IAEA project: Guidance on practical ORP in decommissioning of nuclear installations

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IAEA

International Atomic Energy Agency

Project: ORP and risk management during decommissioning of NPPs

IAEA project 2014 – 2016 to develop guidance material in ORP and risk management during decommissioning of nuclear installations

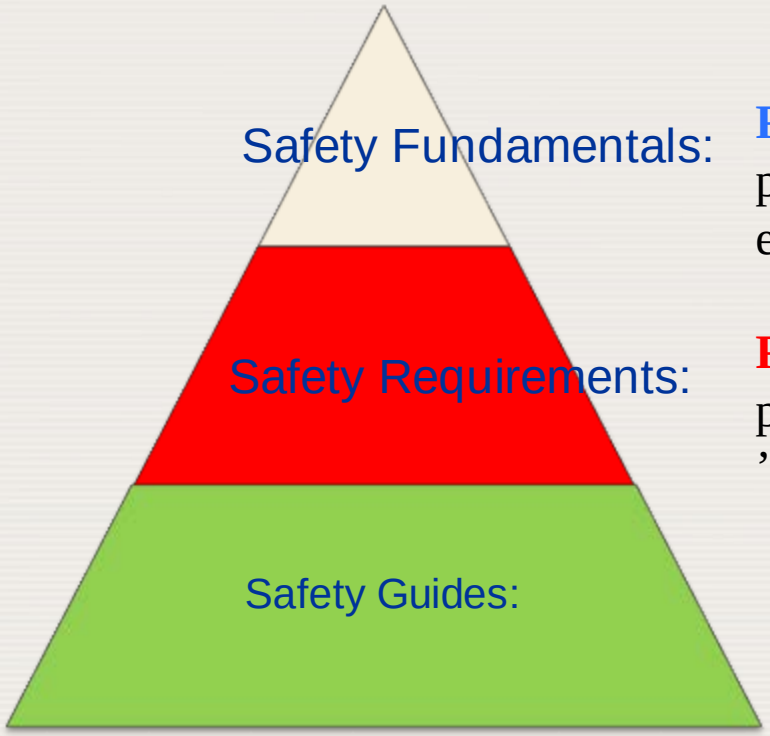
2014: Collection of information and experience

- Workshop for operators, service providers and radiation protection and Technical Meeting for regulatory authorities
- Included experts from: Belgium, Bulgaria, Canada, China, Denmark, Finland, France, Germany, Hungary, India, Japan, Lithuania, Russia, Slovakia, Spain, Sweden ,United Kingdom, United States
- International organizations: EU,OECD/NEA,ILO

2015: Development of guide: Consultancy meetings for drafting/ reviews

2016: Publication as a IAEA Tecdoc to support relevant safety standards

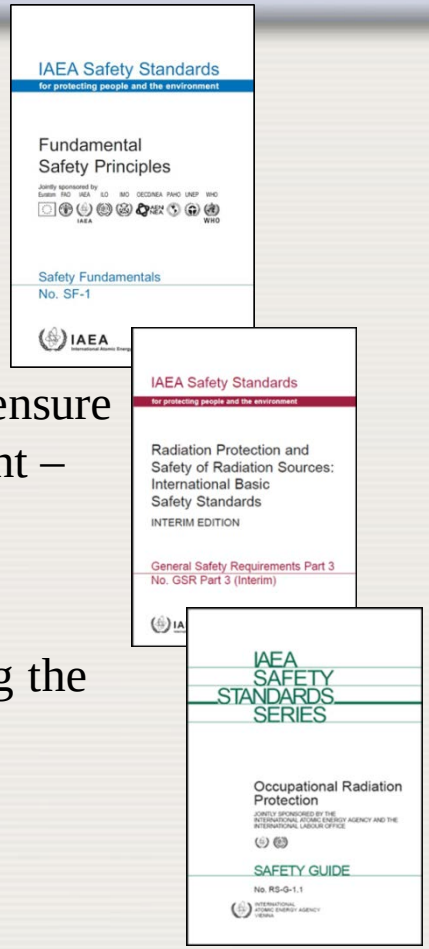
IAEA Safety Standards Categories



Fundamental safety objective and principles for protecting people and environment

