International Workshop
on
'Preparing for Implementation of Decommissioning of Nuclear Facilities'

Wakasa Wan Energy Research Centre
Tsuruga, Fukui Prefecture, Japan

11-14 November, 2019

BACKGROUND MATERIAL

[Version: 19 September 2019]

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1 Objective and Scope of the Workshop

The main purpose of the Workshop will be to provide overview and to discuss current international practice and lessons learnt concerning the detailed preparation for the decommissioning of nuclear facilities. Topics being addressed will include:

- Drivers impacting on decommissioning planning;
- Contract management and organization;
- Human resource development;
- Activities undertaken during the period immediately following shutdown; and
- Management of waste.

The duration of the Workshop will be 3 days, with additional time (1 day) being allocated to the site visit of major nuclear facilities located in Fukui Prefecture which are currently in a permanent shutdown status.

The primary audience for this Workshop will be decommissioning professionals from Member States with significant decommissioning programmes. An attendance of approximately 40 professionals is anticipated, of which around 20 persons are likely to come from Member States outside Japan. Personnel from utility organizations, waste and decommissioning organizations, regulators, policy makers - from inside and outside Japan - are encouraged to participate and share their experiences.

2 Drivers Impacting on Decommissioning Planning

2.1 Objective of the Session

In this session we will discuss the high-level drivers which impact the decommissioning strategy. Key in any strategy is the determination of the final end state which will involve input from both stakeholders and regulators and is essential in determining the projects delivery goal. This is further complicated where conflicting constraints are present such as funding, resources, risk mitigation or the availability of waste disposal facilities. These drivers result in any number of possible strategies. The main objective here is to understand the benefits and/or lessons learned from adopting various decommissioning strategies.

2.2 Summary of the Topic

There are a number of key elements which drive the decommissioning strategy. With any project there is a need to understand the start and the end. Two main drivers are therefore understanding the scope of the project and the desired end state. Understanding the scope through reviews of operational history and site characterization will begin to provide clarity on the inventory of wastes that are required to be removed from the site. This will drive the requirement for an integrated waste strategy which provides pathways as well as the potential requirement (in the absence of disposal facilities) for waste processing and interim storage facilities. Understanding the scope may also drive the requirement for new utilities and/or facilities on site. This may take the form of a decommissioning power supply, a ventilation system, containment systems and potentially shielded facilities to address activated components. Once the above requirements are broken out into plan then it will be possible to estimate the cost of the program. Once there is clarity on the overall desired program there can then be review of the potential constraints which may affect timing and ability to execute the program. Typical constraints include

funding, resources and environmental effects. The drivers all have the potential to impact the schedule. Subsequently this list may require a number of iterations as information is developed.

- End State (desired)
  - Industrial re-use
  - Parkland
  - Residential
  - Greenfield
- Scope development
  - Bound the scope by facility/area
  - Characterization
    - Operational History, Knowns/unknowns
    - Site and facilities sampling/assessment
  - Waste inventory
    - Integrated Waste Strategy development
- Decommissioning Strategy/Planning Development
  - Stakeholder involvement
  - Regulatory input
  - Planning/Scheduling/Costs
    - Develop Work Breakdown Structure
    - Approvals/Licensing
    - Develop clarity of the scope
      - Identify systems to be decommissioned
        - Develop logic for facility/system decommissioning
      - New utilities required
        - Power supply
        - Ventilation
      - New facilities
        - Containment facilities
        - Shielded facilities
        - Waste Processing Facilities
        - Interim Waste Storage Facilities
    - Cost Estimating/profile
- Constraints
  - Funding
  - Resources
  - Environmental impacts
    - Species at risk

2.3 Main Current Issues and Presentation Themes

Defining desired end states and managing stakeholder/regulatory input

Development of a decommissioning strategy impacted by constraints (i.e. risk mitigation, prolonged duration, resources, funding, availability of waste facility), including a graded approach as needed

- Impact of delayed decommissioning
- Impact of prompt decommissioning
- Impact of funding constraints

3 Contract Management and Organization

3.1 Objective of the Session

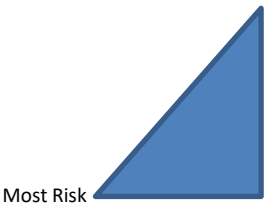
In this session we will discuss the different types of contract strategy adopted by Member States and explore how risks are managed. In addition, we will seek to understand the impacts that contract strategy selection has on the Owner / Client organisation.

