Decommissioning of Nuclear Facilities
- Conclusions and Recommendations -

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R^{2}D^{2}Project: Workshop on 'Planning'
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Main Issues

- Completion / updating of the national legal and regulatory framework addressing decommissioning (Regulators)

- Development of a decommissioning plan (Operators)

- Providing guidance to operators on relevant aspects of D+D planning based upon the national situation (Regulators)

- The importance of early D+D planning, incl. the development of initial and on-going plans, is an important aspect of proper nuclear facility asset management, incl. QA and compliance with international recommendations

- The interrelationship between the different D+D strategies, their end point criteria and the associated costs needs to be considered when performing D+D planning

- Countries participating in the R^2D^2P should become "Party" to the Joint Convention

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Comments on the workshop (I)

- Presented a good opportunity for participating countries to share information on whole D+D planning process
- Appreciated that both operators and regulators were brought together and were able to learn from each other as well as between one other in each of the two groups
- Receiving good and new information useful for preparing or upgrading decommissioning plans
- Opportunities for future co-operation with potential contractors and operators through a direct dialogue
- Networking (exchange of experience with other countries during an ongoing decommissioning projects)

Comments on the workshop (II)

- Information exchange between countries on how to resolve problems (e.g. funds, knowledge) and how to adopt IAEA Standards to national situations

- Practical demonstrations and case studies were missing and should be included in future workshops

- The "peer reviews" made by the participants were very useful and provide a basis for benchmarking and comparing progress in future workshops

- The same experts should be invited to future workshops to ensure continuity

- It was positively noted that the group of workshop participants is becoming more "mature"

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New and useful information (I)

- Up to date information, incl. regulatory requirements, on D+D planning and decommissioning, incl. spent fuel and radioactive waste management
- Typical contents of a decommissioning plan (IAEA SRS 45)
- Examples of prices for storage of different types of radioactive waste
- Typical activation levels of concrete close to the core
- Information on decommissioning planning / design of new research reactors
- Conditioning of graphite and aluminium (e.g. UK experience)
- Experience from actual D+D planning / activities (e.g. Romanian experience)

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New and useful information (II)

- Operators shall develop and submit a decommissioning plan, even if there is no intent to decommission the facility in the near future!

- The decommissioning plan shall be a living document to be reviewed and updated on a regular basis

- Information on elements to be covered in a decommissioning plan and in the management of decommissioning projects

- De-fuelling as part of the operational license, if it is covered!

- Time needed to prepare and review D+D plans depends on the experience of the experts involved in these tasks

- Importance of information to be provided by the regulator of their expectations of what is to be included in a D+D plan

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Situation in participating Countries

- The actual situation in most of the participating countries is summarised in the following two overview tables
- These tables have been taken from the "peer review report" prepared by the "regulators group"

Current Status

1 Legal and regulatory framework; **2** independent regulatory body, **3** Requirements; **4** Standard Review Plan; **5** Competent/qualified staff; **6** Clear roles and responsibilities; **7** One lead organization

	1	2	3	4	5	6	7
Egypt	Y UR	N UR 2008/09	Y UR 2010	N	Y Cont	Y	Y
Indonesia	Y	Y	Y UR EO 2008	Y UR EO 2009	Y NT	Y	Y
Malaysia	Y UR EO 2009	N UR Early 2010	Y UR EO 2009	N 2010	Y NT/NM	Y	Y
Libya	Y UR 2010	N UR 2009	N 2009	N	Y Cont NM	Y	Y
Philippines	Y UR 2010	N UR 2010	Y	N 2009	Y NT/NM	N	Y
Romania	Y UR 2009	Y	Y UR 2009	N 2009	Y NM	Y	Y
Serbia	Y UR 2009	Y	N UR	N 2009	N	N NT/NM	Y NR 2009

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Legend: UR Under revision; **NM** Need more staff members; **NT** Need training for staff members; **Cont** Continuing ; **NR** Need revision

	DP Milestones	Graded Approach	Authorization strategy	Opportunities for improvement
Egypt	Approves DP six months from receipt	Depends on size of RR	Multi-step	Yes
Indonesia	Approves DP one year from receipt (2011)	Depends on size of RR	One-step	Yes
Malaysia	Operator submits DP by 2009	Depends on size/type of facilities	Multi-step	Yes
Libya	Approval of DP to be defined by Law in 2009	Depends on size/type of facilities	Multi-step	Yes
Philippines	Operator submits DP by 2009; approval by 2010	Depends on size/type of facilities	Multi-step	Yes
Romania	Approves DP two months from receipt	Depends on size/type of facilities	Multi-step	Yes
Serbia	Approves DP three months from receipt	Depends on size/type of facilities	Multi-step	Yes

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DP - Decommissioning Plan

Suggestions to partic. Countries (I)

- All participating countries should share information on the status of their respective decommissioning plans (regulators and operators)

- Strength and weaknesses of experiences as well as important milestones should be shared / highlighted as they are of particular importance for learning from each other

- Identification of required training and timely submittals / requests for any required IAEA support, e.g. Technical Co-operation, is essential

- Implementation of a dynamic database with a dynamic model of each D+D step or phase should help the project manager to keep track of the project and update it as necessary. It should also help the staff to execute the project

Suggestions to partic. Countries (II)

- Operators should use SRS 45 as a basis
- Regulators should use IAEA Standards and other countries standard review plans and should take care of the consistency
- 'Trouble free' implementation of a D+D process requires early and detailed planning
- Use contacts established through R²D²P for 'community networking' in solving problems