Requirements that must be met to ensure protection of people and environment – 'shall'

Safety Guides
Recommended ways of meeting the requirements – 'should'



IAEA Safety Reports

IAEA Technical documents (TECDOCs)

Proposed content

Objective

- To provide practical guidance for planning, establishment, conduct and management of occupational radiation protection (ORP) in decommissioning

Target reader

- Managers, RPO's, QE's, and other involved in decommissioning project maybe be useful for operating plants and regulators

Scope

- Practical ORP guidance for NPPs and research reactors; parts may be of use for other nuclear installations
- Considerations also on non-radiological hazards
- Excluded; nuclear installations where severe accidents have occurred

Proposed structure

Sections on

- Impact of decommissioning on protection of workers
- Adaptation of the radiation protection program for decommissioning
- Radiological characterization and site preparation
- Considerations on non-radiological hazards

The guidance in each sections will be supported by examples of practical experiences from different facilities and countries

IMPACT OF DECOMMISSIONING ON PROTECTION OF WORKERS

Hazards to workers

- Access to areas, not accessed during operation
- Continually changing work environment due to dismantling of infrastructures and removal of engineering controls
- Use of temporary storage for radioactive waste
- Different types of hazards and possibility for unexpected hazards and risks are likely to be different but of similarly high importance

Continual assessment of work areas

Understanding of the history of operation, possible alpha contamination and the controls to protect workers

Attention to industrial hazards

Changes in safety culture

- Possible perception that radiation safety is reduced when fuel is removed from site
- Potential for an adverse impact on safety culture because of changes occurring, and uncertainty in the future of the facility and staff. May have negative effects on staff morale
- Challenge to get contractors to adopt appropriate safety culture

Safety culture need to be addressed in safety communications and in training (for contractors in particular)

RP aspects of decommissioning strategy

ORP will be influenced by the chosen decom strategy and therefore

- *ORP should be considered in the development of the strategy and experts in RP and occupational health hazards should be involved as early as possible*

Examples of factors to consider

- Radiological situation (dose rates and contamination); availability treatment facilities and interim storage; availability of experienced RP and decommissioning personnel; for multi-plant sites: transferable learning, sharing of personnel, facilities and RP equipment

No generically preferred strategies from ORP viewpoint

- Immediate dismantling: knowledge of operating history and equipment still accessible
- Deferred dismantling: radioactive decay
- Dismantling from high to low areas: significant reduction of dose rates for the further dismantling steps
- Low to high areas :availability of more space for transport and decay
- Expected workers dose benefit should consider balance between remote dismantling for high dose rates versus manual dismantling for lower dose rates

Adaptation of Radiation Protection Program

Radiation protection program needs to be reinforced for decommissioning and

- reflect changes in hazards, working culture, radiological conditions, work environment, working methods and tools
- should contain sufficient flexibility to deal with unforeseen and unplanned tasks
- a review of the RPP is necessary before implementation of each decom project

- ALARA committees
- Performance of RP program by use of indicators (PI)
- Radiological occurrences and response

RP organization

- Organisation may be structured similar to that of an operating NPP
- Qualified RP manager should be designated on level that allows participation in decision making process
- Roles should be clearly defined and documented
- RP resources different type and size, due to change in nature of hazards. Pressure to reduce staff as a cost reduction
- Training and qualification, identification of needs
  Basic RP training for all workers address awareness of all hazards and changing conditions.
  Specific training for different type of work and workers dismantling, decontamination, safety measures, use of mock-ups.