3.2 Summary of the Topic

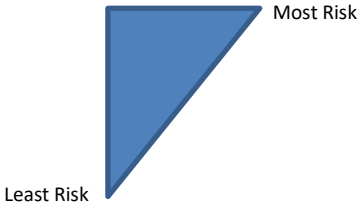
A contract is a key component of a procurement system. It is a formal commitment between two parties that defines the scope, timescale, quality and performance requirements that will be met in the delivery of goods or services.

Setting appropriate contract strategies is vital to the successful delivery of a programme of work such as decommissioning nuclear reactors. A good contract strategy will improve supply chain management whilst ensuring delivery for the Owner / Client at maximum value and minimal cost. In addition, a good contract strategy will support the delivery of best practice for the client and if applicable enable innovation from the subject matter experts engaged under the contract.

There are several types of contracts used currently in decommissioning, some examples are shown below.



- Lump sum or fixed Price contract
- Bill of Quantities or Unit Price contract
- Cost Reimbursable Contract
- Target Cost Contract
- Time and Materials Contract



Owner Risk

Contractor Risk

There are many factors that may influence the selection of one contract in preference to any of the others. One key factor is the transfer of risk. As indicated in the graphic above a fixed price contract will push most of the risk onto the contractor whereas a basic time and materials contract means that the owner or client keeps most of the risk. The Owner / Client can only transfer certain risks in the supply chain and, ultimately, they will always be responsible for decommissioning and therefore own the risk.

The contract strategy will also have a significant impact on the design of the organisation structure required by the Owner / Client organisation and how they intend to manage the knowledge gained during the project.

A fixed price contract will mandate an organisation that can provide oversight of the contract with a smaller team that have contract management experience. A cost reimbursable contract may facilitate a more collaborative approach to delivery with the client and contractor organisations working together towards a common goal.

Contract Types

Lump sum or fixed Price contract

- Single tender price is given based on Owner / Client scope.
- Limited flexibility.
- Can be used to drive a fixed date with damages on the contractor for late delivery.
- Time to deal with claims and counter claims can be extensive.

Bill of Quantities or Unit Price contract

- Based on a schedule of agreed rates.
- Payment made monthly based on the work completed.
- Requires a good knowledge of scope elements.
- Owner / Client can dictate the rate of progress.
- Claims for items not in the schedule can be complex.

Cost Reimbursable Contract

- Contractor reimbursed actual costs plus fee (agreed %), and overheads.
- All records made available to the Owner / Client – Open book.

Target Cost Contract

- Similar to cost reimbursable but with a pain / gain share option.

Time and Materials Contract

- Aspects of cost reimbursable and fixed price
- Value not defined at award – open ended
- More client control
- Good to place quick contracts, say in an emergency.

3.3 Main Current Issues and Presentation Themes

Risk management through selection of contract strategy.
Use of incentivisation in contract strategies.
Different demands on the Owner / Client organisation depending on contract selection.
Drivers for knowledge retention and skills enhancement through contract strategy selection.

1. Presentation from JAPC and Fugen on current project management
2. Presentation from Sellafield on current contract strategies and LFE from risk transfer.
3. Presentations are requested from member states on their experiences on the themes above.

4 Human Resource Development

4.1 Objective of the Session

To consider how to develop appropriate human resources for the decommissioning of nuclear facilities reviewing several examples reported from operators in Japan and other countries.

