

Decommissioning of Nuclear Facilities - Conclusions and Recommendations -



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R²D²Project: Workshop on 'Characterisation Survey'

PNRI, Manila; 03-07 December 2007



Main questions

- **Review of the workshop:**
 - The workshop was aimed at developing an understanding of the characterization process as a part of the process of facility decommissioning. Are there any comments on the workshop, e.g.:
 - Is anything missing?
 - What can be improved?
 - What was new or particular interesting and useful?
 - Any other comments?
- **What to do next:**
 - A workshop on 'Characterisation Survey' is scheduled for 03-07 December 2007 which is based on a national workshop in the Philippines in 09/05 → Please review the presentation (IAEA web folder) and be prepared for the workshop
 - Report on the national situation regarding the 'legal / regulatory framework' and the 'basics of decommissioning' in December 2007 (in particular on activities to close gaps)
 - Workshops on 'characterisation', 'decommissioning plan' and 'decommissioning technologies' are foreseen → check of the approach in the December 2007 workshop
 - Prepare presentations of national decommissioning plans in the first 2008 workshop



Comments on the workshop (I)

- Prepare a workshop report including lessons learned and key points
- Better address and understand the requirements of decommissioning
- Countries should participate with two experts - i.e. – a regulator and an operator
- Participants expressed that the outcome was better / more than expected
- Use output of the workshop as a feedback mechanism for the planning of IAEA programs and activities – e.g. – in preparing documents and for the improvement of the decommissioning situation in the participating countries
- Contributions (including the practical exercise) from participating countries validated the planned Philippines approach
- Practical experience from participating countries will be incorporated into the Philippines project
- Great variety - at all levels - of national projects was very informative for all participants



Comments on the workshop (II)

- Incorporation of practical demonstration into the workshop greatly enhanced the value of the workshop
- Enough time for devoted / structured discussions facilitating additional information exchange
- Progress at PRR-1 is essential to measure the success of this workshop and the R2D2P
- It is essential to define the scope of the PRR-1 decommissioning project as early as possible
- Involve countries with advanced decommissioning plans in the next workshop
- Presentations made at the R2D2P showed visible decommissioning progress in several countries



New and useful information (I)

- Scope of characterization was clarified in the workshop
- Previous environmental characterization data can be used to define background levels
- The Joint Convention (J.C.) can assist in improving the decommissioning and radioactive waste management situation in participating countries
- Radionuclide inventories need to be re-confirmed by measurements
- Development of the Characterization Plan must be integrated with the development of the overall Decommissioning Plan



New and useful information (II)

- It is possible to define transition objectives separately from the decommissioning plan for approval by the regulator
- Characterization is to a large extent dependent on existing technology; early planning, use of a structured approach, teamwork and stakeholder participation are all critical elements
- To some participants the whole subject of characterization was a new topic
- Establishing background levels in concrete by core drilling



New and useful information (III)

- The practical exercise on Characterization Surveys was especially useful
- Documents and other references are available on the Internet as starting points from completed and well documented decomm projects
 - www.nrc.gov/reading-rm/adams.html
- The use of 'scaling factors' is an important tool to ease characterization



Country Reports (I)

1. Brazil

- CNEN operates and regulates its own facilities
- Clearance levels are in place; under review for compliance with RS-G-1.7
- Revision of legal / regulatory framework; D+D regulations being developed
- Responsibilities are assigned; Operator implements D+D (incl. funding)
- Preliminary D+D plan exists; update / completion necessary
- RNI of fuel and structures were done; tools are available
- D+D strategy not selected; is planned to be carried out before shutdown
- End point is planned to be nuclear reuse
- Sufficient RW storage capacity available; repository under development
- Expertise / contractors are available (e.g. from Goiania accident)
- No cost estimates; Government committed to funding D+D of its facilities

Continue updating / completing D+D plans

Two D+D plans necessary in the case of a late strategy decision

Resolve double role of CNEN in the revision of the legal framework



Country Reports (II)

2. Indonesia

- Legal / regulatory framework includes IAEA Standards and is up to ~10a old
- Regulator reports to President
- D+D approach is required 3a before shutdown and to be started within 2a
- Clearance is based on an application of the operator (case by case decision)
- No planning / experience for D+D
- Funding problems with the D+D of a yellow cake production facility

Amend legal / regulatory framework to require D+D plans in accordance with J.C.
Prepare D+D plans for nuclear facilities
Resolve the funding issues with the yellow cake facility

3. Libya

- Legal / regulatory framework dates back to Soviet Union times
- No D+D plan, except D+D chapter in SAR

Update legal / regulatory framework

Prepare D+D plans now

Become Party to the J.C.



