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Decommissioning of Nuclear Facilities

Management of Decommissioning Projects

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1

Lesson Objectives

- **Understand the management and organizational components of decommissioning projects**
- **Understand the principles of a project schedule and required project controls**
- **Understand the importance of and how each of the following elements must be integrated into the management of decommissioning projects**
 - **Quality Assurance**
 - **Training**
 - **Record keeping**

2

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Introduction

- **The ultimate responsibility for decommissioning rests with the licensee (i.e., operator)**
- **The Management staff is responsible to:**
 - **Maintain the facility**
 - **Plan the decommissioning, including development of strategies**
 - **Manage implementation of the chosen strategy**
 - **Perform supporting licensing activities**
 - **Provide project staffing and contractor support**
 - **Perform supporting technical activities - decontamination, dismantling and waste management among others**

3

Introduction (cont'd)

- **Commercially available project management tools can assist in fulfilling the management responsibility to safely and efficiently perform facility decommissioning**
- **In addition to project management tools, key aspects in a successful decommissioning project include: training, quality assurance and records management**

4

Decommissioning Organizational Structure

- **The operating organization should have access to competent staff in the following areas:**
 - Project management (including finance and human resources)
 - Safety (both radiological and industrial safety aspects)
 - Engineering
 - Licensing
 - Facility plant and systems
 - Quality assurance
 - Waste management
 - Physical protection
 - Emergency preparedness
 - Environmental monitoring

5

Decommissioning Organizational Structure (cont'd)

- **Changes in site organizational structures are required for a decommissioning project – these also vary over the course of the project**
 - Typically permanent operations staff decreases
 - Typically decommissioning staff increases
- **The decommissioning staff is typically augmented with temporary support including:**
 - Consultants to work with site professional staff
 - Labor and deconstruction contractors
 - Specialty subcontractors (e.g., demolition or robotics)

6

Decommissioning Organizational Structure (cont'd)

- The operating organization may need to have (or have access to) competent staff to cover the following specialized technical topical areas:
 - Fuel handling
 - Dismantlement and demolition
 - Decontamination
 - Robotics and remote handling
- The competent staff need not be from the original operational organization, however, the entire decommissioning organization needs to work as a single organization

7

Typical Decommissioning Organizational Functions

- **Project Management**
 - Overall project oversight (not QA function)
 - Budget & finance
 - Project planning/scheduling
- **Administrative**
 - Contracts & procurement
 - Personnel
 - Records management
- **Craft Support**
 - Radiation protection technicians
 - Decontamination & dismantlement technicians
 - Rigging and hoisting operators
 - Maintenance and operations technicians

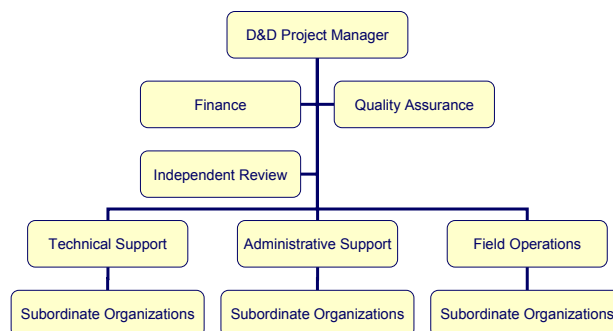
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Typical Decommissioning Organizational Functions (cont'd)

- **Non-Craft Support**
 - Security/Fire Protection/Emergency Management
- **Technical Support Services**
 - Facility Plant Services
 - Licensing
 - Training
 - Health Physics incl Env Monitoring
 - Industrial Safety
 - Waste Management
 - Engineering Services
 - Public Relations and Stakeholder Support
- **Quality Assurance**