4.2 Summary of the Topic

Decommissioning must be conducted in a safe manner considering that many different organizations play in a hierarchy structure. In the highest layer of the structure, the personnel should be trained highly to control entire activities related to the decommissioning, in particular:

- Safety of the nuclear facility and environment
- Program management
- Optimization and scheduling of decommissioning process
- Waste management
- Knowledge transfer
- Regulatory compliance
- Public relations

Resources – manpower, budget, training system for the decommissioning should be controlled properly through the activities in a long timeframe.

Information collected during the decommissioning as well as experiences and history obtained in the plant operation should be properly compiled and handed to the successive generations.

4.3 Main Current Issues and Presentation Themes

Training and human resource development from Kansai (and UK)?
Knowledge transfer and knowledge management from Kansai (and UK)?
Public communication in decommissioning from CEA?

5 Activities Undertaken during the Period immediately following Shutdown

5.1 Objective of the Session

To encourage optimization of activities undertaken during the transition phase to make a detailed decommissioning plan and launch safe and effective decommissioning work.

5.2 Summary of the Topic

It is important to optimize detailed decommissioning plan and to appropriate preparation work for safe and effective decommissioning of nuclear facilities. The transition phase is the period from permanent shutdown to start actual dismantling work. In this phase, big change of plant situation and management is needed for smooth transition to decommissioning.

Transition from operation to decommissioning requires a significant effort and preparation; this transition will be different if an immediate shutdown occurs instead of a planned shutdown due to the lack of anticipation.

Certain nuclear power plant structures, systems and components need to remain 'fully functional' during this transition period in order to safely manage the spent fuel and remaining radioactivity, and other structures can be removed following a certain order according with the decommissioning scenario (for example after in situ decontamination).

The risk level at the plant site is reduced as the spent fuel is moved from site to the interim or to a final repository. Activities such as maintenance and inspections need to be in place during this period and must be conducted in a structured manner.

In many projects it has been necessary to build new decommissioning infrastructure, such as new waste treatment or storage facilities during the transition period, to be able to start dismantling work.

Plant and Equipment

How to select remaining equipment and to maintain the existing plant and equipment for the decommissioning work? What equipment is needed as new installation?

- Allowable under an Operating License
- Facility, system and organizational modifications will be necessary
- Following tasks will be done as a part of reactor operation
    - Waste removal (Operational Waste)
    - SF removal from reactor core to ex-vessel storage facility
    - Bulk Asbestos Insulation Removal
    - System Decontamination
    - Circuit draining
    - Utility isolation (water, electric and security?)
    - (Sampling of systems and components, if necessary)
    - Clean-up of general working areas, if necessary
    - Radiation Survey of Work area
    - Ventilation System Requirements
    - Replace portable one in some areas
    - Reduce flow rates
    - Emergency DG will be changed into compact one
    - Fire protection
    - Eliminate all fire hazards …. Remove oils, grease from components
    - Radiological Scoping Surveys
- New Facilities
    - Treatment facilities (Decontamination, Shredding (Cutting), Cementation, Packaging etc.) for dismantled radioactive waste
    - VLLW & LLW, if necessary
    - ILW
    - Interim Storage Facility
    - …

Change Management

This process is an important part of the process - to change the culture or mindset of the former operations staff from operations to one of a 'new mission'- transition.

Appropriate changes are necessary to the organizational structure of the licensee to reflect the establishment of a decommissioning project team.

Staff must be appropriately trained to perform the transition functions.

Establish interfaces with stakeholders to build confidence and acceptance in decommissioning process.

Staff organizes / gathers the records and resolves any technological issues / uncertainties for finalizing the facility Decommissioning Plan.

Remember – the charge of the management staff during transition is to maintain facility safety while achieving reductions in the required efforts to perform surveillance and maintenance until the decommissioning strategy can be finalized and implemented.

What is important for change of management (organization and mindset of worker)? What mindset is needed for the decommissioning work?