Country Reports (III)

4. Malaysia

- The Atomic Energy Licensing Board (AELB – regulatory body) and the Malaysian Nuclear Agency are both under the Ministry of Science
- The radiation protection law is of 1988, i.e. out of date
- Work on D+D and D+D plan interrupted as priority is given to safety issues
- D+D cost estimate is based on survey of costs in other countries

Resume the work on a decommissioning plan / establish a D+D group
Update legal and regulatory framework and provide for an appropriate separation of regulators and operators

5. Romania

- The legal and regulatory framework was updated (EU member; Party to J.C.)
- D+D plan required and prepared / update every 5a
- For deferred decommissioning a licence renewal is required every 5a
- State-owned RRs: Cost estimate and funds available (State budget)
- Spent fuel was and is intended to be shipped to USA

D+D activities are progressing (e.g. EU support) into an appropriate direction



Country Reports (IV)

6. Serbia

- Separation of regulator and operator
- New law is awaited
- Temporary regulatory body in place
- In the meantime work is based on IAEA Safety Standards; support from IAEA
- Relatively high activity levels (inappropriate design etc.)
- Small number of experts → Co-operation with Slovenia

Active project with issues identified and actions taken to resolve issues

7. Vietnam

- New law prepared and submitted to review by National Assembly in Nov. 2007
 - Approval expected in 2008
 - DNNR operator and regulator are under MOST / Ministry of Science and Techn.
 - No detailed information on D&D available, but D&D plan will be started in 2008
 - State-owned RRs: No cost estimate, but funds will be available (State budget)
- The D&D plan should be started as it contributes to answering open issues
The draft law should be modified before approval (regulatory independence)



Country Reports (V)

Discussion

- The J.C. is a national obligation which helps to improve D+D activities and RWM situations
- Countries not being Party to the J.C. should ratify or take the J.C into account
- Experience shows that implementation of a new law takes time ($\geq 3a$)
- Preferably, one regulator should be in place. It should involve other bodies (industrial safety, environmental protection etc.) in the decision making process
- Several national or regional workshops were suggested (cost calculation, D+D regulation, licensing) → an attempt should be made to integrate such activities into R²D²P or request more information, respectively
- The R²D²P helped initiating D+D activities in participating countries and helped in overcoming difficulties at national level
- Based on good experience, setting up dedicated D+D groups is recommended at the operational organisation and the regulatory body



Suggestions to participating Countries (I)

- Cranes and other lifting equipment needs certification
- Apply the work permit procedure in executing characterisation and other activities
- Apply teamwork concept commensurate to the inter-disciplinary tasks by involving all relevant disciplines at the management level and at the technical level
- Cooperation amongst participants/countries should continue after R2D2P workshops including the sharing of relevant experience
- Participating countries are requested to present their decommissioning plan at the next workshop
- Participating countries are requested to present their progress on the compliance with the international safety regime / recommendations
- Cooperate with other countries experienced in decommissioning



Suggestions to participating Countries (II)

- In order to make characterization easier, specific attention needs to be given - during operations - to spent fuel management, other radioactive waste management and recordkeeping issues
- Consider establishing a decommissioning group on the operational as well as on the regulatory level for strategic planning and foresight purposes
- Comply in the regulatory framework with international recommendations to facilitate cooperation amongst participating countries
- Regulators should consider providing guides/standards to operators in order to facilitate implementation of characterization or decommissioning as a whole
- Active involvement of participating countries as well as proper IAEA support (upon proper application) are essential to give viability and success to the R2D2P
- Characterization needs good planning and a time table to follow; still it is a 'dynamic' activity which needs review and updates of plans and time tables
- Characterization can involve various hazards and all expertise to properly protect workers and the environment and should be included properly
- Participating countries should consider the use of 'scaling factors' for the benefit of their projects



