# 2<sup>nd</sup> Workshop on Qualifications for Nuclear Decommissioning

Bergen (The Netherlands)

24-28 October 2016

# **INTRODUCTION**

According to its mission, European Human Resources Observatory – in Nuclear (EHRO-N) identified the nuclear sector's major challenges:

- to fill-in the 30% gap between HR demand and supply in decommissioning
- to adapt nuclear E&T system to comply more with labour market demands.

In answer to these challenges, in the nuclear decommissioning sub-sector was developed the ELINDER project (ELINDER-European Learning Initiative in Nuclear Decommissioning and Environmental Remediation).

ELINDER project started with pooling of existing decommissioning courses in the EU. These courses are disciplines oriented and the qualifications addressed are not specified. ELINDER project aims at training system modernization by turning the existing decommissioning courses-disciplines oriented, into a training programme-qualifications oriented.

The process of training system modernization is based on the design of the flexible qualifications (unit based qualifications) or to implement the European Credit system for Vocational Education and Training (ECVET).

In this context, the 2nd Workshop on Qualifications for Nuclear Decommissioning, organized by JRC-G10 and held in Bergen (The Netherlands) from 24<sup>th</sup> to 28<sup>th</sup> October 2016 was designed and organized, as part of efforts for ELINDER project development.

The 2nd WS objectives represent steps towards the training modernization in nuclear decommissioning, using ECVET principles:

- designing 6 qualifications-ECVET oriented
- designing training programs (TP)-market oriented starting from flexible qualifications

The 2nd WS objectives' were achieved based on a close collaboration between JRC-G10 and ECVET experts of ECVET Team.

The responsibilities assigned to JRC-G10 were:

- 2nd WS content coordination
- expert's guide development
- provide a classification of occupations, qualifications and jobs in the three phases of the NPP life cycle (new built; operation; decommissioning).

The tasks assigned to ECVET experts (according to the expert contract CT-EX2014D173553-101) have resulted into the following deliverables:

 to provide review, guidance and supervision for a set of 6 qualifications in nuclear decommissioning;



- to support the design of training programs-qualification oriented, using qualifications as input and taking in account ECVET principles.
- Post-Workshop report
- Electronic file with the presentations given

# PARTICIPANTS AND WORKFLOW

It is generally accepted that the scientific level of a scientific event is given by the participants. Four types of participants, listed in the Table 1, were involved in the 2<sup>nd</sup> Workshop: nuclear experts (from nuclear industry, universities, training providers and research), ECVET experts (ECVET Team), JRC staff and organizers.

#### Table 1: The participants at the 2<sup>nd</sup> Workshop

Nucl	ear experts	ECVET experts	JRC-staff	Organizers
Vladimir Slugen	Lyubomir Pyronkov	Thierry Lefeuvre	Franck Wastin	Massimo Flore
Marinela Ilieva	Abdesselam Abdelouas	Alexandra Costa Artur	Pierre Kockerols	Cesar CHENEL-RAMOS
Paul Livolsi	Emilia Vassileva		Birgit Christiansen	Mihail CECLAN
			Marcello Barboni	

The nuclear experts were distributed in two working groups. The nuclear experts were responsible for the fulfilment of tasks and the deadlines assigned to them. A group leader has coordinated the work within each group and has acted as main interface with the JRC contact point.

The 2<sup>nd</sup> Workshop was structured in 7 working sessions of half day each as is emphasized below:

- the first half day was dedicated to nuclear experts training;
- the next 6 working sessions, were focused on the following tasks:
  - > group review of the qualifications drafted in the preparatory phase;
    - group preparation of the EVET input for training programs (TP)-market oriented starting from flexible qualifications.

The 2nd Workshop on Qualifications for Nuclear Decommissioning was designed and organized in 3 phases, as part of efforts for ELINDER project development. Within the design phase were identified:

- priority qualifications in decommissioning addressed by the 2nd Workshop are listed in the Table 2;
- the need for building ECVET infrastructure (qualification design- ECVET oriented) with the view of view of turning existing TP-disciplines oriented into TP-market oriented;

In the preparatory phase, based on remote interaction between experts, were completed three tasks:

- Task 1: Draft design of 6 qualifications (ECVET infrastructure for ELINDER project);
- Task 2: Review for ECVET compliance & transversal analysis;
- Task 3: Amendment of the qualifications

During the execution phase, based on direct interaction between experts, were performed other two tasks:

- Task 4: group review of the 6 qualifications;
- Task5: group preparation of ECVET input for training programs- qualification oriented



# CONCLUSIONS

It is relevant to underline the great work done by all the experts involved in the 2<sup>nd</sup> Workshop. Results are coherent and consistent and will be useful for different stakeholders interested in flexible qualification development as well as training modernization in the nuclear decommissioning sector.

Qualification	Jobs covered		
	3.1.01. Project Manager		
	3.1.02. Contractors Manager		
	3.1.03. Management System Manager		
3.1.1. Decommissioning Management	3.1.04. Training Manager		
	3.1.05. Licensing Manager (for decommissioning)		
	3.1.06. Communication and PR Manager		
-	3.1.07. Financial Manager		
	3.1.08. Site Manager		
	3.7.01. Radioactive Waste Manager		
3.7.1.Radioactive Waste Management	3.7.02. Radioactive Waste Manager- characterisation		
	3.7.03. Radioactive Waste Manager- processing		
	3.3.01. Site Engineer		
3.3.1. Preparatory work Management	3.3.02. Spent Fuel Management Engineer		
	3.3.03. Engineering Support Manager		
3.9.1. Radiation Protection Expert	3.9.01 Radiation Protection Manager		
3.8.1 Management of maintenance in	3.8.01. Maintenance Engineer – Manager		
Decommissioning	3.8.02. Maintenance Supervisor		
2.3.1. Management of Radioactive	2.4.01 WM&RP Manager		
Waste &RP			

#### Table 2: Priority qualifications in decommissioning addressed by the 2nd Workshop

Conclusions highlighted within the 2<sup>nd</sup> Workshop regarding the implementation of flexible gualifications and training programs-market oriented are:

- All planed tasks and deliverables were achieved at a high standard of quality. The 2<sup>nd</sup> Workshop was successful and the working method applied (preparatory phase based on remote interaction between experts and single execution phase) proved to be more efficient and economically viable than having multiple executive workshops without preparatory phase.
- 2) Next steps in nuclear ECVET implementation:
  - In 2017 will be organized the 3rd Workshop on designing qualifications of EQF 5 level (in order to demonstrate permeability between VET and higher education (HE) and flexible learning pathway);
  - In 2018 is foreseen a Conference/WS to get feedback from nuclear industry/NRB and other stakeholders on the perceived benefits of the nuclear ECVET effort.
- 3) Structural analysis of qualifications was done in order to comply with an ECVET requirement:
  - the title of unit of learning outcomes (ULOs) should be in line with role/ functions of jobs covered by the given qualification;
  - the structural analysis has led to several unit titles changing.
- 4) Six flexible qualifications are now established. Five qualifications
  - (3.1.1; 3.7.1; 3.3.1; 3.9.1; and 3.8.1) belong to decommissioning and one (2.3.1) belongs to operation (see Table 2):



- through transversal analysis over two groups of three qualifications were identified common ULOs (listed in the Table 3 and 4), corresponding to common competences/LO;
- three types of ULOs were identified: transversal units (TU)-common over three qualifications; bilateral units (BU) )-common over two qualifications; single unit (SU) )- belonging to one qualification;

#### Table 3: First group of flexible qualifications in decommissioning and operation

	3.9.1	2.3.1 Management of	3.7.1
	Radiation Protection	Radioactive Waste	Radioactive Waste Management
	Expert	&RP	_
U1		Radiation Protect	ion – TU
U2		Accident and emergen	cy issues – TU
U3	Team and project management - TU		
U4	Interaction with other nuclear areas/departments – TU		
U5	Evaluation and optimizat collective doses – BU (3.9.	tion of individual and 1;2.3.1)	Decommissioning management SU (3.7.1)
U6	Management of health, radiological and environmental risks - BU (3.9.1; 2.3.1)		
U6/7		Radioactive was	te management – BU (3.7.1 ; 2.3.1)

#### Table 4: Second group of flexible qualifications in decommissioning

	3.1.1 Decommissioning Management	<b>3.3.1</b> Preparatory work Management	<b>3.8.1</b> Management of maintenance in Decommissioning
U1	M	anagement of Decommiss	sioning projects - TU
U2		Safety and secu	urity -TU
U3	Management - SU	Operation, maintenance and engineering - SU	Facility maintenance - SU
U4	Integrated management system in decommissioning - SU	Preparatory work and spent fuel - SU	
U5	Communication and public relation - SU		

- 4) A methodology for designing training programs (TP) based on exit outcomes was developed:
  - training program design is not a compulsory part of ECVET implementation, but the training is the way to emphasise ECVET benefits, because training is more visible and understable;
  - the design sequence of a TP based on exit outcome, was developed within  $2^{nd}$  WS, has two steps:
    - TP-exit outcomes definiton;
    - learning modules identification within each ULOs of a given qualification;
- 5) Five ECVET input for TP based on exit outcomes (or TP-qualification oriented) are now established and emphasized in the Table 5 and 6.
  - training modules were identified inside each unit of learning outcomes (ULOs);
  - three types of modules were defined: transversal modules (TM)-common over three qualifications; bilateral Modules (BM) )-common over two qualifications; single module (SU)- belonging to one qualification;



- some modules have very close contents. Transversal modules can be designed after comparison and limited adjustments. Some transversal modules could be appearing for the 6 training programs.
- 6) Quality of assessment is a key aspect to guaranty the quality of qualifications as well as the quality of training programs. Assessment methods and protocols must be transparent and easy to understand. To be in line with ECVET principles, assessment must focus on skills. The last part of the seminar gave opportunity to work on an example and to design a first template. This must be continued and developed.

	3.9.1/11M=9TM+2BM	2.3.1/13M=9TM+4BM	3.7.1/12M=9TM+2BM+1SM
U1	Radiation Protection – <b>3TM</b> (3.9.1;2.3.1; 3.7.1)		
U2	Accident a	and emergency issues – <b>2TM</b> (3.9	9.1;2.3.1; 3.7.1)
U3	Team and	project management – <b>3TM</b> (3.9	9.1;2.3.1; 3.7.1)
U4	Interaction with other nuclear areas/departments – <b>1TM</b> (3.9.1;2.3.1; 3.7.1)		
U5	Evaluation and optimization of individual and collective doses Decommissioning management (3.9.1; 2.3.1)- <b>1BM</b> (3.7.1)- <b>1SM</b>		Decommissioning management (3.7.1)- <b>1SM</b>
U6	Management of health, radiological and environmental risks U6 (3.9.1; 2.3.1)- <b>1BM</b>		
U6/7		Radioactive waste managen	nent – U6/7 (3.7.1 ; 2.3.1) <b>2BM</b>

#### Table 5: Training modules for qualifications 3.9.1; 2.3.1; 3.7.1

# Table 6: Training modules for the qualifications 3.3.1 and 3.8.1

	Training modules for the qualif.			
	3.1.1	3.3.1/7M=5TM+2SM	3.8.1/7M=5TM+2BM	
U1	Management of	Management of Decommissioning projects <b>2 TM</b> $(3.1.1; 3.3.1; 3.8.1)$		
U2	Safe	ety and security_ <b>3 TM</b> (3.1.1; 3.3.	.1; 3.8.1)	
U3	Management	Operation, maintenance and	Facility maintenance	
		engineering support		
U4	Communication and PR	Preparatory Work and spent		
		fuel		
U5	Integrated management			
	system in decommissioning			

- 7) Nuclearisation is one of the aims of all the work. Units permit to reduce the time to obtain a full qualification by recognition of previous learning and experience. Time of training can also be adapted and/or reduced with the same philosophy, using modules. Some guidelines for using units and modules could be useful to provide for actors in charge of recognition of previous learning/experience and for training providers.
- 8) To move forward the question of the competent body or bodies able to recognise qualifications, units and modules is on the table. Sustainability of all the qualification and training framework on which we worked depend on the trust of each actor give to documents/awards/diploma delivered. In order to identify/define a respected body in charge of the strategic matter of official recognition of qualifications, units and modules in the nuclear sector, we should identify the authority responsible for a given qualification:
  - when qualifications are under the responsibility of a Ministry or a national competent body, there is not any possibility of a supra national authority for the recognition of national qualifications. In that case, the way to support recognition is competent bodies of different countries sign a memorandum of understanding describing communalities of qualifications and the procedure of recognition.



 when qualifications are under the responsibility of and awarded by a professional sector or branch, an independent body trusted by every operators is needed for recognition of units and/or qualification (the case of welding sector was emphasised).

# METHODOLOGY AND OUTCOMES

# Methodology for qualification design

The starting point was to use the nuclear job taxonomy previously established for the nuclear sector. This material gave a list of job profiles grouped in coherent sets making qualifications covering a range of job profiles.

In the nuclear sector we can underline jobs are performed at EQF upper levels 6 to 8. For our work, and after deep discussion, the 6 qualifications are definitely assigned to level 6.

According to ECVET principles, each qualification is structured in units of learning outcomes. The reference document concerning EQF is the "Proposal for a Council Recommendation on the European Qualifications Framework for lifelong learning and repealing the Recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning) COM (2016) 383/2" of the 10<sup>th</sup> June 2016. The document precise the descriptors of learning outcomes in Knowledge, Skills and Responsibility/autonomy. This last item (Responsibility/autonomy) replaces competence. It defines and characterise the levels.

The tasks were divided in 2 phases:

- a preparatory work from June to September was dedicated to provide drafts of qualifications divided in units of learning outcomes including assessment criteria and methods;
- a face-to-face working during the workshop.

