Optimized determination of the radiological inventory during different phases of decommissioning

Characterization within licensing procedure

Operational Phase
- Final shutdown
  - Licence: Full System Decontamination (FSD)
    - Assessment criteria:
      - Atomic Energy Act, RPO
      - Guidelines, Directives
      - ISO, DIN ...
    - Concepts have to be:
      - optimized
      - comprehensive
      - verifiable
    - limited characterization of radiological inventory

Post-operational Phase
- Dismantling Phase
  - Supervision by competent authority:
    - compliance with terms and conditions of licence
    - compliance with state of the scientific and technical knowledge
    - assessment of relevant documents
    - supervision at the site
    - supervision of procedures
    - supported by independent experts
  - Licence: Decommissioning
  - Licence: Dismantling of systems and components – Parts I …X
  - Supervision by competent authority, supported by independent experts
  - detailed characterization according to concepts of radiological inventory with respect to:
    - Radiation Protection of the personnel and the public
    - Nuclear fingerprint (nuclide vector) for release of material and waste management (implementation of concepts)

Dismantling Phase
- Licence: Clearance of buildings and withdrawal procedure
  - Supervision by competent authority:
    - as above and
    - special supervision for procedures concerning release of concrete and rubble
  - release of site from nuclear regulatory control
  - (# release of licensee from nuclear regulatory control because of e.g. radioactive waste stored elsewhere)
  - detailed characterization / Determination of the radiological inventory
    - Description of the site (e.g. system boundaries, buildings, groundwater)
    - Description of historic and current usage (use of radioactive material, relevant occurrences)
    - Description of potential contaminants (radiological and non-radiological hazards)
    - Determine optimal preparation of the site

Radiological framework during decommissioning

Post operational Phase
- Decommissioning phase
  - Removal of fuel elements
  - Dismantling reactor vessel and interior constructions
    - Biological shield
    - Primary circuit, aux. systems
  - Residual Activity (Bq)
    - 10^21
    - 10^19
    - 10^17
    - 10^13
    - 10^12
    - 10^9

Post operational Phase
- Decontamination (FSD)
  - Biological shield
  - Primary circuit, auxiliary systems
  - Buildings incl. sumps
  - Removal of fuel elements
  - Reactor vessel and interior constructions

Assessment criteria:
- Remodelling
- radiological inventory
- other hazards

Concept of sampling
- concept of clearance
- concept of waste management
- concept of radiol. characterization

Characterization over time for decommissioning

Post operational Phase
- Decommissioning phase
- Release of site
  - Characterization (detailed) for licence
    - nuclide vector
    - appropriate measurement technique
    - measures of decontamination
    - radiation protection
  - Characterization (detailed) for release of site
    - based on operational history
    - Determination of contaminants (spatial and radio)

Conclusion
- The specific requirements for characterization are associated with the milestones during decommissioning
- The amount of activity do not directly correspond to the radiological hazard potential of the facility