The Top 10 Concepts for Decommissioning

1. Information Exchange / Regulatory Interactions
2. Communications
3. Site/Facility History
4. Waste Management
5. Hazards Assessment / Safety Assessment
6. Planning/Cost Estimates
7. Technologies
8. Final Surveys / End State
9. Management / Organization
10. Teamwork

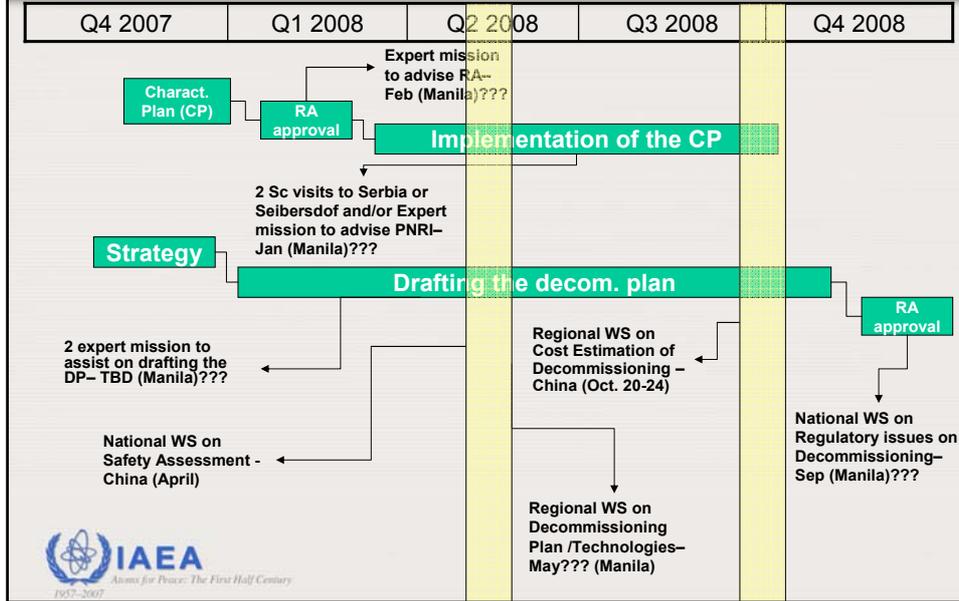


New proposed workplan in 2008

- **Regional events**
 - WS on Decommissioning Plan /Technologies– June (Manila)
 - WS on Cost Estimation of Decommissioning – China (Oct. 20-24)
- **National events, Expert missions, Scientific Visits**
 - 2 Sc. Visits to Serbia or Seibersdorf (Jan)
 - Expert mission to advise PNRI-RA, Philippines (Feb)
 - WS on Safety Assessment, China (April)
 - To be attended by 2 PNRI staff (1 Op + 1 Reg)
 - 2 expert mission to assist on drafting the Decommissioning Plan, Philippines (March and May)
 - National WS on Regulatory issues on Decommissioning, Philippines (Sep)