On the first step, qualifications were defined in relation with job requirements. The nuclear experts written proposals checked by the ECVET expert to insure qualifications were set up according to ECVET principles. During this phase, ECVET experts identified transversal units supporting *nuclearisation* and flexible pathways.

As a result of qualifications structural check we improved the title of several ULOs, taking in consideration transversal, bilateral and singular units, for a better coherence of the 6 qualifications.

In addition, qualifications were used as input for program trainings structured in modules and a template for assessment of modules was prepared.



# Description of the qualifications produced

# 2.2.1. DECOMMISSIONING MANAGEMENT (3.1.1.)

The present qualification applies to 8 jobs, specified in the Table 2, increasing their extensive scope.

# Unit of learning outcomes No. 1: MANAGEMENT OF DECOMMISSIONING PROJECTS /

TU(3.1.1; 3.3.1; 3.8.1)

# Autonomy/Responsibility

Manage complex decommissioning activities, taking responsibility for decision-making in unpredictable work contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

	Skills	Knowledge
S.1.1.	Coordinate planning, scheduling, implementing and monitoring activities and projects	<ul> <li>K.1.1. Decommissioning methodology, techniques and strategies</li> <li>K.1.2. Environmental impact of nuclear power;</li> </ul>
S.1.2.	Manage resources involved in the project	K.1.3. Remediation methods;
S.1.3.	Monitor implementation of plans and procedures to ensure compliance with project schedules, safety procedures and legislation	<ul><li>K.1.4. Risk estimation and management</li><li>K.1.5. Management and workflow of the project</li><li>K.1.6. Information technology</li><li>K.1.7. Nuclear decommission practices: clean up of</li></ul>
S.1.4.	Perform risk estimation and management and cost control.	radioactivity (remediation) and plant demolition K.1.8. Radioactivity and nuclear science and
S.1.5. S.1.6.	Select contractors and establish contracts Develop decommissioning project specifications, scopes-of-work, and prepare tender procedures	engineering K.1.9. Management of civil engineering operations K.1.10. Decommissioning regulation and licensing: site characterization, dismantlement activities, plans
S.1.7.	Intervene, analyse, manage and resolve business and technical conflicts between the company and the contractors	for site remediation, detailed plans for final radiation surveys for release of the site, environmental change.
S.1.8.	Develop procedures and obtain permits (licensing for decommissioning)	K.1.11. Decommissioning funds and financial mechanism
Assessme	ent criteria:	
Coordinati monitoring	on of all planning, implementing and gactivities and projects;	Develop licensing procedures and decommissioning
Monitoring on plans and procedures implementation to ensure compliance with project schedules, safety procedures and legislation		strategy(s) (immediate/deferred dismantling)
Identify types and sources of radioactive waste;		
Associate hazards and environmental impacts and safety considerations with the Nuclear Fuel Cycle;		
Manage the risks		
Recomme	ended assessment methods:	

Practical test, Development of project, Situational judgment test, face to face examination, practical exercise, grid test with multiple choice.

# Unit of learning outcomes No.2: SAFETY AND SECURITY / TU(3.1.1; 3.3.1; 3.8.1)

# Autonomy/Responsibility

Manage complex activities of applying safety principles and requirement and safety and security management, taking responsibility for decision-making in unpredictable work contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

Skills		Kno	wledge
S.2.1.	Provide training and information about the special procedures as emergency, potential risks on workers' health, nuclear safety and security	K.2.1. K.2.2. K.2.3.	National licensing requirements International regulations and standards Radiation protection (ALARA concept, dose commitment to workers and environment,
S.2.2.	Analyze and interpret the licensing requirements	K.2.4.	radiation protection methods and tools) Industrial safety
S.2.3. S.2.4.	Identification of safety requirements Apply regulations issued by different authorities	K.2.5. K.2.6. K.2.7.	Safety culture Waste and transport safety Emergency preparedness
S.2.5.	Review processes, systems and activities in the facilities	K.2.8. K.2.9.	Clearance of material and site release Nuclear security, safeguard and non-
S.2.6.	Perform appropriate hazard and accident analysis	K.2.10.	proliferation Radiological hazard analysis
S.2.7.	Develop and document the safety function, functional performance requirements and performance criteria	K.2.11. K.2.12.	Risk assessment Environmental site remediation
S.2.8.	Prepare safety basis documents: Conceptual Safety Design Reports, Preliminary Safety Design Reports, Preliminary Documented Safety Analyses, Documented Safety		
S.2.9.	Monitor and control security, safeguard and non-proliferation requirements		
Assessme	ent criteria:		
Preparation as emerg nuclear sat	n of information about the special procedures ency, potential risks on workers' health, fety and security		
Apply the taking into	regulations issued by different authorities account interdependencies and interfaces		
Show con regulations	npliance of licencing documents with the		
Perform ha	azard and accident analysis		
Prepare sa	fety-related documentation, technical reports		
Recomme	ended assessment methods:		
Practical te judgment	est, practical exercise, case study, situational test.		



# **Unit of learning outcomes No. 3: MANAGEMENT /** SU(3.1.1)

#### Autonomy/Responsibility

Manage complex decommissioning projects, taking responsibility for decision-making in unpredictable work or study contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

	Skills		Knowledge
S.3.1.	Formulate strategic goals and long-term business plans	K.3.1. K.2.2.	Business administration Strategic planning, Organizing and
S.3.2.	Enforce policies, procedures, and productivity standards	K.2.3.	Monitoring Project management
S.3.3.	Plan and Schedule working processes	K.2.4.	Resource management
S.3.4.	Manage personnel - capacity to allocate tasks and organize work	K.2.5. K.2.6.	Team Management Requirements of integrated management
S.3.5.	Plan, manage and control the budget		system
S.3.6.	Manage and control of processes, purchases, documents	K.2.7. K.2.8.	Site organisation and lifecycle Document management
S.3.7.	Manage organisational change	K.2.9.	Advanced computer literate
S.3.8.	Promote safety culture and legal work environment	K.2.10.	Nuclear regulation and licensing
S.3.9.	Evaluate information and data		
S.3.10.	Analyze information for management control		
S.3.11.	Organize supplies and control of		
S.3.12.	Operate computers using a variety of software		
S.3.13.	Comply with statutory regulations and		
	organizational safety requirements		
S.3.14.	Define objectives and evaluate outcomes		
S.3.15.	Interface with stakeholders, auditors and		
	subcontractors		
Assessme	ent criteria:		
Precision i	n analyzing achievements of organization and n directives for further development	Managemer	nt control based on deduction analysis
Tormulatio		Clarity of	specified requirements, description, goals,
Plan the p priorities	hases and activities of according to strategic	monitoring and effectiveness of processes under their responsibility	
Safety cul with the re	ture principles application on site and comply egulatory requirements	Taking resp implementir	ponsibility for the process of planning and ng change in organizations Practice diversity,
Capability	of planning, scheduling and organization of all	coaching an	nd mentoring, conflict management
resources and service		Adopt techr	nological developments and take into account
Capacities of partnering and teamwork		market tren	105
Ability of making appropriate decisions			
Recommended assessment methods:			
Practical test, practical exercise, case study, peer review, essay, situational judgment test.			



# **Unit of learning outcomes No. 4: COMMUNICATION AND PUBLIC RELATIONS/** SU(3.1.1)

## Autonomy/Responsibility

Manage complex activities of internal communication and PR management, taking responsibility for decision-making in unpredictable work contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

Skills		Knowledge	
S.4.1. S.4.2. S.4.3.	Draft and provide appropriate information to internal and external stakeholders Prepare, organize, evaluate and follow-up the communication plan Promote cooperative relationships with the stakeholders	K.4.1. K.4.2. K.4.3. K.4.4. K.4.5.	Communication plan content and workflow Communication strategy application Communication methods and techniques Current trends in digital media/social media communication Crisis management
S.4.4. S.4.5.	<ul> <li>Conduct public speaking</li> <li>Select and apply the appropriate approaches for information dissemination</li> <li>Control information output and handle incoming requests for information</li> </ul>		Public relations Occupational sociology
S.4.6.			Journalish, marketing
S.4.7.	Drive corporate strategy and message development Croate, test and improve a crisic		
5.4.8.	communication plan		
Assessme	ent criteria:		
Draft appr	opriate information for stakeholders	Capacity	of networking
Prepare, communic	organize, evaluate and follow-up the ation plan	Conduct a crisis communication plan	
Draft pres	s releases		
Deliver effective public speech			
Appropriate approaches and channels for information dissemination			
Recommended assessment methods:			
Practical to	est, face to face examination, grid test with mult	iple choice	2.

# $\label{eq:unit} \textbf{Unit of learning outcomes No. 5: INTEGRATED MANAGEMENT SYSTEM IN DECOMMISSIONING/ $SU(3.1.1)$}$

#### Autonomy/Responsibility

Manage complex activities of implementation, development and improvement of IMS, taking responsibility for decision-making in unpredictable work contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

Skills	Knowledge		
<ul> <li>S.5.1. Develop process maps and establish the requirements with regards documentation, instructions, management of interfaces, transfer of responsibilities, and key competences</li> <li>S.5.2. Analyze and report information</li> <li>S.5.3. Monitor business process performance and effectiveness</li> <li>S.5.4. Carry out the assessment of the processes and propose improvements</li> <li>S.5.5. Coordinate personnel, policies and processes</li> <li>S.5.6. Oversee and apply complex regulations and procedures</li> <li>S.5.7. Monitor implementation, assessment and improvement of the MS.</li> <li>S.5.8. Ensure that the activities comply with the requirements specified in the MS</li> <li>S.5.9. Manage organizational changes and their impact on safety</li> <li>S.5.10. Promote safety culture</li> </ul>	<ul> <li>K.5.1. National legislation on management system and international standards (e.g. ISO, IAEA)</li> <li>K.5.2. Processes design</li> <li>K.5.3. Quality assurance, management system and environmental management</li> <li>K.5.4. Management of human and organisational factors</li> <li>K.5.5. Safety culture</li> <li>K.5.6. ICT literacy</li> </ul>		
Assessment criteria:			
Plan process indicators and monitor business process performance and effectiveness Ensure compliance with complex regulations and procedures Review process flow, develop process maps Focus on excellence and continuous improvement	Analyze data and report information Defining proposals for improvement of processes based on collected data and their analysis		
Recommended assessment methods:			
Practical test, Situational judgment test, face to face examination, grid test with multiple choice.			



# 2.2.2. RADIOACTIVE WASTE MANAGEMENT (3.7.1)

# Unit of learning outcomes No.1: RADIATION PROTECTION/ TU (3.9.1;2.3.1; 3.7.1)

# Autonomy/Responsibility

Manage complex activities, related to radioactive waste management and radiation protection aspects. Take responsibility for decision-making in routine and/or unpredictable work in relation with radiation protection expert. Take responsibility for managing professional development of individuals in radioactive waste management and radiation protection areas.

	Skills		Knowledge
S.1.1.	Develop specific provisions and	K.1.1.	The main types of ionizing radiation and
	requirements on radioctive waste	K.1.2.	Relevant national and international
	management		legislation and guidelines
S.1.2.	Implement ALARA principle to define	K.1.3.	Dose definition, dose types, dose
C 1 2	optimised radiation protection actions		measures, dose constraints and
5.1.5. S 1 4	Optimize the occupational radiation	K 1 4	Radiation monitoring workplace
0.11.11	protection programme	11111	monitoring and individual monitoring
S.1.5.	Define and/or apply principle	K.1.5.	Radiation protection programs
	strategies of a radiation protection	K.1.6.	ALARA principle and procedures
	programme during various phases of a	K.1.7.	Health surveillance
	nuclear installation (design, operation	K.1.8.	Radiological impacts on the environment
C 1 C	or dismantling).	K.1.9.	Contamination control, decontamination
5.1.6.	Develop radiation protection procedures and framework in pormal	K 1 10	and reduction of sources of radiation
	and emergency cases	K.1.10.	access control
S.1.7.	Use radiation control and	K.1.11.	Use of protective equipment such as
	measurement equipment		shielding and protective clothing
S.1.8.	Develop technical specifications and	K.1.12.	Storage arrangements for
	procedures		radioactive/contaminated items
S.1.9.	Monitor and maintain a safe working	K.1.13.	Emergency planning and emergency
S 1 10	Apply appropriate radiation		prepareuness
5.1.10.	measurements for preliminary sample		
	sorting		
S.1.11.	Identify appropriate shielding for		
	radiation sources		
S.1.12.	Characterise radiation sources and		
	identify appropriate protection		
Assessmen			
Ability in dou	coloning procedures and specifications	Suctainab	ility of cafety culture principles application
Ability in dev	eloping procedures and specifications	Sustainad	inty of safety culture principles application
Capabilities i implementat	n application of the ALARA ion strategy	Compliand area	ce with legislation in radiation protection
Successful m	anagement of emergency situations	Realism o	f corrective measures evaluation
Effectiveness of implementation of radiation programme			
Recommen	ded assessment methods:	Inteview	
Situational ju	Idgement tests	Written te	est
Case studies		Task solvi	na
			''y



# Unit of learning outcomes No.2: ACCIDENTS AND EMERGENCY ISSUES / TU (3.9.1;2.3.1; 3.7.1)

## Autonomy/Responsibility

Assume position and responsibility in emergency situations. Manage tasks prompt and reactive on changing situation in emergency case, distinguish and select the adequate data, stress control in emergency situation. Proper and prompt communication and reporting.

