Considerations on safety in the transition period from operation to decommissioning of nuclear facilities

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1. Introduction

The transition period between operation and the implementation of decommissioning involves some routine operations along with others that may be specific to the transition stage based on the type of facility. This period can be confusing and stressful to plant workers and, in addition, operational safety may be compromised. During this period a number of plant, system and organizational modifications will be necessary to meet the objectives and requirements associated with decommissioning. A change of thinking within the management and workforce is also needed to respond to these new objectives and to the different management and working practices.

The goal during the transition period is to achieve a significant reduction in radiological hazards through the safe termination of operational activities and removal of radioactive material, and to place the facility in a stable and safe condition until the decommissioning strategy is implemented. During this period, control of any remaining spent fuel, other radioactive material or nonradioactive hazardous material should be maintained, and the safety of the workers and the public, and protection of the environment, should be ensured.

2. The transition period for decommissioning

2.1 Overview of transition period

The transition period from installation operation to implementation of a decommissioning strategy is an important one. During this period a number of plans and modifications are made to adapt a facility to new objectives and requirements. Transition activities take place between operation and placement of the facility in a safe and stable condition preparatory to safe enclosure and/or dismantling. Typically these activities include defueling of reactors, retirement of equipment and systems, radiological and waste characterization, operational waste treatment and removal of minor components. Generally, removal or dismantling of major components and, where applicable, safe enclosure are excluded. However, activities carried out during the transition period will depend upon the type of facility and the regulatory regime. The objective of the transition period is to plan and implement these activities in a timely manner. A cultural change is also needed to reflect different management and working practices. It is essential that planning for the transition and decommissioning begin during operation and that activities be implemented as soon as possible after permanent shutdown to ensure a controlled transition and the best use of resources.

A key to the success of the transition period is the training and preparation of facility personnel. This includes, in particular, utilizing operating staff whose knowledge of the facility and its systems is invaluable during this transition period. In addition, as shown in this publication, a number of strategic and administrative issues need to be addressed before or immediately after permanent shutdown of the plant to support planning for decommissioning and to reduce the burden of operational requirements. Figure 1 provides a possible scheme for decommissioning related activities, projects and organizational aspects covering the period from operation to final dismantling of a nuclear installation.

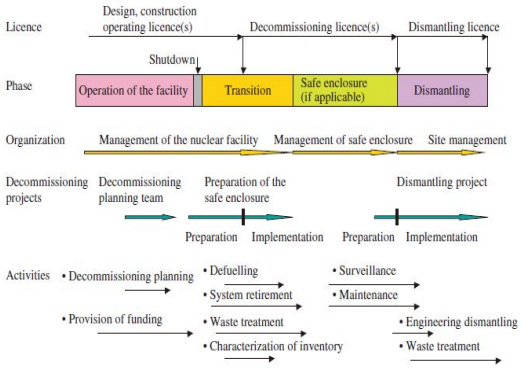

Fig. 1. Decommissioning related activities during the life cycle of a NPP.

There are some important operations that are independent of the decommissioning strategy and that need to be carried out promptly after shutdown as part of the operational phase of the facility in order to achieve a large reduction in radiological hazards. As shown in Figure 2, examples of these transitional operations are removal of fuel, drainage of circuits, cleaning and decontamination, conditioning of operational waste, and rationalization of site services and infrastructure that may no longer be required during the decommissioning phase.

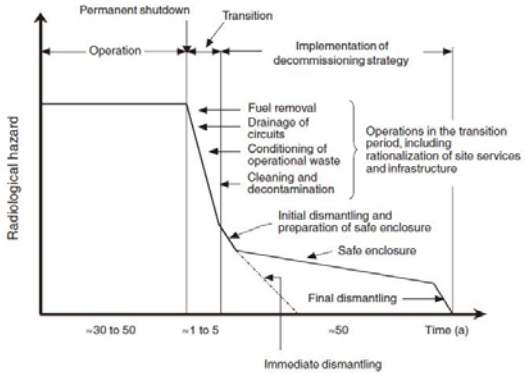

Fig. 2. Transitional decommissioning operations and typical durations for the 'safe enclosure' option.

2.2 Organization and administrative activities

There are important organizational and administrative activities to be performed prior to final shutdown or at the latest during the transition period in preparation for implementation of the decommissioning strategy. These activities include as follows.

(a) Appropriate changes to the structure of the licensee's organization, with the establishment of a decommissioning project team, responsible and accountable for decommissioning planning and operations. The team may report initially to the facility manager but, as decommissioning subsequently progresses, the decommissioning process should be managed under the executive control of a decommissioning project manager.

(b) Establishment of clear interfaces with stakeholders, including the general public, and of adequate information exchange mechanisms to build confidence in, and acceptance of, the selected decommissioning strategy.

(c) Preparation of the final decommissioning plan with all related documents.

(d) Collection and retention of important records and establishment of an efficient record keeping system.

(e) Definition of a program of development work on techniques and equipment required for dismantling, if necessary.

2.3 Operations during the transition period

This section identifies and discusses safety concerns and considerations associated with facility activities during the transition period. Facility and plant operations conducted during the transition period could include handling and temporary storage of nuclear fuel, drainage of systems, cleaning and decontamination, estimates of the inventory of radioactive material at shutdown, conditioning and removal of operational waste, retirement, reconfiguration and planning for the provision of new systems, and changes to confinement barriers.

Within each of these sections, safety considerations and concerns are presented in an effort to assist in the safe conduct of activities throughout the transition period.

3. Major changes during the transition period

The period between the announcement of the shutdown of a NPP and the start of decommissioning can present significant challenges to plant management. They need to prepare for new technical and organizational problems in a climate where there could be pressure to reduce costs and, specifically, the number of staff. The move towards decommissioning can be regarded as a process of major organizational change which will mostly take place during the transition period. In some projects, attention has largely focused on the technical aspects of decommissioning, with relatively little attention being given to organizational and other personnel issues, in particular an associated significant reduction in numbers of staff. These changes need to be carried out in accordance with rigorous and comprehensive change management arrangements.

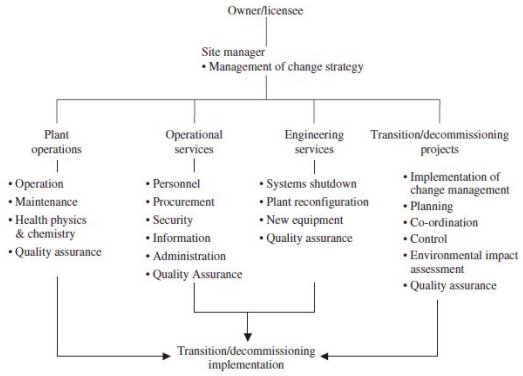

Fig. 3. Example of a functional organization during the transition period.

4. Conclusions

It is very desirable to take timely action to place a nuclear facility in a safe, stable and known condition as soon as possible after final shutdown. It is important that stabilization and other activities for facilities, systems and materials be planned and initiated prior to the end of operations. Carrying out these activities during the final stages of a facility's operational phase and during the transition period will be beneficial in that the operational capabilities of the facility and the knowledge of personnel will be utilized before they are lost. Actions taken at this time will pave the way to efficient and cost effective decommissioning by eliminating, reducing or mitigating hazards, minimizing uncertainty and maintaining steady progress.