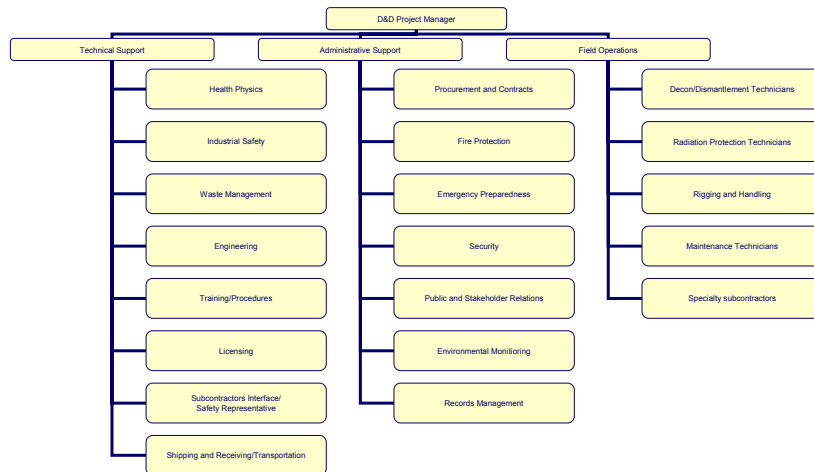
9

Typical Decommissioning Organization Chart



10

Typical Decommissioning Organizational Chart (cont'd)



11

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Decommissioning Organizational Structure

- The final structure should be described in the facility Decommissioning Plan (DP)
- Clear authority and responsibilities should be defined for each organizational unit and the management chain within the organization
- The quality assurance function needs to be independent of the decommissioning organization
- Attention should be given to retaining key personnel familiar with facility operations and history.

12

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Decommissioning Organizational Structure (cont'd)

- **Records**

- **Record keeping is an essential function for ensuring project success**
- **If the selected decommissioning approach is deferred dismantlement, it is essential to gather and document the collective historical knowledge of former operating personnel**
- **Although separation of responsibilities is required, it is essential for all personnel on the decommissioning project to effectively work as a team toward the overall project objectives**

13

Decommissioning Organizational Structure (cont'd)

- **Use of contractor staff**

- **In many cases, contractors are needed or selected to be part of the decommissioning team**
- **This is most likely when deferred dismantlement is the selected decommissioning option or the operating staff do not have the required expertise**
- **Financial considerations may also impact the selection of and use of contractors – use of specialized technical services**
- **Appropriate levels of contractor control, supervision and training are essential**

14

Decommissioning Project Phases

- **Pre-Decommissioning actions**
- **Decommissioning planning**
- **Decommissioning execution**
- **Decommissioning project controls**
- **Decommissioning project closeout**

15

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Decommissioning Execution

- **This is the decontamination and dismantlement phase of the project**
- **This phase of the project involves the most cost-intensive, radiation dose-incurring portion of the work, and, therefore, requires close monitoring**
- **Project management is essential for control of safety, adherence to procedures, and quality assurance during this phase**

16

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Decommissioning Project Controls

- Project controls allow for the routine small changes in scope, direction, and progress that occur repeatedly during a project
- Quality Assurance provides another project control where the safety management objectives are identified and kept within expected performance
- Project controls consider initial decommissioning detailed plans/schedules (the baseline) against the present condition of the project
- Routine reporting detail is needed on task-specific performance, resources and costs expended
- This information allows management to focus attention or to reallocate resources or funds to assure the overall project stays on schedule and budget

17

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Project Scheduling

- Project schedule developed as a portion of overall project planning. The schedule is based on a Work Breakdown Structure (WBS) approach
- The project schedule ties project resources, costs and task durations together – with a graphical output
- Once fully established, the project schedule becomes the single most essential management tool to ensure the project arrives at the anticipated end-state, at the anticipated time and for the anticipated cost.

18

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Project Scheduling (cont'd)

- **Specific elements often addressed in a decommissioning project schedule include:**
 - Preliminary site characterization
 - Safety basis and licensing documentation
 - Preparation of the decommissioning plan
 - Obtaining required permits and approvals
 - Facility design/engineering/modifications to support decommissioning
 - Decontamination
 - Dismantlement and demolition
 - Waste management
 - Final status surveys
 - License termination actions

19

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Project Scheduling (cont'd)

- **Each key element will have its own detailed list of tasks to complete the key element. Each line item in the schedule should be tied to the resources and time needed to complete the task.**
- **Routine (frequent) reporting and updating of the schedule of actual performance against the schedule (again including resources and funds expended to reach the level of completion) allows the project manager to quickly identify tasks which need additional attention to ensure the overall success of the project schedule and plan.**

20

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Project Closeout

- When radiological and hazardous materials have been satisfactorily removed or remediated, the site license may be terminated by the regulatory authority
- Site management may still need to perform differing tasks to reach the agreed upon final end state
- If any long term monitoring or institutional controls are needed, they are developed and implemented
- Once physical work is done to reach the end point, appropriate project reporting and documentation is completed