Skills	Knowledge
<ul> <li>S.2.1. Ensure execution of emergency plans</li> <li>S.2.2. Identify and detect emergency or hazards</li> <li>S.2.3. Monitor radiation situation in emergency case</li> <li>S.2.4. Preparing emergency plans</li> <li>S.2.5. Prepare emergency exercises</li> <li>S.2.6. Mitigate the consequences of accidental situation</li> <li>S.2.7. Protect personnel in restricted areas as well as on site</li> <li>S.2.8. Provide correct and prompt information to organisations and public</li> <li>S.2.9. Evaluate radiation situation in emergency case</li> <li>S.2.10. Predict next development of emergency case</li> <li>S.2.11. Rate abnormal situation</li> <li>S.2.12. Implement protective actions for incidental and accidental conditions</li> <li>S.2.13. Participate in accident event analysis</li> <li>S.2.15. Classify events (INES)</li> </ul>	<ul> <li>K.2.1. Emergency preparedness</li> <li>K.2.2. Emergency planning</li> <li>K.2.3. Several accident management</li> <li>K.2.4. Nuclear safety approaches, principles and requirements</li> <li>K.2.5. Relevant national and international legislation and guidelines</li> <li>K.2.6. Health protection</li> <li>K.2.7. Environmental protection</li> <li>K.2.8. Nuclear safety culture and human factor</li> <li>K.2.9. Nuclear facility components and systems</li> <li>K.2.10. Radiation ecology</li> <li>K.2.11. Contamination and decontamination</li> <li>K.2.12. Protective clothing and protective equipment</li> <li>K.2.13. Classification of area and access control</li> <li>K.2.14. International Nuclear Event Scale (INES)</li> <li>K.2.15. Safety assessment requirements</li> </ul>
S.2.16. Implement corrective measures	
Ability for emergency planning and realisation of emergency plans Ability to make decision in emergency situations Adequacy of dose measures and use of radiation control equipment Ability to evaluate the abnormal situation	Appropriateness of corrective actions Ability to apply ALARA and safety culture principles Behaviour in stress situations Prompt reporting
Recommended assessment methods:	
Situational judgement tests	
Task solving	
Written exam	

# Unit of learning outcomes No.3: TEAM AND PROJECT MANAGEMENT/ TU (3.9.1;2.3.1; 3.7.1)

#### Autonomy/Responsibility

Taking responsibility for decision-making in daily operations and emergency situations in order to respect time schedule and costs for decommissioning installation. Take responsibility for managing professional development of individuals and groups under their responsibility. Take responsibility in strategic resourse and workforce planning of the department. Manage and lead the team of professionals in radiation protection and waste management area in decommissioning phase.

	Skills		Knowledge
S.3.1. S.3.2.	Participate in recruitment process Plan initial and continuing specialised training for employees	K.3.1. K.3.2. K.3.3.	Organisation of human resources Social regulation Workforce planning and recruitment process
S.3.3. S.3.4. S.3.5. S.3.6. S.3.7. S.3.8. S.3.9. S.3.10. S.3.11. S.3.12.	training for employees Allocate tasks and assign personnel Prioritise objectives Develop teamwork Anticipate and manage conflicts Evaluate individual and team performance Perform managerial communication Propose activities for building successful teams Promote individuals Respect and apply national and international legislation Promote safety culture, questioning attitude and rigorous and prudent approach	K.3.3. K.3.4. K.3.5. K.3.6. K.3.7. K.3.8. K.3.9. K.3.10. K.3.11. K.3.12. K.3.13. K.3.14. K.3.15. K.3.16.	Workforce planning and recruitment process Individual and team performance Managerial communication Team coordination and motivation Resolution of conflict Work planning Training solutions Change management Quality Management Integrated Management System (conformity with ISO) General principles of knowledge management General principles of configuration management Project management Budget, time and cost management
S.3.13.	Manage project	K.3.17.	Organizational changes from operation to decommissioning
Assessme	ent criteria:		
Ability to activities	plan, schedule and control daily work	Ability decommi	to plan radioactive waste activities in ssioning project according to strategic
Pertinence of recruitn	of workforce planning and adequacy nent activities	cy Pertinence of corrective actions to antici	
Ability to r	nanage financial resources	efficiency	
Proper ap system	plication of integrated management	Appropria	ateness of managerial communication
Accurate s in unpredi	solutions for solving complex problems ctable and emergency situations		
Ability to standards	apply national and international		
Recomme	ended assessment methods:		
Interview			
Situationa	l judgement tests		
Case studi	es		
Task solvi	ng		
Written ex	am		



# Unit of learning outcomes No.4: Interaction with other nuclear actors/departments – TU (3.9.1;2.3.1; 3.7.1)

Autonomy/Responsibility

Interact with actors/departments involved in radioactive waste management, decomissioning phase of the NPP project. Taking responsibility for establishing and maintaining relationships with other departments, for participating decision-making in daily operations and emergency situations, for communicating the General Management decisions to the radioactive waste management team.

Skills		Knowledge		
S.4.1.	Integrate radwaste management strategy into the decommissioning	К.4.1. К 4 2	General plant description and basic technical characteristics of nuclear facilities Nuclear fuel cycle	
S.4.2.	Integrate radwaste management	K.4.3.	Safety systems operation	
	strategy into the overall management strategy of the plant	K.4.4.	Radioactive waste treatment systems operation	
S.4.3.	Lead performance of complex analyses involving different facility's	K.4.5.	Applicable codes, regulations and standards for decommissioning phase	
	systems, structures, components and processes	K.4.6.	Knowledge of plant (site, units') operational history	
S.4.4.	Perform proper communication in different areas of waste management	K.4.7. K 4 8	Safety Analysis Report (SAR) Dismantling methods and techniques	
S.4.5.	Report activities and disseminate information	K.4.9.	Key issues of facilities' maintenance, surveillance and inspection. Facility	
S.4.6.	Coordinate actors in waste	K / 10	modifications	
S.4.7.	Share knowledge, information and experiences	K.4.10. K.4.11.	Decontamination techniques for equipment	
S.4.8.	Analyse and upgrade	K.4.12.	Waste categorisation	
	decommissioning plans	K.4.13.	Knowledge management	
Assessm	ent criteria:			
Ability to organise and share knowledge, information and experiences		Pertinence of plant key performance indicators		
Taking in	account professional environment and	Accuracy of reports		
constraint processes	ts of design, technological systems and	Pertinence of decommissionning plans anal		
Complian and comp	ce with safety standards, legislation any policy	upgradir	g	
Recomm	ended assessment methods:			
Interview				
Situationa	al judgement tests			
Case stud	lies			
Task solv	ing			
Written e	xam			



#### Unit of learning outcomes No.5: DECOMMISSIONING MANAGEMENT / SU (3.9.1;2.3.1; 3.7.1) Autonomy/Responsibility

Perform and manage tasks in decomissioning activities. Take responsibility for selection of proper decommissioning technologies and procedures. Participation in daily decisions for operations and emergency situations. Communication to the general management. Take responsibility for quality and safety of performed works.

Skills	Knowledge
S.5.1. Participate and/or organize	K.5.1. Waste origin and handlings
decommissioning activities	K.5.2. Contamination, decontamination
S.5.2. Organise decommissioning	K.5.3. Decontamination technologies and tools
work	K.5.4. Radioecology and environmental remediation
S.5.3. Prioritise objectives	K.5.5. Partitioning and compacting
S.5.4. Use the optimal tools and	K.5.6. Decommissioning procedures
technology in decommissioning	K.5.7. Limits for free release
S.5.6. Evaluate efficiency of	K.5.8. Prediction and simulating of activation
decontamination	
S.5.7. Monitor waste	
accumulation and transport	
Accordment criteria	
Assessment cificenta:	Eadback on operational events
Performance of decommissioning	Partinence of decommissioning selected tools and techniques
strategy and program	refunctive of accommissioning selected tools and techniques
Ability to organize decommissioning	
works and activities	
Recommended assessment	
methods:	
Written test,	
Interview	
Situational judgement test	
Problem solving	
Note:	



# Unit of learning outcomes No.6: RADIOACTIVE WASTE MANAGEMENT / BU (2.3.1; 3.7.1) Autonomy/Responsibility

Manage complex activities related to radioactive waste management including handling, treatment and storage. Take responsibility for decisions related to technologies, processes, nuclear and industrial safety as well as impact to environment.

Skills	Knowledge
S.6.1. Evaluate and control the level of contamination and induced activities of radioactive waste S.6.2. Select optimal solution and manage radioactive waste categorisation S.6.3. Manage radioactive waste handling and transport S.6.5 Apply proper criteria for treated waste classification and handling S.6.6. Evaluate and manage collected data about waste characteristics S.6.9. Comply activities with national program in decommissioning S.6.10. Developing waste management program, creating and procedures	K.6.1. Waste characterisation and categorisation K.6.2. Dosimetry K.6.3. Nuclear safety and radiation protection K.6.4. Relevant national and international legislation and guidelines K.6.5. Health protection K.6.6. Environmental protection K.6.7. Nuclear safety culture and human factor K.6.8. Protective clothing and protective equipment K.6.9. Transport, handling and storage of radioactive waste K.6.10. Treatment and long term storage K.6.11. National policy and program in decommissionning K.6.12. Waste conditioning including packaging
specifications and procedures	
S.6.11. Apply appropriate solutions in packaging	
Characterisation of radioactive waste Handling with radioactive waste Proper use of radiation control equipment Developing specifications and procedures	Evaluation of radiation protection measures Manipulation with active waste Effective shielding measures
Recommended assessment methods:	
Practical exercises Situational judgement tests	
Lessons learned	
Case studies	
Task solving	



# 2.2.3. PREPARATORY WORK MANAGEMENT (3.3.1)

# Unit of learning outcomes No. 1: MANAGEMENT OF DECOMMISSIONING PROJECTS/

TU (3.1.1; 3.3.1; 3.8.1)

# Autonomy/Responsibility

Manage complex decommissioning activities, taking responsibility for decision-making in unpredictable work contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

Skills		Knowledg	e
S.1.1.	Coordinate planning, scheduling, implementing and monitoring activities and	K.1.1.	Decommissioning methodology, techniques and strategies
	projects	K.1.2.	Environmental impact of nuclear power;
5.1.2.	Manage resources involved in the project	K.1.3.	Remediation methods;
5.1.3.	Monitor implementation of plans and	K.1.4.	Risk estimation and management
	procedures to ensure compliance with project	K.I.5.	Management and worknow of the project
S 1 /	Perform rick estimation and management	K.1.0. K 1.7	Nuclear decommission practices: clean up
5.1.4.	and cost control	K.1.7.	of radioactivity (remediation) and plant
S.1.5.	Select contractors and establish contracts		demolition
S.1.6.	Develop decommissioning project	K.1.8.	Radioactivity and nuclear science and
	specifications, scopes-of-work, and prepare		engineering
	tender procedures	K.1.9.	Management of civil engineering
S.1.7.	Intervene, analyse, manage and resolve		operations
	business and technical conflicts between the	K.1.10.	Decommissioning regulation and
C 1 0	company and the contractors		licensing: site characterization,
5.1.8.	(licensing for decommissioning)		dismantiement activities, plans for site
	(incensing for decommissioning)		radiation surveys for release of the site
			environmental change
		K.1.11.	Decommissioning funds and financial
			mechanism
Assessm	ent criteria:		
Coordinat	ion of all planning implementing and		
monitoring activities and projects;		Develop licensing procedures and decommissioning strategy(s) (immediate/deferred dismantling)	
Monitoring on plans and procedures implementation to			
ensure compliance with project schedules, safety			
procedure	s and legislation		
T			

Identify types and sources of radioactive waste;

Associate hazards and environmental impacts and safety considerations with the Nuclear Fuel Cycle;

Manage the risks

# Recommended assessment methods:

Practical test, Development of project, Situational judgment test, face-to-face examination, practical exercise, grid test with multiple choice.

# Unit of learning outcomes No.2: SAFETY AND SECURITY / TU (3.1.1; 3.3.1; 3.8.1)

## Autonomy/Responsibility

Manage complex activities of applying safety principles and requirement and safety and security management, taking responsibility for decision-making in unpredictable work contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

Skills		Knowledge	e
S.2.1.	Provide training and information about the special procedures as emergency, potential risks on workers' health, nuclear safety and	K.2.1. K.2.2. K.2.3.	National licensing requirements International regulations and standards Radiation protection (ALARA concept, dose commitment to workers and environment
S.2.2.	Analyze and interpret the licensing	K D 4	radiation protection methods and tools)
S.2.3. S.2.4.	requirements Identification of safety requirements Apply regulations issued by different authorities	K.2.4. K.2.5. K.2.6. K.2.7.	Safety culture Waste and transport safety Emergency preparedness
S.2.5.	Review processes, systems and activities in the facilities	К.2.8. К 2 9	Clearance of material and site release
S.2.6.	Perform appropriate hazard and accident	K 2 10	proliferation Radiological bazard analysis
S.2.7.	Develop and document the safety function, functional performance requirements and performance criteria	K.2.11. K.2.12.	Risk assessment Environmental site remediation
S.2.8.	Prepare safety basis documents: Conceptual Safety Design Reports, Preliminary Safety Design Reports, Preliminary Documented Safety Analyses, Documented Safety Analyses and Technical Safety Requirements		
S.2.9.	Monitor and control security, safeguard and non-proliferation requirements		
Assessm	ent criteria:		
Preparatio as emerge safety and	on of information about the special procedures ency, potential risks on workers' health, nuclear d security		
Apply the regulations issued by different authorities taking into account interdependencies and interfaces			
Show co regulatior	mpliance of licencing documents with the is		
Perform hazard and accident analysis			
Prepare s	afety-related documentation, technical reports		



# Unit of learning outcomes No. 3: OPERATION, MAINTANANCE AND ENGINEERING SUPPORT / SU (3.3.1)

#### Autonomy/Responsibility

Manage complex tasks of operation, maintenance and engineering support of decommissioning projects, taking responsibility for decision-making in unpredictable work or study contexts. Take responsibility for managing professional development of individuals and groups involved in decommissioning activities.