RP information transfer and interaction

- Use of operating experience: e.g. ISOE database
- Transfer of information between operating and decommissioning organization: operational records and reports, interviews with long term workers and retirees

- Interaction in radiation protection between
  - RP, decommissioning project and contractors at management level
  - RP staff and workers including itinerant workers
  - RP staff and occupational health on industrial hazards

RP optimization and operational tools

- A stepwise approach from a general planning of dismantling projects down to specific procedures including detailed description of work steps and RP measures
  - consideration on expected doses and doses from possible incidents
- Example of administrative operational tools
  - investigation levels, action levels, dose budgets, administrative limits, dose constraints

Planning for dismantlement

Selection of technique

- identification and selection of practicable RP options and decommissioning techniques
- review of decommissioning experience and use of dose criteria
- considerations on engineering control vs PPE

Examples

- gamma camera to detect hot spots, contamination, to optimize shielding
- movable ventilation systems,
- temporary containment systems
- remote technique for cutting
- chemical decontamination

Detailed planning

Example of information in planning documents:

- Description and access to rooms/areas, SSC in the area
- Detailed radiological characterization, conditions for work
- Work sequences relevant for exposure, estimation of dose for each work step and work package, required training and instructions
- List of ALARA measures considered, list of RP equipment, specific risks, potential occurrences and counter measures

ORP issues on radioactive waste management:

- Storage areas, housekeeping and cleanliness, decontamination of large components before removal, disposal of mixed waste

Radiological characterization

Care in deciding the level of detail in characterization use of methodology to minimize dose and contamination hazard

Knowledge about the operation phase well managed documentation, knowledge of long term workers

Detailed characterization

- List with dose rate and contamination measurements in the rooms/area/SSC, average dose rate data at working places, dose rates at local hot spots,
- Information on nuclide composition
- Nuclide vectors
- No matter how good the characterization has been there are likely to be surprises and procedures for reaction may be helpful.

Nuclide vectors

Nuclide compositions in the nuclear installation need to be well understood and nuclide vectors need careful derivation and consideration of characterization data

- For different purposes different nuclide vectors characterizing the same material might be bounding
- Vectors relevant during operation may not be relevant when decommissioning starts
- Nuclides of minor significance during operations may become important during decommissioning

Classification of areas

- Controlled and supervised areas may need to be changed during decommissioning
  - Procedures for changes are needed
- Several entrance/exits may be necessary and appropriate measures/ controls need to be in place.
- For temporary exits administrative measures and mobile equipment can be used instead of fixed installations
- Inside controlled areas, local zones can be easily installed and removed

Site preparation

- Radiation protection areas
  - workers will move between zones to a greater extent
- Exit monitoring of workers
  - reflect change in hazards (alfa contamination)
- Workplace monitoring programme
  - more extensive, airborne contamination a particular issue, reflect hazard at each workplace,
- RP systems and facilities
  - systems affecting RP ventilation, lighting, power, water and air supply
- Personal Protective Equipment
  - new types may be needed., e.g. ventilated suits

Dose monitoring and contamination control

Dosimetry and assessment of doses

- need to be adapted to suit decommissioning, implementation of bioassay program, PAS and eye dosimetry may be considered

Contamination monitoring important and include

- airborne activity stationary and mobile, hand held monitors for direct measurement of surface contamination, hand /foot and WBC for surface and internal contamination, wipe test equipment, equipment for H-3, C-14, gamma spectrometry

Cleanliness

- a good work environment minimise contamination and chronic low internal contaminations
- help to promote a positive atmosphere and motivation of personnel

Non-radiological hazards

Example of hazards:

- asbestos – lagging on pipes;
- electric shock – cutting cables;
- falling from heights;
- fire – cutting techniques;
- chemical risk – PCBs, ammonia
- heat stress - working in plastic suits;
- poor lighting conditions
- oxygen deficient atmospheres – entry into confined spaces;
- dropped loads – from cranes or other lifting equipment;
- falling debris;
- air quality - poor ventilation efficiency;
- noise - inaudible alarms and warnings

Thank you for listening…

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