21

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Personnel Training

- All decommissioning personnel require nuclear facility site and safety procedures training to ensure safe and effective conduct of the decommissioning
- Specialized training is useful and required for certain activities including the use of mock-ups and models in training
- Some examples of typical decommissioning training include:
 - Facility orientation and entry requirements – all employees
 - Radiation worker and/or safety training – differing classes based on worker exposure potential
 - Quality assurance – all employees
 - Special task or function training
 - High consequence activities
 - Hoisting and rigging
 - Decommissioning activities

22

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Project Quality Assurance (QA) and Documentation

- **An approved QA program should be in place for use by the decommissioning team**
- **The QA program should be developed, in place and working before decommissioning operations begin**
- **A description of the QA program should be included in the project decommissioning plan**
- **A strong QA program ensures compliance with regulatory authority requirements for decommissioning and controls changes to work scope and methods**
- **IAEA guidance documents are available to support the development of effective QA programs**

23

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Elements of a QA Program

- **The QA program must be documented in the form of a QA Plan and all personnel must be appropriately trained as to the QA requirements that impact their job**
- **An effective QA program focuses on three key areas:**
 - **Management**
 - **Description of the QA program**
 - **Task performance**
 - **Personnel training and qualification**
 - **Quality improvements**
 - **Documents and records**
 - **Work processes**
 - **Design**
 - **Procurement**
 - **Inspection and acceptance testing**

24

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Elements of a QA Program (cont'd)

- **Assessment**
 - **Management assessment**
 - **Independent assessment**

25

Quality Assurance - Records Management

- **Acquisition and retention of records from the decommissioning activities are a key component in a QA program**
- **Records maintained should be available for future decommissioning projects and as dictated by regulatory authority requirements**
- **Records retention periods and storage locations should be routinely reviewed to ensure those in use are appropriate**

26

Quality Assurance - Records Management (cont'd)

- **When prolonged periods of safe enclosure are planned, it is critical that accurate and complete information be maintained on radioactive materials remaining at the facility for use in the eventual final decommissioning**
- **For deferred dismantling, reports of on-going surveillance and maintenance (S&M) results and the needs for future S&M needs should be maintained and documented**
- **Progress of decommissioning, once underway should be documented by the managing organization**

27

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Quality Assurance - Records Management (cont'd)

- **All radioactive material present at the beginning of decommissioning should be properly accounted for with the final disposal site documented**
- **After each phase of the decommissioning, details of the progress in the decommissioning process should be reported to the appropriate regulatory authority – this report might also detail anomalies observed during the same period**
- **Upon completion of the final dismantling, appropriate records should be retained – both by the operator (licensee) and the appropriate regulator**

28

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Quality Assurance - Records Management (cont'd)

- In accordance with the national framework, these decommissioning records should then be used to confirm completion of the decommissioning project in accordance with the approved decommissioning plan
- Records maintained should be commensurate with the complexity of the installation being decommissioned and its associated hazards

29

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Examples of Records to Demonstrate QA Program Compliance

- Survey instrument calibration records
- Inspection and certification of test and measurement equipment (e.g., lifting equipment)
- Waste package certification for disposal
- Personnel training records
- Demolition procedures

30

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Typical Decommissioning Management Concerns

- Inadequate lead time to establish decommissioning organization
- Poor definition of the decommissioning project baseline – any combination of scope, schedule or cost
- Incorporation of additional scope to the project impacting schedule and costs
- Poor definition of the desired end state for the project
- Lack of proper financial controls and status tracking system
- Improper or inadequately staffed and/or trained project personnel – critical for health and safety management and contractor management
- Poor definition and/or implementation of quality assurance and its impacts
- Lack of proper resources for project execution and realization of need for on-going change as project advances
- Poor management of interfaces with external organizations

31

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Summary

- Implementation of an effective and thorough cycle of planning for decommissioning facilitates the management team to simply 'manage the process'
- Well established management techniques must be used in decommissioning projects just as on any other traditional project
- The entire decommissioning process must be well planned for successful execution with roles of all the parties clearly defined to be effectively managed
- Several management approaches are available, but quality assurance, safety and training are always licensee responsibilities regardless of - for example - contracting arrangements

32

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References

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- IAEA Safety Guide WS-G-2.2
- IAEA Safety Guide WS-G-2.4
- IAEA TRS #351
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- IAEA TRS #399
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- IAEA TECDOC-1394
- IAEA Draft TECDOC – Decomm Training
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