5, Transition Implementation Guide, 04/24/2001

[7] DOE DOE/EM-0318, Facility Deactivation Methods and Practices Handbook, Emphasizing End-Points Implementation, Revision 1, August 20, 1999

[8] Negin, C. and Szilagyi, A., Specifying Permanent Shutdown for Contaminated Facilities - The End Points Method Applied to the PBF Reactor, International Conference on Lessons Learned from Decommissioning of Nuclear Facilities and the Safe Termination of Nuclear Activities, December 11-15, 2006.