	Skills		Knowledge		
S.3.1.	Plan, implement, co-ordinate and monitor	K.3.1.	Decommissioning methodology		
	operation activities	K.3.2.	Electrical and mechanical installations		
S.3.2.	Plan, implement, co-ordinate and monitor	K.3.3.	Radioactive waste treatment systems		
	maintenance activities	K.3.4.	Process System engineering and design		
S.3.3.	Plan, implement, co-ordinate and monitor	K.3.5.	Electrical engineering and design		
	engineering support activities	K.3.6.	Mechanical engineering and design		
S.3.4.	Provide technical information for operation,	K.3.7.	HVAC engineering and design		
	activities	K.3.8.	Fire protection engineering and design		
5.3.5.	Provide technical information for maintenance,	K.3.9.	lechniques and methodologies of decontamination within scope		
536	Provide technical information for engineering	K 3 10	Engineering principles (i.e. mechanical		
0.0.0.	support activities	11.51101	electrical, instrumentation and control)		
S.3.7.	Draft work instructions related to waste	K.3.11.	Site specific rules and procedures (permit to		
	management		work, standard operating & maintenance		
S.3.8.	Understanding of complex regulations and		procedures and risk assessment etc.)		
	procedures	K.3.12.	Equipment and system operating and		
S.3.9.	Perform inspection, evaluation and control of		maintenance instructions		
6 3 1 0	works	к.з.13.	Comprehension on technological systems and		
5.3.10.	Specify functional requirements	1/ 2 14	processes.		
5.3.11.	Specify design requirements	K.3.14.	Documenting of design solutions and design		
5.3.12.	Assess design options	V 2 1 F	modifications		
5.5.15.	Managa aquinment delivery	K.3.15.	Establish of relevant procedures for		
S.J.14.	Draft technical specification and requirements		delivery		
S 3 16	Use and interpret engineering drawings and		delivery:		
0.0.10.	documents				
Assessm	ent criteria:				
Annronria	te planning implementation co-ordination and	Demonstr	ate comprehensive knowledge on technological		
monitorin	a of engineering activities on the base of	systems a	systems and processes		
available	technical information Ability to draft	0,000.000			
requirements specifications, technical specifications,		Document modificati	ting of design solutions and design ons		
and proc	edures Appropriate evaluation and control of	Establish	of relevant procedures for management of		
work; performing inspections and report them		equipment purchase and delivery.			
Recomm	nended assessment methods:				
Practical	test, quizzes, grid test with multiple choices,				
how-to e	examination.				



# Unit of learning outcomes No.4: PREPARATORY WORK AND SPENT FUEL / SU(3.3.1)

#### Autonomy/Responsibility

Manage complex activities, related to nuclear physics and nuclear engineering aspects of decommissioning projects, taking responsibility for decision-making in unpredictable work or study contexts. Take responsibility for managing professional development of individuals and groups depending on their duties.

Skills		Knowle	dge
S.4.1.	Planning, implementing, coordinating and	K.4.1.	Nuclear physics fundamentals
	monitoring engineering activities	K.4.2.	Nuclear engineering
S.4.2.	Organize treatment of damaged fuel elements	K.4.3.	Nuclear installation systems and components
S.4.3.	Plan decommissioning site preparation	K.4.4.	Nuclear safety (criticality, heat generation,
S.4.4.	Defining engineering processes		radiolysis)
S.4.5.	Draft technical specifications and working	K.4.5.	Radiation fundamentals
	documents related to decommissioning activities	K.4.6.	Nuclear standards
	and spent fuel management	K.4.7.	Decommissioning techniques
S.4.6.		K.4.8.	Chemical Engineering and Waste Management
S.4.7.	Prepare controlled work areas for	K.4.9.	Radioactive waste handling and storage
	decommissioning activities and Design Radiation protection barriers	K.4.10.	Inspection of spent fuel assemblies and special conditioning of damaged elements
S.4.8.	Implement design modifications	K.4.11.	Spent fuel management, including damaged fuel
S.4.9.	Identify and analyze radiological incidents		elements
S.4.10.	Report technical and regulatory data according to standard operating procedures	K.4.12.	Spent fuel transport (preparation of packaging,)
S.4.11. S.4.12.	Apply defense in depth principle in design		
S.4.13.	Organise and monitor storage, handling,		
	packaging and transport of spent fuel		

#### Assessment criteria:

Interpret engineering drawings and documents

Define engineering processes

Ability to plan and monitor engineering activities applying applicable methods

Planning of decommissioning site preparation

Planning and managing of safe transport and storage of spent fuel

# **Recommended assessment methods:**

Grid test with multiple choices, quizzes, practical exercise, peer review, face to face examination.



# 2.2.4. RADIATION PROTECTION EXPERT (3.9.1)

### Unit of learning outcomes No.1: RADIATION PROTECTION/ TU (3.9.1;2.3.1; 3.7.1)

#### Autonomy/Responsibility

Manage complex activities, related to radioactive waste management and radiation protection aspects. Take responsibility for decision-making in routine and/or unpredictable work in relation with radiation protection expert. Take responsibility for managing professional development of individuals in radioactive waste management and radiation protection areas.

	Skills		Knowledge
S.1.1.	Develop specific provisions and procedures based on regulatory requirements on radioctive waste	K.2.1.	The main types of ionizing radiation and their effects
S.1.2.	management Implement ALARA principle to define optimised	К.2.2.	Relevant national and international legislation and guidelines
S.1.3.	radiation protection actions Confirm work permits	K.2.3.	Dose definition, dose types, dose measures, dose constraints and
S.1.4.	Optimize the occupational radiation protection programme	K.2.4.	reference levels Radiation monitoring, workplace
S.1.5.	Define and/or apply principle strategies of a	к 2 5	monitoring and individual monitoring Radiation protection programs
	phases of a nuclear installation (design, operation or dismantling)	K.2.6.	ALARA principle and procedures
S.1.6.	Develop radiation protection procedures and	K.2.8.	Radiological impacts on the
S.1.7. S.1.8. S.1.9.	Use radiation control and measurement equipment Develop technical specifications and procedures Monitor and maintain a safe working environment	K.2.9.	Contamination control, decontamination and reduction of sources of radiation
S.1.10.	Apply appropriate radiation measurements for preliminary sample sorting	K.2.10.	Classification of working areas and access control
S.1.11. S.1.12.	Identify appropriate shielding for radiation sources Characterise radiation sources and identify	K.2.11.	Use of protective equipment such as shielding and protective clothing
-	appropriate protection strategies	K.2.12.	Storage arrangements for radioactive/contaminated items
		K.2.13.	Emergency planning and emergency preparedness
Assessm	ent criteria:		

Ability in developing procedures and specifications

Capabilities in application of the ALARA implementation strategy

Successful management of emergency situations

Effectiveness of implementation of radiation protection programme

Sustainability of safety culture principles application

Compliance with legislation in radiation protection area

Realism of corrective measures evaluation

**Recommended assessment methods:** 

Situational judgement tests

Case studies

Inteview Written test Task solving

# Unit of learning outcomes No.2: ACCIDENTS AND EMERGENCY ISSUES / TU (3.9.1;2.3.1; 3.7.1)

# Autonomy/Responsibility

Assume position and responsibility in emergency situations. Manage tasks prompt and reactive on changing situation in emergency case, distinguish and select the adequate data, stress control in emergency situation. Proper and prompt communication and reporting.

	Skills		Knowledge
S.2.1.	Ensure execution of emergency plans	K.2.1.	Emergency preparedness
S.2.2.	Identify and detect emergency or hazards	K.2.2.	Emergency planning
S.2.3.	Monitor radiation situation in emergency case	K.2.3.	Several accident management
5.2.4. s 2 5	Preparing emergency plans	К.2.4.	nuclear safety approaches, principles
5.2.5.	Mitigate the consequences of accidental	K 2 5	Relevant national and international
5.2.01	situation	10.2.131	legislation and guidelines
S.2.7.	Protect personnel in restricted areas as well as	K.2.6.	Health protection
	on site	K.2.7.	Environmental protection
S.2.8.	Provide correct and prompt information to organisations and public	K.2.8.	Nuclear safety culture and human factor
S.2.9.	Evaluate radiation situation in emergency case	K.2.9.	Nuclear facility components and
S.2.10.	Predict next development of emergency case	14 2 1 0	systems
S.2.11.	Rate abnormal situation	K.Z.10.	Radiation ecology
5.2.12.	accidental conditions	K.Z.II. K 2 12	Protective clothing and protective
S.2.13. Par	ticipate in accident event analysis	K 2 1 2	equipment
5 2 14 Ido	ntify root course	K.Z.13.	control
5.2.14. Iue	nully root causes	К 2 14	International Nuclear Event Scale
S.2.15. Cla	ssify events (INES)	10.2.1 11	(INES)
S.2.16. Imp	plement corrective measures	K.2.15.	Safety assessment requirements
Assessment	criteria:		
Ability for em	nergency planning and realisation of	Appropriateness of corrective actions	
emergency pl	ans	Ability to apply ALARA and safety culture principles	
Ability to mak	e decision in emergency situations	Behaviour i	n stress situations
Adequacy of equipment	dose measures and use of radiation control	Prompt rep	orting
Ability to eva	luate the abnormal situation		
Recommend	led assessment methods:		
Interview			
Situational ju	dgement tests		
Case studies			
Task solving			
Written exam			



### Unit of learning outcomes No.3: TEAM AND PROJECT MANAGEMENT/ TU (3.9.1;2.3.1; 3.7.1)

## Autonomy/Responsibility

Taking responsibility for decision-making in daily operations and emergency situations in order to respect time schedule and costs for decommissioning installation. Take responsibility for managing professional development of individuals and groups under their responsibility. Take responsibility in strategic resourse and workforce planning of the department. Manage and lead the team of professionals in radiation protection and waste management area in decommissioning phase.

Skills	Knowledge
<ul> <li>S.3.1. Participate in recruitment process</li> <li>S.3.2. Plan initial and continuing specialised training for employees</li> <li>S.3.3. Allocate tasks and assign personnel</li> <li>S.3.4. Prioritise objectives</li> <li>S.3.5. Develop teamwork</li> <li>S.3.6. Anticipate and manage conflicts</li> <li>S.3.7. Evaluate individual and team performance</li> <li>S.3.8. Perform managerial communication</li> <li>S.3.9. Propose activities for building successful teams</li> <li>S.3.10. Promote individuals</li> <li>S.3.11. Respect and apply national and international legislation</li> <li>S.3.12. Promote safety culture, questioning attitude and rigorous and prudent approach</li> <li>S.3.13. Manage project</li> </ul>	<ul> <li>K.3.1. Organisation of human resources</li> <li>K.3.2. Social regulation</li> <li>K.3.3. Workforce planning and recruitment process</li> <li>K.3.4. Individual and team performance</li> <li>K.3.5. Managerial communication</li> <li>K.3.6. Team coordination and motivation</li> <li>K.3.7. Resolution of conflict</li> <li>K.3.8. Work planning</li> <li>K.3.9. Training solutions</li> <li>K.3.10. Change management</li> <li>K.3.11. Quality Management</li> <li>K.3.12. Integrated Management System (conformity with ISO)</li> <li>K.3.13. General principles of knowledge management</li> <li>K.3.14. General principles of configuration management</li> <li>K.3.15. Project management</li> <li>K.3.16. Budget, time and cost management</li> <li>Organizational changes from operation to decommissioning</li> </ul>
Assessment criteria:	
Ability to plan, schedule and control daily work activities	Ability to plan radioactive waste activities in decommissioning project according to strategic
Pertinence of workforce planning and adequacy of recruitment activities	Pertinence of corrective actions to anticipate and
Ability to manage financial resources	reduce stress, and increase individual / team efficiency.
Proper application of integrated management system	Appropriateness of managerial communication
Accurate solutions for solving complex problems in unpredictable and emergency situations	
Ability to apply national and international standards	
Recommended assessment methods:	
Interview	
Situational judgement tests	
Case studies	
Task solving	
Written exam 2	4

# Unit of learning outcomes No.4: Interaction with other nuclear actors/departments TU(3.9.1;2.3.1;3.7.1)

## Autonomy/Responsibility

Interact with actors/departments involved in radioactive waste management, decomissioning phase of the NPP project. Taking responsibility for establishing and maintaining relationships with other departments, for participating decision-making in daily operations and emergency situations, for communicating the General Management decisions to the radioactive waste management team.

	Skills		Knowledge
S.4.1.	Integrate radwaste management strategy into the decommissioning plan	K.4.1.	General plant description and basic technical characteristics of nuclear
S.4.2.	Integrate radwaste management strategy into the overall management strategy of	K.4.2.	facilities Nuclear fuel cycle
S.4.3.	Lead performance of complex analyses involving different facility's systems,	K.4.3. K.4.4.	Radioactive waste treatment systems operation
S.4.4.	structures, components and processes Perform proper communication in different	K.4.5.	Applicable codes, regulations and standards for decommissioning phase
S.4.5.	Report activities and disseminate information	к.4.6. К.4.7.	operational history Safety Analysis Report (SAR)
S.4.6.	Coordinate actors in waste management activities	K.4.8. K.4.9.	Dismantling methods and techniques Key issues of facilities' maintenance,
S.4.7.	Share knowledge, information and experiences Analyse and upgrade decommissioning	K.4.10	surveillance and inspection. Facility modifications Radiological characterization of the
	plans	K.4.11.	facility Decontamination techniques for
		K.4.12. K 4 13	equipment and SSCs Waste categorisation Knowledge management
		N. 1.151	niomeage management
Assessm	ent criteria:		
Ability to and exper	organise and share knowledge, information iences	Pertinence	of plant key performance indicators
Taking in	account professional environment and	Accuracy of	reports
processes	s of design, technological systems and	Pertinence	of decommissionning plans analyse and
Compliand company	e with safety standards, legislation and policy	upgrading	5. ,
Recomme	ended assessment methods:		
Interview			
Situational judgement tests			
Case stud	ies		
Task solvi	ng		
Written ex	kam		



# Unit of learning outcomes No.5: EVALUATION AND OPTIMISATION OF INDIVIDUAL AND COLLECTIVE DOSES / BU (3.9.1; 2.3.1)

#### Autonomy/Responsibility

Manage complex activities concerning evaluation of individual and collective exposures (internal and external). Take responsibility for radiation protection actions implemented with respect to ALARA principle, regulation and rules. Advice other teams on radiation protection issues concerning decommissioning project.