Suggestions to the Host Country

- Include "hands-on" demonstrations into the workshop
- Progress into the right direction is visible
- Make use of assistance / expertise from other countries
- Plan scientific visits, fellowships etc. for regulators / operators and file timely applications to IAEA

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Suggestions to the IAEA (I)

- More emphasis should be given to practical demonstrations and case studies

- Practical demonstrations should be included the upcoming workshop on "Cost calculations" and "Technologies"

- Include technologies for **decontamination and** dismantling into the "Technology" workshop, incl. protection of people, purpose and type of equipment …

- More focus should be given to things that could go wrong or have gone wrong in order to learn from them and to avoid a repetition of mistakes

- Consider eliminating national presentations and discuss practical problems arising from preliminary planning activities

- Bring operators and regulators together in R²D²P workshops

- Add a workshop on "Safety Assessment" into the R²D²P plan

Suggestions to the IAEA (II)

- Develop a Safety Report on how to assess decommissioning plans for Research Reactors and Nuclear Power Plants
- Consider using the standard review plan (SRP) of Indonesia for introducing SRP into IAEA safety / technology publications
- Promote training for regulators in assessing D+D applications
- Have a lecture on clearance levels incl. necessary / available instruments for checking compliance with clearance levels

Remark: Please check the "Basics" workshop and consult the presentation: Warnecke - Release from regulatory control

- Try to make funds available for training of Philippine experts
- Provide funding for two participants per country, one regulator and one operator
- Invitations must be submitted earlier in order to obtain low priced tickets, visas etc.

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Difficult issues

- Clearance levels, in particular the measurement very low radionuclide concentrations

- Estimation of dose uptakes of workers when carrying out individual decommissioning activities

Remark: Consult the paper by G. Rindahl et. al. on 'Virtual Reality Technology and Nuclear Decommissioning', IAEA Decommissioning Conference, Berlin (2002)

http://www-pub.iaea.org/MTCD/publications/PDF/Pub1154_web.pdf

- There are so many different ways of processing RW: How to select "the best" option?

Conclusions (I)

- Decommissioning planning has to start at the design stage
- It is an ongoing updating + review process during operation
- A final decommissioning plan should be available at the end of operations, reviewed by the regulator
- Each nuclear facility should have an up-to-date decomissioning plan
- A decommissioning plan should be developed as soon as possible, if it is not available
- Use IAEA SRS 45 for contents of a decommissioning plan
- Several countries are working towards developing a decommissioning plan
- Other countries should follow these examples
- Operational and regulatory capabilities for preparing and reviewing decommissioning plans have to be developed

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Conclusions (II)

- National legal frameworks are in most instances not up-to-date. Amendments are essential.
- Workshop participants are often not in a position to initiate a legislative or law making process
- Plans should be made for seeking help within the country or from other sides, e.g. the IAEA
- "Networking" among participating countries and with experts attending the workshops is vital in resolving issues
- Workshops should include "hands-on" demonstrations and practical information, e.g. what went well / what went wrong
- Bring operators and regulators together in workshops
- Add a workshop on "Safety Assessment" to the R²D²P plan
- Participants should use the "peer review" results for bench-marking their reports at the next workshop

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ANNEX:
Suggestions for Decomm. Licensing (I)

This ANNEX was developed by Mr. F. Abdel-Rahman, Egypt

A Regulatory Requirements for Decommissioning License

1 - Fuel Removal Authorization (from site)

- Plan for constructing a fuel storage building
- Transportation procedures
- Criticality calculation
- Safety and security

2 - Waste Storage

- Site report
- QA programme and QA procedures
- Monitoring plan

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ANNEX:
Suggestions for Decomm. Licensing (II)

- Type and capacity
- Facility layout and access
- Potential hazards
- Waste characterization
- Safety, Security &Safeguards
- Engineering structure

3 - Decommissioning License

- Decommissioning Plan
- Decommissioning Management
- Decommission Method / Strategy
- Quality Assurance
- Financial plan

ANNEX:
Suggestions for Decomm. Licensing (III)

- Fire protection plan
- Waste Management plan
- Responsibilities of operators, contractors, other relev. parties
- Estimation of time, dose and costs
- Future plan of the site

B Regulatory Solution for Licensing

1 - Fuel Removal Authorization (from the site)

The regulatory body should provide:

- Set of licensing guidance and procedures
- Competent staff for reviewing the application
- Acceptance criteria for authorisation of fuel transport
- Authorization of spent fuel storage
- Licensing conditions

ANNEX:
Suggestions for Decomm. Licensing (IV)

2- Waste Storage

The regulatory body should provide:

- Set of licensing guidance and procedures
- Competent personnel for reviewing the application
- Acceptance criteria for waste storage license
- Licensing conditions

3 - Decommissioning License

The regulatory should provide:

- Set of licensing guidance and procedures;
- Competent personnel for reviewing the application;
- Acceptance criteria for decommissioning license.
- Licensing conditions

C. Regulatory Functions

1- Inspection / Enforcement

The regulatory body should provide:

- Set of inspection / enforcement guidelines and procedures
- Inspection plan and records
- Competent inspectors
- Training for the inspectors
- Financial resources

2. Licensing / Authorization

The regulatory body should provide:

- Set of licensing guidance and procedures;
- Competent personnel for reviewing the application;
- Training for the personnel

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ANNEX:
Suggestions for Decomm. Licensing (VI)

3. Release from regulatory control

The regulatory body should provide:

- Set of guidelines and procedures for the review of the decommissioning and final survey report
- Independent verification
- Competent personnel
- Acceptance criteria for site release

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