Complete workplan for 2008



ISO CODE	FACIL. NO.	FACILITY NAME	STAT1	CAT2	REACTOR TYPE	THERMAL POWER STEADY (KW)	INTEGRAL POWER (MWd)	YEAR OF CRITIC.	YEAR OF SHUTDOWN	Characterization Plan	Decommissioning Plan	DECOMM. CATEGORISATION STRATEGY STATUS/SITE USAGE3
BR	1	IEA-R1	O	A	POOL	5000.000		1957				
BR	2	IPR-RI	O	A	TRIGA MARK I	250.000		1960		Activation calculations	Preliminary Plan	
BR	3	ARGONAUTA	O	C	ARGONAUT	0.200		1965				
BR	4	IPENMB-01	O	D	CRITICAL ASSEMBLY	0.100		1988				
CN	1	ZERO POWER REACTOR	S	A	CRITICAL ASSEMBLY	0.000		1956	1983			
CN	2	HWRNA	O	A	HEAVY WATER	15000.000		1958	e2007	DONE	DONE	DDT/OP(2005)/U(e2030)
CN	3	ZERO POWER FAST REACTOR	O	A	FAST CRITICAL	0.050		1970				
CN	4	HFETR	O	B	TANK	125000.000		1979				
CN	5	SPR-IAE	O	A	POOL	3500.000		1984				
CN	6	MNSR-IAE	O	A	MNSR	27.000		1984				
CN	7	PPR-PULSING	O	A	POOL UZRH	1000.000		1990				
CN	8	HFETR-CRITICAL	S	D	CRITICAL ASSEMBLY	0.000		1979				
CN	9	SPR-300	O	A	POOL	3000.000		1979				
CN	10	LTHR (NHR-5)	O	E	HEATING PROT	5000.000		1989				
CN	11	TSHINGHUA REACTOR	O	A	POOL-2 CORES	1000.000		1984				XDW/OP(2005)/N(e2005)
CN	12	MTR	O	A	POOL	5000.000		1991				
CN	13	MNSR-SZ	O	A	MNSR	30.000		1988				
CN	14	MNSR-SD	O	A	MNSR	33.000		1989				
CN	15	MNSR-SH	O	A	MNSR	30.000		1991				XDW/OP(2005)/N(e2005)
CN	16	HTR-10	O	B	HTRG	10000.000		2000				
CN	17	ICARR	C	A	UNKNOWN	60000.000		e2005				
CN	18	CFER	C	E	FAST BREEDER	65000.000						
DZ	1	NUR-ALGERIA	O	A	POOL	1000.000		1989		???	???	
DZ	2	ES-SALAM	O	A	HEAVY WATER	15000.000		1992		???	???	
EG	1	ETRR-1	O	A	TANK WWR	2000.000		1961		???	???	
EG	2	ETRR-2	O	A	POOL	22000.000		1997				
ID	1	TRIGA II, BANDUNG	O	A	TRIGA MARK II	2000.000		1964				
ID	2	KARTINI-P3TM	O	A	TRIGA MARK II	100.000		1979	2010?	NO	NO	
ID	3	GIA SIWABESSY MPR	O	A	POOL	30000.000		1987				
ID	4	RP	P	A	POOL	10000.000						
LY	1	IRT-1	O	A	POOL IRT	10000.000		1981		NO	NO	
MY	1	TRIGA PUSPATI (RTP)	O	A	TRIGA MARK II	1000.000		1982		NO	2008???	
PH	1	PRR-1	D	A	TRIGA CONV	3000.000		1963	1988	Under development	2008	DDT/SD(1999)/U(e2011)
RO		HELEN	D	D	SUB CRIT ASSMB	0.000						
RO	1	WWR-C BUCHAREST	D	A	TANK WWR	2000.000	9590	1957	1997	Approved by RB	To be approved by RB	XDW/SF(2002)/N(e2005)
RO	2	TRIGA II PITESTI - SS CORE	O	B	TRIGA DUAL CORE	14000.000		1979	e2010		Conceptual Decom. Plan	ICP/SF(1998)/R(e2040)
RO	3	TRIGA II PITESTI - R	O	B	TANK	0.000		1976	1977			XDW/SF(2002)/N(e2005)
RO	4	TRIGA II PITESTI - PULSED	O	B	TRIGA DUAL CORE	500.000		1979	e2019			XDW/SF(2000)/N(e2005)
SB	2	R-A	D	A	HEAVY WATER	6500.000		1959	1984	2003/rev 2006	Final Stage	DDT/SF(2002)/U(e2016)
SB	3	R-B	O	D	HEAVY WATER	0.001		1958		NO	NO	
VN		TRIGA DALAT RESEARCH REACTOR	D	A	TRIGA MARK II	250.000		1963	1975			ICP/SP(1984)/R(e1984)
VN	1	REACTOR	O	A	POOL	500.000		1984			Under development	