Skills		Knowledge	
S.5.1. Monitor decommissioned areas	K.5.1.	Measurement of radioactive characteristics	
S.5.2. Evaluate dose rates and radioactive	K.5.2.	Detectors for radiation monitoring	
contamination	K.5.3.	Dosimetry (limits and norms)	
S.5.3. Evaluate the radiation situation	K.5.4.	Radiation protection measures and	
S.5.4. Evaluate problems regarding		technics	
radiation protection and dosimetry	K.5.5.	Statistical assessment of data	
S.5.5. Ensure the maintenance of radiation	K.5.6.	Modelling and simulation codes applied in	
protection instruments and materials		dosimetry	
S.5.6. Optimise radiation protection	K.5.7.	ALARA principles	
methods and techniques for	K.5.8.	Nuclid vectors identification	
decommissioning	K.5.9.	Stochastic approach in radiation impact	
S.5.7. Provide information about	K.5.10.	Biological impacts of radiation doses	
radiological situation			
S.5.8. Analyse historical radiologic data of			
the dismantling installation			
S.5.9. Analyse and upgrade decommissioning plans			
S.5.10. Comply with legal requirements of			
radiation protection and dosimetry in			
national regulations and rules			
S.5.11. Recommend personal and collective			
protective equipment			
Assessment criteria:			
Ability to manage operational dosimetry	Ability to	o identify, quantify and select optimal	
data (cartography, computer modelling).	radiation	protection action with respect to ALARA	
Ability to determine supervised and	procedure		
controlled areas.			
Pertinence of identification, quantification,			

Recommended assessment methods:

term in decommissioned installation.

and assessment of ionising radiations source

Interview

Situational judgement tests

Case studies

Task solving

Written exam

#### Unit of learning outcomes No.6: Management of health, radiological and environmental risks BU (3.9.1; 2.3.1)

#### Autonomy/Responsibility

Perform and manage complex tasks to ensure compliance with national and international regulations and standards concerning management of health, radiological and environmental risks. Take responsibility for actions related to health in relation with medical service, radiological and environmental risks.

	Skills		Knowledge
S.6.1.	Evaluate health and radiological risks	K.6.1.	Risks assessment and management
S.6.2.	Evaluate environmental risks	K.6.2.	Health and environmental standards, codes
S.6.3.	Apply risks assessment methods in		and guidelines
	decommissioning	K.6.3.	Biological acceptance of irradiation
S.6.4.	Provide internal information about risks	K.6.4.	Health protection
	assessment	K.6.5.	Environmental protection
S.6.5.	Undertake corrective measures	K.6.6.	Radiation protection measures and technics
S.6.6.	Harmonise health and regulatory	K.6.7.	Human behaviour related to health,
	requirements		radiological, and environmental risks
S.6.7.	Propose and implement corrective and	K.6.8.	Individual and collective protective
	and/or conventional risks	K 6 9	Management of health radiological and
568	Inform and/or train work teams to global	10151	environmental data
5.0.0.	approach "Health Safety Environment"	K.6.10.	Train the trainers methodology
S.6.9.	Participate in workplace studies with related		
	health, safety and medical department		
S.6.10.	Create and use of health, radiological, and		
	environmental databases		

# Assessment criteria:

Ability to identify, quantify, assess and implement Pertinence of individual and collective protective actions for safety hazards and risks measures

Effective reporting to the company management Pertinence of data management related to health, radiological and environmental risks

Efficiency of training

Abilily to lead measures and procedures on health effects and risk assessment and management methods for nuclear installation in decommissioning.

#### **Recommended assessment methods:**

Interview

Situational judgement tests

Case studies

Task solving

Written exam



# **2.2.5.** MANAGEMENT OF MAINTENANCE IN DECOMMISSIONING (3.8.1.)

# Unit of learning outcomes No. 1: MANAGEMENT OF DECOMMISSIONING PROJECTS/ TU (3.1.1; 3.3.1; 3.8.1)

#### Autonomy/Responsibility

Manage complex decommissioning activities, taking responsibility for decision-making in unpredictable work contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

Skills		Knowled	ge
S.1.1.	Coordinate planning, scheduling, implementing and monitoring activities and projects	K.1.1.	Decommissioning methodology, techniques and strategies
S.1.2. S.1.3.	Manage resources involved in the project Monitor implementation of plans and procedures to ensure compliance with project schedules, safety procedures and legislation	K.1.2. K.1.3. K.1.4. K.1.5.	Environmental impact of nuclear power; Remediation methods; Risk estimation and management Management and workflow of the project
S.1.4.	Perform risk estimation and management and cost control.	K.1.6. K.1.7.	Information technology Nuclear decommission practices: clean up
S.1.5. S.1.6.	Select contractors and establish contracts Develop decommissioning project specifications, scopes-of-work, and prepare	K.1.8.	of radioactivity (remediation) and plant demolition Radioactivity and nuclear science and
S.1.7.	tender procedures Intervene, analyse, manage and resolve business and technical conflicts between the company and the contractors	K.1.9. K.1.10.	engineering Management of civil engineering operations Decommissioning regulation and licensing: site characterization, dismantlement
S.1.8.	Develop procedures and obtain permits (licensing for decommissioning)	V 1 11	activities, plans for site remediation, detailed plans for final radiation surveys for release of the site, environmental change.
		K.I.II.	mechanism
Assessme	ent criteria:		
Coordination of all planning, implementing and monitoring activities and projects; Monitoring on plans and procedures implementation to ensure compliance with project schedules, safety procedures and legislation Identify types and sources of radioactive waste; Associate hazards and environmental impacts and safety considerations with the Nuclear Fuel Cycle; Manage the risks		Develop strategy(s	licensing procedures and decommissioning s) (immediate/deferred dismantling)

#### **Recommended assessment methods:**

Practical test, Development of project, Situational judgment test, face to face examination, practical exercise, grid test with multiple choice.



### Unit of learning outcomes No.2: SAFETY AND SECURITY / TU (3.1.1; 3.3.1; 3.8.1)

#### Autonomy/Responsibility

Manage complex activities of applying safety principles and requirement and safety and security management, taking responsibility for decision-making in unpredictable work contexts. Take responsibility for managing professional development of individuals and groups under their responsibility.

Skills		Knowledge	3
K.2.1.	Provide training and information about the special procedures as emergency, potential risks on workers' health, nuclear safety and	K.2.1. K.2.2. K.2.3.	National licensing requirements International regulations and standards Radiation protection (ALARA concept, dose
K.2.2.	Analyze and interpret the licensing	K 7 4	radiation protection methods and tools)
K.2.3.	Identification of safety requirements	K.2.5.	Safety culture
K.2.4.	Apply regulations issued by different	К.2.6. к 2 7	Waste and transport safety
K.2.5.	Review processes, systems and activities in the facilities	K.2.8. K.2.9.	Clearance of material and site release Nuclear security, safeguard and non-
K.2.6.	Perform appropriate hazard and accident	И Э 10	proliferation Padiological bazard analysis
K.2.7.	Develop and document the safety function, functional performance requirements and performance criteria	K.2.11. K.2.12.	Risk assessment Environmental site remediation
K.2.8.	Prepare safety basis documents: Conceptual Safety Design Reports, Preliminary Safety Design Reports, Preliminary Documented Safety Analyses, Documented Safety Analyses and Technical Safety Requirements		
K.2.9.	Monitor and control security, safeguard and non-proliferation requirements		
Assessm	ent criteria:		
Preparation of information about the special procedures as emergency, potential risks on workers' health, nuclear safety and security Apply the regulations issued by different authorities taking into account interdependencies and interfaces Show compliance of licencing documents with the regulations Perform hazard and accident analysis Prepare safety-related documentation, technical reports			
Recommo Practical 1 judgment	ended assessment methods: test, practical exercise, case study, situational test.		

### **Unit of learning outcomes No.3: FACILITY MAINTENANCE/** SU (3.8.1)

#### Autonomy/Responsibility

Manage complex activities and projects, related to maintenance of specific nuclear facilities during decommissioning phase, taking responsibility for decision-making in unpredictable work or study contexts. Take responsibility for managing professional development of individuals and groups depending on their duties.

e maintenance strategy(s)	14.0.4	
a maintonanco tochniquo(c)	K.3.1.	Plant systems including machines,
ne maintenance program		buildings and structures
or new equipment and technology	K.3.2.	Mechanical and electrical maintenance
ng regular site visits to ensure	K.3.3.	Radioactive materials and waste
naintenance performance		fundamentals – characterization, processing, disposal transportation
ince of structures, systems and nts	K.3.4.	Maintenance strategies: i.e.: reactive (RM), preventive (PM), predictive (PdM), proactive
nazardous chemical and radioactive		centered maintenance (PCM)
	К.3.5.	Maintenance techniques: i.e.: condition monitoring (CM), reliability centered maintenance (RCM), Failure Modes & Effects Analysis (FMEA), Failure Modes, Effects, and Criticality Analyses (FMECA), Root Cause Failure Analysis (RCFA),Computerized Maintenance Management System (CMMS),
	e maintenance technique(s) e maintenance program or new equipment and technology ng regular site visits to ensure naintenance performance the installation, repair and nce of structures, systems and nts nazardous chemical and radioactive	a maintenance technique(s) be maintenance program or new equipment and technology ng regular site visits to ensure haintenance performance the installation, repair and nce of structures, systems and nts hazardous chemical and radioactiveK.3.2. K.3.3.K.3.4.K.3.4.

# Assessment criteria:

Design of maintenance strategies Apply maintenance techniques Supervision of maintenance work Understanding of specific maintenance approaches, methods and techniques.

# **Recommended assessment methods:**

Grid test with multiple choices, in-video quizzes, practical exercise, peer review.

# 2.2.6. MANAGEMENT OF RADIOACTIVE WASTE & RP (2.3.1)

# Unit of learning outcomes No.1: RADIATION PROTECTION/ TU (3.9.1;2.3.1; 3.7.1)

## Autonomy/Responsibility

Manage complex activities, related to radioactive waste management and radiation protection aspects. Take responsibility for decision-making in routine and/or unpredictable work in relation with radiation protection expert. Take responsibility for managing professional development of individuals in radioactive waste management and radiation protection areas.

Skills			Knowledge	
S.1.1.	Develop specific provisions and procedures	K.1.1.	The main types of ionizing radiation and their effects	
	radioctive waste management	K.1.2.	Relevant national and international	
S.1.2.	Implement ALARA principle to define optimised radiation protection actions	K.1.3.	legislation and guidelines Dose definition, dose types, dose measures,	
S.1.3.	Confirm work permits		dose constraints and reference levels	
S.1.4.	Optimize the occupational radiation	K.1.4.	Radiation monitoring, workplace monitoring	
S.1.5.	Define and/or apply principle strategies of a radiation protection programme during	K.1.5. K.1.6.	Radiation protection programs ALARA principle and procedures	
	(design, operation or dismantling).	K.1.7. K.1.8.	Realth surveillance Radiological impacts on the environment	
S.1.6.	Develop radiation protection procedures	K.1.9.	Contamination control, decontamination and reduction of sources of radiation	
	cases	K.1.10.	Classification of working areas and access	
S.1.7.	Use radiation control and measurement	К 1 11	control Use of protective equipment such as	
S.1.8.	Develop technical specifications and		shielding and protective clothing	
S.1.9.	procedures Monitor and maintain a safe working	K.1.12.	Storage arrangements for radioactive/contaminated items	
0.1.9.	environment	K.1.13.	Emergency planning and emergency	
S.1.10.	Apply appropriate radiation measurements for preliminary sample sorting		preparedness	
S.1.11.	Identify appropriate shielding for radiation			
S.1.12.	Sources Characterise radiation sources and identify			
_	appropriate protection strategies			
Assessment criteria: Ability in developing procedures and specifications Capabilities in application of the ALARA implementation strategy Successful management of emergency situations Effectiveness of implementation of radiation protection programme		Sustaina Complia Realism	ability of safety culture principles application nce with legislation in radiation protection area of corrective measures evaluation	
Recommended assessment methods:		Interviev	W	
Situationa	l judgement tests	Written test		
Case stud	ies	Task sol	ving	

# Unit of learning outcomes No.2: ACCIDENTS AND EMERGENCY ISSUES /

TU (3.9.1;2.3.1; 3.7.1)

# Autonomy/Responsibility

Assume position and responsibility in emergency situations. Manage tasks prompt and reactive on changing situation in emergency case, distinguish and select the adequate data, stress control in emergency situation. Proper and prompt communication and reporting.