- Organization structure
- Management (Project, Risk, Cost, Safety)
- Radiological safety -> Industrial safety (Security regulation)
- Definition of the role of the operator in the future decommissioning
- Assessing capacity to perform future role/task
- Identification of capabilities missing within the organization
- Developing/ acquiring capabilities
- Identification of key personnel and their assignment into new positions
- Adaptation of organizational structure to meet future need
- Identification of operating personnel that might be used for decommissioning
- Relocation and retraining personnel for future positions
- Definition of the managing structure and its links to other organizational structures within the company
- Develop project management tools for decommissioning planning and scheduling

5.3 Main Current Issues and Presentation Themes

Organizational change

System modifications

Data collection and management

Permissions (approach to scenario definition, safety and environmental stand

- Examples of transition phase activities (preparation work) (e.g. from Fugen and Chubu)
- Examples of transition phase activities from programmes outside Japan

6 Management of Waste

6.1 Objective of the Session

To encourage optimization of waste from decommissioning through adoption of an integrated waste strategy from characterization at source to disposal.

6.2 Summary of the Topic

Defining decommissioning scenarios includes defining waste management strategy in an iterative process. It depends on the accuracy of the decommissioning waste inventory, of available decontamination or segmentation processes, on available waste route, including waste processing facility intermediate storage facility and Waste acceptance criteria for disposal when disposal sites exist or levels for clearance when applicable.

Terminologies / categories of waste need to be clarified and drivers for choice of process/ Technologies need to be identified:

- Characterization (in situ and waste) in order not to over-estimate future storage or disposal;
- Decontamination in situ? Full decontamination?
- Decontamination after segmentation? On site or in a dedicated facility/ contractor off site
- Segregation, size reduction to maximize packing efficiency
- Treatment (fusion, incineration, etc.),
- In situ, on site or centralized dedicated facility?
- Conditioning?
- Release / Recycling: possibilities / public acceptance barriers
- Interim storage on site for waste with no route, activated material or other ILW-LL

Certain level of technological maturity yet in decommissioning and associated waste management, but further developments are required, aiming at improving performances, safety and waste minimization. In particular, some wastes currently have no defined management route and some wastes need new developments for treatment, conditioning or transportation for disposal:

- Decontamination down to clearance, decontamination without liquid effluents? New adsorbents: non-organics?
- New technique for segmentation? Melting?
- New binders to avoid hydrogen production (e.g. for aluminium, etc.) and optimize loading
- Treatment for organics,
- IT tools for management (waste, materials, transportation, etc.) in the overall vision of BIM with forecasts and day to day management.
- etc.

6.3 Main Current Issues and Presentation Themes

How to manage waste in the absence of waste acceptance criteria for disposal?

Problematic waste and identified technology gap (SHARE + new initiative on predisposal at EU + initiative NEA?)

Implementation of Clearance and Recycling (e.g. including result of Circular Economy workshop hosted by SOGIN) /

Integrated waste strategy (e.g. example of steam generator with full decontamination: drivers, possibilities, etc. from characterization at source to disposal). EDF/ORANO

7 APPENDIX: Workshop Programme

Time	Monday, 11 November	Tuesday, 12 November	Wednesday, 13 November	Thursday, 14 November
09:00	Registration and coffee	Site tours of Fugen decommissioning project and Mihama Nuclear Power Station of KEPCO Separated 2 groups visit each NPP in the morning and afternoon in alternate shifts	*Theme:* Contract management and organization	*Theme:* Activities undertaken during the period immediately following shutdown
09:30	Official Opening Remarks (Vice-Governor of Fukui Prefecture) Group Photo		*Break*	*Break*
10:00	Overview of decommissioning activities in Fukui Prefecture (including waste management) • Decommissioning activities of Kansai Electric Power Company - KEPCO • Monju and Fugen decommissioning - JAEA		*Panel:*	
12:00	*Lunch*		*Lunch*	*Lunch*
13:00	*Theme:* Drivers Impacting on Decommissioning Planning		*Theme:* Human resource development	*Theme:* Management of waste
15:30	*Break*		*Break*	*Break*
16:00	*Panel: 'Drivers Impacting on Decommissioning Planning?'*		*Panel:*	Panel: How to optimize management of waste from decommissioning
17:30	*Adjourn*		*Adjourn*	*Closing Remarks & Adjourn*