	Skills		Knowledge
S.2.1.	Ensure execution of emergency plans	K.2.1. K.2.2.	Emergency preparedness Emergency planning
S.2.2.	Identify and detect emergency or hazards	K.2.3. K.2.4.	Several accident management Nuclear safety approaches, principles and
S.2.3.	Monitor radiation situation in emergency case	K.2.5.	requirements Relevant national and international legislation
S.2.4. S.2.5.	Preparing emergency plans Prepare emergency exercises	K.2.6.	and guidelines Health protection
S.2.6.	Mitigate the consequences of accidental situation	K.2.7. K.2.8.	Environmental protection Nuclear safety culture and human factor
S.2.7.	Protect personnel in restricted areas as well as on site	K.2.9. K.2.10.	Nuclear facility components and systems Radiation ecology
S.2.8.	Provide correct and prompt information to organisations and public	K.2.11. K.2.12. K.2.13.	Contamination and decontamination Protective clothing and protective equipment Classification of area and access control
S.2.9.	Evaluate radiation situation in emergency case	K.2.14. K.2.15.	International Nuclear Event Scale (INES) Safety assessment requirements
S.2.10.	Predict next development of emergency case		
S.2.11. S 2 12	Rate abnormal situation		
C 2 1 2 Da	incidental and accidental conditions		
S.2.13. Fe S.2.14. Id S.2.15. Cl S.2.16. In	entify root causes assify events (INES) pplement corrective measures		
Assessme	ent criteria:		
Ability for of emerge	emergency planning and realisation ncy plans	Appropri	ateness of corrective actions
Ability to r situations	make decision in emergency	Behaviou	ir in stress situations
Adequacy radiation of	of dose measures and use of control equipment	Prompt r	reporting
Ability to e	evaluate the abnormal situation		
Recommo	ended assessment methods:		
Interview			
Situationa	l judgement tests		
Case studies			
Task solving			
Written ex	am		

### Unit of learning outcomes No.3: TEAM AND PROJECT MANAGEMENT/ TU (3.9.1;2.3.1; 3.7.1)

## Autonomy/Responsibility

Taking responsibility for decision-making in daily operations and emergency situations in order to respect time schedule and costs for decommissioning installation. Take responsibility for managing professional development of individuals and groups under their responsibility. Take responsibility in strategic resourse and workforce planning of the department. Manage and lead the team of professionals in radiation protection and waste management area in decommissioning phase.

	Skills		Knowledge
S.3.1.	Participate in recruitment process	K.3.1.	Organisation of human resources
S.3.2.	Plan initial and continuing specialised	K.3.2.	Social regulation
	training for employees	K.3.3.	Workforce planning and recruitment
S.3.3.	Allocate tasks and assign personnel		process
S.3.4.	Prioritise objectives	K.3.4.	Individual and team performance
S.3.5.	Develop teamwork	K.3.5.	Managerial communication
S.3.6.	Anticipate and manage conflicts	K.3.6.	Team coordination and motivation
S.3.7.	Evaluate individual and team performance	K.3.7.	Resolution of conflict
S.3.8.	Perform managerial communication	K.3.8.	Work planning
S.3.9.	Propose activities for building successful	K.3.9.	Training solutions
	teams	K.3.10.	Change management
S.3.10.	Promote individuals	K.3.11.	Quality Management
S.3.11.	Respect and apply national and	K.3.12.	Integrated Management System
	international legislation		(conformity with ISO)
S.3.12.	Promote safety culture, questioning	K.3.13.	General principles of knowledge
	attitude and rigorous and prudent		management
	approach	K.3.14.	General principles of configuration
S.3.13.	Manage project		management
		K.3.15.	Project management
		K.3.16.	Budget, time and cost management
		K.3.17.	Organizational changes from operation to
			decommissioning

#### Assessment criteria:

Ability to plan, schedule and control daily work activities

Pertinence of workforce planning and adequacy of recruitment activities

Ability to manage financial resources

Proper application of integrated management system

Accurate solutions for solving complex problems in unpredictable and emergency situations

Ability to apply national and international standards

#### **Recommended assessment methods:**

Interview

Situational judgement tests

Case studies

Task solving

Written exam

Ability to plan radioactive waste activities in decommissioning project according to strategic priorities Pertinence of corrective actions to anticipate and reduce stress, and increase individual / team efficiency.

Appropriateness of managerial communication

#### Unit of learning outcomes No.4: Interaction with other nuclear actors/departments TU (3.9.1;2.3.1; 3.7.1)

### Autonomy/Responsibility

Interact with actors/departments involved in radioactive waste management, decomissioning phase of the NPP project. Taking responsibility for establishing and maintaining relationships with other departments, for participating decision-making in daily operations and emergency situations, for communicating the General Management decisions to the radioactive waste management team.

Skills		Knowledge	
S.4.1.	Integrate radwaste management strategy into the decommissioning plan	K.4.1.	General plant description and basic technical characteristics of nuclear
5.4.2.	Integrate radwaste management strategy into the overall management strategy of	K.4.2.	facilities Nuclear fuel cycle Safety systems operation
S.4.3.	Lead performance of complex analyses involving different facility's systems,	K.4.4.	Radioactive waste treatment systems operation
S.4.4.	structures, components and processes Perform proper communication in different	K.4.5.	Applicable codes, regulations and standards for decommissioning phase
S.4.5.	areas of waste management Report activities and disseminate information	к.4.6. к 4 7	Knowledge of plant (site, units') operational history Safety Analysis Report (SAR)
S.4.6.	Coordinate actors in waste management	K.4.8. K.4.9	Dismantling methods and techniques
S.4.7.	Share knowledge, information and experiences		surveillance and inspection. Facility modifications
S.4.8.	Analyse and upgrade decommissioning plans	K.4.10. K.4.11.	Radiological characterization of the facility Decontamination techniques for
		K.4.12.	equipment and SSCs Waste categorisation
		К.4.13.	Knowledge management
Assessme	ent criteria:		
Ability to and exper	organise and share knowledge, information increased and share knowledge, information	Pertinence	of plant key performance indicators
Taking ir	account professional environment and		
constraint processes	s of design, technological systems and	Pertinence	of decommissionning plans analyse and
Complianc company	e with safety standards, legislation and policy	upgrading	
Recomme	ended assessment methods:		
Interview			
Situationa	l judgement tests		
Case studi	es		
Task solvi	ng		
Written ex	am		

# Unit of learning outcomes No.5: EVALUATION AND OPTIMISATION OF INDIVIDUAL AND **COLLECTIVE DOSES/** BU (3.9.1 ; 2.3.1)

#### Autonomy/Responsibility

Manage complex activities concerning evaluation of individual and collective exposures (internal and external). Take responsibility for radiation protection actions implemented with respect to ALARA principle, regulation and rules. Advice other teams on radiation protection issues concerning decommissioning project.

Skills		Knowledge
S.5.1. Monitor decommissioned areas	K.5.1.	Measurement of radioactive
S.5.2. Evaluate dose rates and radioactive		characteristics
contamination	K.5.2.	Detectors for radiation monitoring
S.5.3. Evaluate the radiation situation	K.5.3.	Dosimetry (limits and norms)
S.5.4. Evaluate problems regarding radiation	K.5.4.	Radiation protection measures and
protection and dosimetry		technics
S.5.5. Ensure the maintenance of radiation	K.5.5.	Statistical assessment of data
protection instruments and materials	K.5.6.	Modelling and simulation codes applied
S.5.6. Optimise radiation protection methods and		in dosimetry
techniques for decommissioning	K.5.7.	ALARA principles
S.5.7. Provide information about radiological	K.5.8.	Nuclid vectors identification
situation	K.5.9.	Stochastic approach in radiation impact
S.5.8. Analyse and upgrade decommissioning plans	K.5.10.	Biological impacts of radiation doses
S.5.9. Comply with legal requirements of radiation		
protection and dosimetry in national regulations		
and rules		
S.5.10. Recommend personal and collective		
protective equipment		
A and a subtraction		

# Assessment criteria:

Ability to manage operational dosimetry data Ability to identify, quantify and select optimal (cartography, computer modelling...).

Ability to determine supervised and controlled areas.

Pertinence of identification, quantification, and assessment of ionising radiations source term in decommissioned installation.

#### **Recommended assessment methods:**

Interview

Situational judgement tests

Case studies

Task solving

Written exam

radiation protection action with respect to ALARA procedure



# **Unit of learning outcomes No.6:** Management of health, radiological and environmental risks BU (3.9.1; 2.3.1)

## Autonomy/Responsibility

Perform and manage complex tasks to ensure compliance with national and international regulations and standards concerning management of health, radiological and environmental risks. Take responsibility for actions related to health in relation with medical service, radiological and environmental risks

Skills		Knowledge	
S.6.1.	Evaluate health and radiological risks	K.6.1.	Risks assessment and management
5.6.2. 5.6.3.	Apply risks assessment methods in	K.0.2.	codes and guidelines
0.0.01	decommissioning	K.6.3.	Biological acceptance of irradiation
S.6.4.	Provide internal information about risks	K.6.4.	Health protection
565	assessment Undertake corrective measures	K.6.5.	Environmental protection Radiation protection measures and
S.6.6.	Harmonise health and regulatory	10.0.0	technics
	requirements	K.6.7.	Human behaviour related to health,
S.6.7.	Propose and implement corrective and	VCO	radiological, and environmental risks
	and/or conventional risks	K.0.0.	equipment
S.6.8.	Inform and/or train work teams to global	K.6.9.	Management of health, radiological, and
<b>C C O</b>	approach "Health Safety Environment"	K C 10	environmental data
5.6.9.	related health, safety and medical	K.6.10.	I rain the trainers methodology
	department		
S.6.10.	Create and use of health, radiological,		
Assessm	ent criteria:		
Ability to actions for	identify, quantify, assess and implement r safety hazards and risks	Abilily to lead measures and procedures on health effects and risk assessment and management methods for nuclear installation in decommissioning	
Effective	reporting to the company management	methods	for nuclear installation in decommissioning.
related to risks	b health, radiological and environmental	Pertinenco measures	e of individual and collective protective
		Pertinence	e of data management
		Efficiency	of training
Recomm	ended assessment methods:		
Interview			
Situational judgement tests			
Case studies			
Task solving			
Written e>	am		



# Unit of learning outcomes No.7: RADIOACTIVE WASTE MANAGEMENT/ BU (2.3.1; 3.7.1)

# Autonomy/Responsibility

Manage complex activities related to radioactive waste management including handling, treatment and storage. Take responsibility for decisions related to technologies, processes, nuclear and industrial safety as well as impact to environment.

Skills	Knowledge
S.7.1. Evaluate and control the level of contamination and induced activities of radioactive waste	K.7.1. Waste characterisation and categorisation K.7.2. Dosimetry
S.7.2. Select optimal solution and manage	K.7.3. Nuclear safety and radiation protection
S.7.3. Manage radioactive waste handling and transport	K.7.4. Relevant national and international legislation and guidelines K.7.5. Health protection
S.7.4. Apply proper techniques for optimal storage of waste	<ul><li>K.7.6. Environmental protection</li><li>K.7.7. Nuclear safety culture and human factor</li></ul>
S.7.5. Apply proper criteria for treated waste classification and handling	K.7.8. Protective clothing and protective equipment
S.7.6. Evaluate and manage collected data about waste characteristics	K.7.9. Transport, handling and storage of radioactive waste
S.7.7. Ensure radiation protection support for waste manipulation and storage	K.7.10. Treatment and long term storage K.7.11 National policy and program in
S.7.8. Evaluate radiation situation in decontamination, handling, transport and storage process	decommissionning K.7.12. Waste conditioning including packaging
S.7.9. Comply activities with national program in decommissioning	
S.7.10. Developing waste management program, specifications and procedures S.7.11 Apply appropriate solutions in packaging	
Assessment criteria:	
Accurate characterisation of radioactive waste	Ability to approve radiation protection measures
Respect rules of radioactive waste handling and transport	Compliance with international and national legislation
Proper use of radiation control equipment	
Pertinence of specifications and procedures proposals	
Recommended assessment methods:	
Written test	
Interview	
Situational judgement tests	
Case studies	
Task solving	



# Methodology for designing a training program based on exit outcomes

The concept of training programme (TP) based on exit-outcomes includes six elements illustrated in Figure 1:

- learner: who is enrolled in the TP with the view of acquiring necessary competences (or learning outcomes/LO) for getting a qualification required by the labour market;
- exit outcomes: of the training program as a whole describes, in terms of qualifications or jobs, the labour market needs; also the TP-exit outcomes is the main motivation for learners to take a given training program/TP;
- content: is what the learners/students learn to reach the TP-exit outcomes;
- assessment: represent the examinations designed to assess the extent to which the learners had learned the content; assessment includes also content assessment based on the feedback from learners;
- support: represent learners-teachers interactions (courses, workshops, laboratories, etc) and support materials on paper/CD offered to learners in order to pass through the training programme and to reach the TP-exit outcomes;
- learning approach: defines how learners study the prescribed content (how to learn) and through this achieve the training program-exit outcomes.



Because the exit outcomes of a TP define, in terms of occupations or qualifications, the labour market needs, a TP based on exit outcomes is called also TP-market oriented.

Consideration of the training programme-exit outcomes should be the basis for training programme development and evaluation.

The exit outcomes of a training program determine the aims and objectives of the different training program phases.

The TP-Exit Outcome is a statement that has two main components:

- first component identifies the core skils required for a specific job
- second component additional skills.



A design sequence of a TP based on exit outcome would be adopted, as is shown in the Figure 2:

- the exit outcomes are first specified/defined;
- than the learning modules linked to each ULOs from a qualification are derived from these TP-exit outcomes and the process is repeated for each ULOs. Learning modules are developed by picking up skills and knowledge associated with a given ULOs in order to make pedagogical and coherent set.





# Description of training programs based on exit outcomes

# RADIOACTIVE WASTE MANAGEMENT (3.7.1)

Unit of learning outcomes No.1: RADIATION PROTECTION/ TU(3.9.1;2.3.1; 3.7.1)				
M1.1: Radiation sources and tools for	Remarks/limits/advices			
S.1.1. Develop specific provisions and procedures based on regulatory requirements on radioactive waste management S.1.6. Develop radiation protection procedures and framework in normal and emergency cases S.1.12. Characterise radiation sources and identify appropriate protection strategies	K.1.1. The main types of ionizing radiation and their effects K.1.2. Relevant national and international legislation and guidelines K.1.3. Dose definition, dose types, dose measures, dose constraints and reference levels K.1.10 Classification of working areas and access control	Basic experience in nuclear installation is recommended.		
M1.2: Control and measurement in ra	idiation protection - TM	Remarks/limits/advices		
S.1.7. Use radiation control and measurement equipment S.1.8. Develop technical specifications and procedures S.1.9. Monitor and maintain a safe working environment S.1.10. Apply appropriate radiation measurements for preliminary sample sorting	K.1.4. Radiation monitoring, workplace monitoring and individual monitoring K.1.9. Contamination control, decontamination and reduction of sources of radiation	Prerequisite: M1.1		
M1.3: Radiation protection implemen	tation - TM	Remarks/limits/advices		
S.1.2. Implement ALARA principle to define optimised radiation protection actions S.1.3. Confirm work permits S.1.4. Optimize the occupational radiation protection programme S.1.5. Define and/or apply principle strategies of a radiation protection programme during various phases of a nuclear installation S.1.11. Identify appropriate shielding for radiation sources	K.1.5. Radiation protection programsK.1.6. ALARA principle andproceduresK.1.7. Health surveillanceK.1.8. Radiological impacts on theenvironmentK.1.11 Use of protective equipmentsuch as shielding and protectiveclothingK.1.12 Storage arrangements forradioactive/contaminated itemsK.1.13 Emergency planning andemergency preparedness	Prerequisite: M1.2 Experience from radiation protection is expected.		
Unit of learning outcomes No.2: A M2.1: Nuclear safety fundamentals a	/ TU(3.9.1;2.3.1; 3.7.1) Remarks/limits/advices			
S.2.6. Mitigate the consequences of accidental situation S.2.12. Implement protective actions for incidental and accidental conditions S.2.13. Participate in accident event analysis S.2.14. Identify root causes S.2.15. Classify events (INES) S.2.16. Implement corrective measures	<ul> <li>K.2.3. Severe accident management</li> <li>K.2.4. Nuclear safety approaches, principles and requirements</li> <li>K.2.5. Relevant national and international legislation and guidelines</li> <li>K.2.8. Nuclear safety culture and human factor</li> <li>K.2.9. Nuclear facility components and systems</li> <li>K.2.14. International Nuclear Event Scale (INES)</li> </ul>	Basic skills and knowledge. Defense in depth is embedded in K.2.4 Determistic and probabilistic safety analysis is embedded in K.2.15		



	K.2.15. Safety assessment requirements			
M2.2: Emergency measures -	тм	Remarks/limits/advices		
S.2.1. Ensure execution of emergency plans S.2.2. Identify and detect emergency or hazards S.2.3. Monitor radiation situation in emergency case S.2.4. Preparing emergency plans S.2.5. Prepare emergency exercises S.2.7. Protect personnel in restricted areas as well as on site S.2.8. Provide correct and prompt information to organisations and public S.2.9. Evaluate radiation situation in emergency case S.2.10. Predict next development of emergency case S.2.11. Rate abnormal situation	<ul> <li>K.2.1. Emergency preparedness</li> <li>K.2.2. Emergency planning</li> <li>K.2.6. Health protection</li> <li>K.2.7. Environmental protection</li> <li>K.2.10. Radiation ecology</li> <li>K.2.11. Contamination and decontamination</li> <li>K.2.12. Protective clothing and protective equipment</li> <li>K.2.13. Classification of area and access control</li> </ul>	Prerequisite: M2.1		
Unit of learning outcomes No.3: TEAM AND PROJECT MANAGEMENT/ TU(3.9.1:2.3.1: 3.7.1)				

J		
M3.1: Recruitment and work	organisation - TM	Remarks/limits/advices
S.3.1. Participate in recruitment process S.3.3. Allocate tasks and assign personnel S.3.4. Prioritise objectives S.3.10. Perform managerial communication	<ul> <li>K.3.1. Organisation of human resources</li> <li>K.3.2. Social regulation</li> <li>K.3.3. Recruitment process</li> <li>K.3.6. Managerial communication</li> <li>K.3.9. Work planning</li> <li>K.3.14. Organizational changes from operation to decommissioning</li> <li>K.3.16. Policies and key issues of facilities' maintenance, surveillance and inspection.</li> <li>Facility modifications; basics of configuration management</li> </ul>	
M3.2 :Team coaching - TM		Remarks/limits/advices
S.3.5. Develop teamwork S.3.6. Propose activities for building successful teams S.3.2. Plan training S.3.7. Anticipate and manage conflicts S.3.11. Promote safety culture and learning attitude towards safety S.3.8. Evaluate individual and team performance S.3.9. Promote individuals	K.3.4. Individual and team performance K.3.7. Team coordination and motivation K.3.8. Resolution of conflict K.3.10. Training solutions K.3.5. Change management K.3.12 Quality Management K.3.13 Knowledge Management	
M3.3 : Project management	- TM	Remarks/limits/advices
S.3.12. Monitor project	K.3.5. Project management K.3.14 Budget, time and cost management	
	No. 4. INTEDACTION WITH OTHED NUCLEAD A	CTODE / DEDADTMENTS

Unit of learning outcomes No.4: INTERACTION WITH OTHER NUCLEAR ACTORS/DEPARTMENTS



TU(3.9.1;2.3.1; 3.7.1)				
M4.1: IN	FERACTION WITH OTHE	R NUCLEAR	ACTORS/DEPARTMENTS	Remarks/limits/advices
S.4.9.	Integrate radwaste management strategy into the	K.4.14.	General plant description and basic technical characteristics of nuclear facilities	
	decommissioning plan	K.4.15.	Nuclear fuel cycle	
S.4.10.	Integrate radwaste	K.4.16.	Safety systems operation	
	management strategy into the overall	K.4.17.	Radioactive waste treatment systems operation	
	management strategy	K.4.18.	Applicable codes, regulations	
	of the plant		and standards for	
S.4.11.	Lead performance of		decommissioning phase	
	complex analyses	K.4.19.	Knowledge of plant (site, units)	
	involving different	K 4 20	operational history	
	facility's systems,	K.4.20.	Safety Analysis Report (SAR)	
	and processos	K.4.21.		
5412	Perform proper	K 4 77	Key issues of facilities'	
5.4.12.	communication in	N.4.22.	maintenance surveillance and	
	different areas of waste		inspection : facility	
	management		modifications	
S.4.13.	Report activities and	K.4.23.	Radiological characterization of	
	disseminate		the facility	
	information	K.4.24.	Decontamination techniques	
S.4.14.	Coordinate actors in		for equipment and SSCs	
	waste management	K.4.25.	Waste categorisation	
	activities	K / 13	Knowledge management	
S.4.15.	Share knowledge,	K.4.13.	Knowledge management	
	information and			
	experiences			
S.4.16.	Analyse and upgrade			
	decommissioning plans			

# Unit of learning outcomes No.5: DECOMMISSIONING MANAGEMENT/ SU (3.7.1.)

M5.1: Decommissioning manage	Remarks/limits/advices	
S.5.1. Participate and/or organize	K.5.1. Waste origin and handlings	This module will be merge
decommissioning activities	K.5.2. Contamination, decontamination	with "decommissioning of
S.5.2. Organise decommissioning	K.5.3. Decontamination technologies and	nuclear installations"
work	tools	related to Unit "
S.5.3. Prioritise objectives	K.5.4. Radioecology and environmental	Management of
S.5.4. Use the optimal tools and	remediation	decommissioning projects
technology in decommissioning	K.5.5. Partitioning and compacting	-TU"
S.5.5. Evaluate efficiency of	K.5.6. Decommissioning procedures	
decontamination	K.5.7. Limits for free release	
S.5.6. Monitor waste accumulation	K.5.8. Prediction and simulating of	
and transport	activation	

Unit of learning outcomes No.6: RADIOACTIVE WASTE MANAGEMENT/ BU(3.7.1 ; 2.3.1)				
M6.1: Handling and transport radio	Remarks/limits/advices			
S.6.1. Evaluate and control the level	K.6.1. Waste characterisation and			
of contamination and induced	categorisation			
activities of radioactive waste	K.6.2. Dosimetry			
S.6.2. Select optimal solution and	K.6.3. Nuclear safety and radiation			
manage radioactive waste	protection			
categorisation	K.6.5. Health protection			
S.6.3. Manage radioactive waste	K.6.6. Environmental protection			
handling and transport	K.6.7. Nuclear safety culture and human			
S.6.5 Apply proper criteria for	factor			
treated waste classification and	K.6.8. Protective clothing and protective			



handling S.6.6. Evaluate and manage collected data about waste characteristics S.6.9. Comply activities with national program in decommissioning S.6.10. Developing waste management program, specifications and procedures S.6.11. Apply appropriate solutions	equipment K.6.9. Transport, handling and storage of radioactive waste K.6.12. Waste conditioning including packaging	
M6.2: Storage radioactive waste		
S.6.4. Apply proper techniques for optimal storage of waste S.6.7. Ensure radiation protection support for waste manipulation and storage S.6.8. Evaluate radiation situation in decontamination, handling, transport and storage process	K.6.4. Relevant national and international legislation and guidelines K.6.10. Treatment and long term storage K.6.11. National policy and program in decommissioning	M7.1 is recommended as a prerequisite



# **PREPARATORY WORK MANAGEMENT (3.3.1)**

	<b>Unit 1: MANA</b> TU (3.1.	<b>GEMENT OF DECO</b> .1; 3.3.1; 3.8.1)	MMISSIONI	NG PROJECTS/
M1.1	Project Management			
	S.1.1. Coordinate plann implementing and monitor projects S.1.2. Manage resources project S.1.4. Perform risk management and cost contr S.1.5. Select contractors contracts S.1.7. Intervene, analyse resolve business and to	ing, scheduling, ing activities and involved in the estimation and ol. s and establish e, manage and echnical conflicts		estimation and management gement and workflow of the nation technology ecommissioning funds and chanism
M1 2	between the company and t	ne contractors		
<u>M1.2</u>	S.1.3. Monitor implementar procedures to ensure comp procedures and legislation S.1.6. Develop decomm specifications, scopes-of-we tender procedures S.2.8. Develop procedures a (licensing for decommissioni	instalations tion of plans and liance with safety issioning project ork, and prepare and obtain permits ing)	K.1.1. Dec techniques a K.1.2. Envir power; K.1.3. Reme K.1.7. Nucle clean up of and plant de K.1.8. Radic and enginee K.1.9. Mana operations K.1.10. Dec licensing: dismantleme remediation, radiation sur environment	ommissioning methodology, and strategies conmental impact of nuclear diation methods; ear decommission practices: f radioactivity (remediation) molition pactivity and nuclear science ring agemente of civil engineering ommissioning regulation and site characterization, ent activities, plans for site detailed plans for final rveys for release of the site, cal change.
			<b>V</b> / TII (2 1 1	
M2 1	Safety and rick analysis	TT AND SECURIT	<b>I</b> / IU (3.1.1	, 5.5.1, 5.6.1) Bomarks (limits (advices
112.1	S.2.4. Apply regulations issued by different authorities S.2.7. Perform appropriate hazard and accident analysis	K.2.1. National and international regulations and standards K.2.3. Industrial safety K.2.10. Risk assessment		Safety culture is about attitude that is why Safety culture should be emphasized in each unit of a qualification in the A/R box and not as a training module.
M2.2	Nuclear and radiological safe	ety		
	S.2.1. Provide training and information about the special procedures as emergency, potential risks on workers' health, nuclear safety and security S.2.2. Analyze and interpret the licensing requirements S.2.3. Identification of safety requirements	K.2.1. National requirements K.2.5. Waste an safety K.2.6. preparedness K.2.7. Clearance and site release K.2.11. Environr remediation K.2.2. Radiation (ALARA conce	licensing d transport Emergency of material mental site protection pt, dose	

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	the facilities S.5.8. p Develop and document k the safety function, a	protectio (.2.9. analysis	n methods and tools) Radiological hazard		
	functional performance				
	performance criteria				
	S.2.10. Prepare safety				
	Dasis documents: Conceptual Safety				
	Design Reports,				
	Preliminary Safety				
	Design Reports, Preliminary Documented				
	Safety Analyses,				
	Documented Safety				
	Analyses and Technical Safety Requirements				
M2.3	Security				
	S.2.11. Monitor and k	(.2.8.	Nuclear security,		
	and non-proliferation	proliferat	cion		
	requirements				
No 3	OPERATION MAINTANANCI				
M3.1	Operation				
	S.3.1. Plan,		K.3.1. Decommissioni	ng methodology	
	implement, co-		K.3.2. Electrical and mechanical installations		
	operation activities		K.3.4. Process System engineering and design		
	S.3.5. Provide technical		K.3.5. Electrical engineering and design		
	information for operation,		K.3.6. Mechanical engineering and design K.3.7. HVAC engineering and design		
	activities		K.3.8. Fire protection	engineering and design	
			K.3.10. Engineering	principles (i.e. mechanical,	
			electrical, instrumenta	tion and control)	
			(permit to work, s	tandard operating &	
			maintenance proc	edures and risk	
			assessment etc.)		
M3.2	Maintenance				
	S.3.2. Plan,		K.3.1. Decommission	ingmethodology	
	implement, co- ordinate and monitor		K.3.2. Electrical and m	nechanical installations	
	maintenance activities		K.3.4. Process System	n engineering and design	
	S.3.6. Provide technical inform	mation	K.3.5. Electrical engin	eering and design	
	for maintenance, activities		K.3.6. Mechanical eng	ineering and design	
			K.3.8. Fire protection	engineering and design	
			K.3.9. Techniques	and methodologies of	
			decontamination		
			K.3.10. Engineering	principles (i.e. mechanical,	
			electrical, instrumenta	ation and control)	
			K.3.11. Site specific	rules and procedures	
			maintenance proc	edures and risk	
			assessment etc.)		
			K.3.12. Equipment	and system operating and	
				115	



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1.1.2.2	Engineering support			
	S.3.3. Plan, implement, co-	K.3.1. [	Decommissioning methodology	
	ordinate and monitor engineering	K.3.2. E	lectrical and mechanical installations	
	support activities	K.3.3. R	adioactive waste treatment systems	
	S.3.6. Provide technical	K.3.4. P	rocess System engineering and design	
	information for engineering support	K.3.5. E	lectrical engineering and design	
	activities	K.3.6. M	lechanical engineering and design	
	S.3.7. Draft work instructions	K.3.7. H	VAC engineering and design	
	related to engineering support	K.3.8. F	ire protection engineering and design	
	S.3.7. Specify functional	K.3.10.	Engineering principles (i.e. mechanical,	
	requirements	electrica	, instrumentation and control)	
	S.3.8. Understanding of complex			
	S 2 0 Porform increation			
	S.S.9. Perform inspection,			
	S 3 11 Specify design requirements			
	S 3 12 Assess design options			
	S 3 13 Document design			
	modifications			
	S.3.15. Draft technical specification			
	and requirements			
	S.3.16. Use and interpret			
	engineering drawings and			
	documents			
	Remark: The knowledge listed for	operatio	n, maintenance and engineering support	
	should be adapted to the particularities of each activity.			
	No. 4: PREPARATORY	WORK A	ND SPENT FUEL/ SU 3.3.1	
M4.1	Spent fuel			
	S.4.1. Organize treatment of damaged	fuel	K.4.1. Nuclear physics fundamentals	
	elements		K.4.6. Nuclear standards	
	S.4.2. Defining engineering processes		K.4.10.Inspection of spent fuel	
	S.4.3. Draft technical specifications and	d	assemblies and special conditioning of	
	working documents related to		damaged elements	
	decommissioning activities and spent f	uel	K.4.11. Spent fuel management, including	
	management		democrated first store subs	
	C 4 4 Identify and analyze radialagian		damaged fuel elements	
	S.4.4. Identify and analyze radiologica	I	damaged fuel elements K.4.12. Spent fuel transport	
	S.4.4. Identify and analyze radiologica incidents	I	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,)	
	S.4.4. Identify and analyze radiologica incidents S.4.5. Report technical and regulatory data according to	I	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis)	
	S.4.4. Identify and analyze radiologica incidents S.4.5. Report technical and regulatory data according to standard operating procedures	Ι	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis)	
	S.4.4. Identify and analyze radiologica incidents S.4.5. Report technical and regulatory data according to standard operating procedures S.4.6. Organise and monitor	Ι	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis)	
	S.4.4. Identify and analyze radiologica incidents S.4.5. Report technical and regulatory data according to standard operating procedures S.4.6. Organise and monitor storage, handling, packaging and	I	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis)	
	S.4.4. Identify and analyze radiologica incidents S.4.5. Report technical and regulatory data according to standard operating procedures S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel	I	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis)	
M4.2	S.4.4. Identify and analyze radiologica incidents S.4.5. Report technical and regulatory data according to standard operating procedures S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel Prepatory work on the decommissioning	I ng site	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis)	
M4.2	S.4.4. Identify and analyze radiologica incidents S.4.5. Report technical and regulatory data according to standard operating procedures S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel Prepatory work on the decommissionin S.4.7. Planning, implementing, coordin	ng site nating	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis) K.4.2. Nuclear engineering	
M4.2	S.4.4. Identify and analyze radiologica incidents S.4.5. Report technical and regulatory data according to standard operating procedures S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel Prepatory work on the decommissionin S.4.7. Planning, implementing, coordin and monitoring engineering act	ng site nating tivities	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis) K.4.2. Nuclear engineering K.4.5. Radiation fundamentals	
M4.2	<ul> <li>S.4.4. Identify and analyze radiologica incidents</li> <li>S.4.5. Report technical and regulatory data according to standard operating procedures</li> <li>S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel</li> <li>Prepatory work on the decommissioning</li> <li>S.4.7. Planning, implementing, coordinand monitoring engineering act</li> <li>S.4.8. Plan decommissioning site prepator</li> </ul>	ng site nating tivities aration	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis) K.4.2. Nuclear engineering K.4.5. Radiation fundamentals K.4.3. Nuclear installation systems and	
M4.2	<ul> <li>S.4.4. Identify and analyze radiologica incidents</li> <li>S.4.5. Report technical and regulatory data according to standard operating procedures</li> <li>S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel</li> <li>Prepatory work on the decommissioning</li> <li>S.4.7. Planning, implementing, coordiant monitoring engineering act</li> <li>S.4.8. Plan decommissioning site prepators</li> <li>S.4.9. Prepare controlled work and</li> </ul>	I ng site nating tivities aration reas for	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis) K.4.2. Nuclear engineering K.4.5. Radiation fundamentals K.4.3. Nuclear installation systems and components	
M4.2	<ul> <li>S.4.4. Identify and analyze radiologica incidents</li> <li>S.4.5. Report technical and regulatory data according to standard operating procedures</li> <li>S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel</li> <li>Prepatory work on the decommissioning</li> <li>S.4.7. Planning, implementing, coordinand monitoring engineering action</li> <li>S.4.8. Plan decommissioning site prepares</li> <li>S.4.9. Prepare controlled work and decommissioning activities and</li> </ul>	I ng site nating tivities aration reas for Design	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis) K.4.2. Nuclear engineering K.4.5. Radiation fundamentals K.4.3. Nuclear installation systems and components K.4.7. Decommissioning techniques	
M4.2	<ul> <li>S.4.4. Identify and analyze radiologica incidents</li> <li>S.4.5. Report technical and regulatory data according to standard operating procedures</li> <li>S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel</li> <li>Prepatory work on the decommissioning</li> <li>S.4.7. Planning, implementing, coordiand and monitoring engineering act</li> <li>S.4.8. Plan decommissioning site prepares</li> <li>S.4.9. Prepare controlled work and decommissioning activities and Radiation protection barriers</li> </ul>	I nating tivities aration reas for Design	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis) K.4.2. Nuclear engineering K.4.5. Radiation fundamentals K.4.3. Nuclear installation systems and components K.4.7. Decommissioning techniques K.4.8. Chemical Engineering and Waste	
M4.2	<ul> <li>S.4.4. Identify and analyze radiologica incidents</li> <li>S.4.5. Report technical and regulatory data according to standard operating procedures</li> <li>S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel</li> <li>Prepatory work on the decommissioning</li> <li>S.4.7. Planning, implementing, coordia and monitoring engineering act</li> <li>S.4.8. Plan decommissioning site prepations</li> <li>S.4.9. Prepare controlled work and decommissioning activities and Radiation protection barriers</li> <li>S.4.10. Implement design modification</li> </ul>	ng site nating tivities aration reas for Design	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis) K.4.2. Nuclear engineering K.4.5. Radiation fundamentals K.4.3. Nuclear installation systems and components K.4.7. Decommissioning techniques K.4.8. Chemical Engineering and Waste Management	
M4.2	<ul> <li>S.4.4. Identify and analyze radiologica incidents</li> <li>S.4.5. Report technical and regulatory data according to standard operating procedures</li> <li>S.4.6. Organise and monitor storage, handling, packaging and transport of spent fuel</li> <li>Prepatory work on the decommissioning</li> <li>S.4.7. Planning, implementing, coordinand monitoring engineering act</li> <li>S.4.8. Plan decommissioning site prepators</li> <li>S.4.9. Prepare controlled work and decommissioning activities and Radiation protection barriers</li> <li>S.4.10. Implement design modification</li> </ul>	ng site nating tivities aration reas for Design ns nciple in	damaged fuel elements K.4.12. Spent fuel transport (preparation of packaging,) K.4.4. Nuclear safety (criticality, heat generation, radiolysis) K.4.2. Nuclear engineering K.4.5. Radiation fundamentals K.4.3. Nuclear installation systems and components K.4.7. Decommissioning techniques K.4.8. Chemical Engineering and Waste Management K.4.9. Radioactive waste handling and	



# **RADIATION PROTECTION EXPERT (3.9.1.)**

Unit of learning outcomes No.1: RADIATION PROTECTION/TU(3.9.1;2.3.1; 3.7.1)					
M1.1: Radiation sources and tools for re	Remarks/limits/advic es				
S.1.1. Develop specific provisions and procedures based on regulatory requirements on radioactive waste management S.1.6. Develop radiation protection procedures and framework in normal and emergency cases S.1.12. Characterise radiation sources and identify appropriate protection strategies	K.1.1. The main types of ionizing radiation and their effectsK.1.2. Relevant national and international legislationguidelinesK.1.3. Dose definition, dose types, dose measures, dose constraints and reference levelsK.1.10ClassificationK.1.10Classificationareas and access control	Basic experience in nuclear installation is recommended.			
M1.2: Control and measurement in radia	ation protection - TM	Remarks/limits/advic es			
S.1.7. Use radiation control and measurement equipment S.1.8. Develop technical specifications and procedures S.1.9. Monitor and maintain a safe working environment S.1.10. Apply appropriate radiation measurements for preliminary sample sorting	K.1.4. Radiation monitoring, workplace monitoring and individual monitoring K.1.9. Contamination control, decontamination and reduction of sources of radiation	Prerequisite: M1.1			
M1.3: Radiation protection implementat	ion - TM	Remarks/limits/advic es			
S.1.2. Implement ALARA principle to define optimised radiation protection actions S.1.3. Confirm work permits S.1.4. Optimize the occupational radiation protection programme S.1.5. Define and/or apply principle strategies of a radiation protection programme during various phases of a nuclear installation S.1.11. Identify appropriate shielding for radiation sources	K.1.5. RadiationprotectionprogramsproceduresK.1.6. ALARAprincipleproceduresproceduresK.1.7. Health surveillanceK.1.8. Radiological impacts on theenvironmentK.1.11Use of protective equipmentsuch as shielding and protectiveclothingK.1.12Storage arrangements forradioactive/contaminated itemsK.1.13Emergency planning andemergency preparedness	Prerequisite: M1.2 Experience from radiation protection is expected.			
Unit of learning outcomes No.2: ACCIDENTS AND EMERGENCY ISSUES/ TU(3.9.1;2.3.1; 3.7.1)					

M2.1: Nuclear safety fundamentals and safety assessment

Remarks/limits/advices

S.2.6. Mitigate the consequences of	K.2.3. Severe accident	Basic skills and
accidental situation	management	knowledge.
S.2.12. Implement protective actions for	K.2.4. Nuclear safety approaches,	Defense in depth is
incidental and accidental conditions	principles and requirements	embedded in K.2.4
S.2.13. Participate in accident event	K.2.5. Relevant national and	Determistic and
analysis	international legislation and	probabilistic safety
S.2.14. Identify root causes	guidelines	analysis is embedded in
S.2.15. Classify events (INES)	K.2.8. Nuclear safety culture and	K.2.15
S.2.16. Implement corrective measures	human factor	
	K.2.9. Nuclear facility components	
	and systems	
	K.2.14. International Nuclear	
	Event Scale (INES)	
	K.2.15. Safety assessment	
	requirements	

M2.2: Emergency measures		Remarks/limits/advices
S.2.1. Ensure execution of emergency plans	K.2.1. Emergency preparedness	Prerequisite: M2.1
S.2.2. Identify and detect emergency or	K.2.2. Emergency planning	
hazards	K.2.6. Health protection	
S.2.3. Monitor radiation situation in	K.2.7. Environmental protection	
emergency case	K.2.10. Radiation ecology	
S.2.4. Preparing emergency plans	K.2.11. Contamination and	
S.2.5. Prepare emergency exercises	decontamination	
S.2.7. Protect personnel in restricted areas	K.2.12. Protective clothing and	
as well as on site	protective equipment	
S.2.8. Provide correct and prompt	K.2.13. Classification of area and	
information to organisations and public	access control	
S.2.9. Evaluate radiation situation in		
emergency case		
S.2.10. Predict next development of		
emergency case		
S.2.11. Rate abnormal situation		

M3.1: Recruitment and work organisation	Remarks/limits/	
		advices
S.3.1. Participate in recruitment process	K.3.1. Organisation of human resources	
S.3.3. Allocate tasks and assign personnel	K.3.2. Social regulation	
S.3.4. Prioritise objectives	K.3.3. Recruitment process	
S.3.10. Perform managerial communication	K.3.6. Managerial communication	
	K.3.9. Work planning	
	K.3.14. Organizational changes from	
	operation to decommissioning	
	K.3.16. Policies and key issues of facilities'	
	maintenance, surveillance and inspection.	
Facility modifications; basics of		
	configuration management	
M3.2 :Team coaching		Remarks/limits/
		advices
S.3.5. Develop teamwork	K.3.4. Individual and team	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes	K.3.4. Individual and team sful performance	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes teams	sful K.3.4. Individual and team performance K.3.7. Team coordination and	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes teams S.3.2. Plan training	sful K.3.4. Individual and team performance K.3.7. Team coordination and motivation	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes teams S.3.2. Plan training S.3.7. Anticipate and manage conflicts	K.3.4. Individual and team sful performance K.3.7. Team coordination and motivation K.3.8. Resolution of conflict	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes teams S.3.2. Plan training S.3.7. Anticipate and manage conflicts S.3.11. Promote safety culture and learn	K.3.4. Individual and team performance K.3.7. Team coordination and motivation K.3.8. Resolution of conflict K.3.10. Training solutions	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes teams S.3.2. Plan training S.3.7. Anticipate and manage conflicts S.3.11. Promote safety culture and learn attitude towards safety	K.3.4. Individual and team performance K.3.7. Team coordination and motivation K.3.8. Resolution of conflict K.3.10. Training solutions K.3.5. Change management	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes teams S.3.2. Plan training S.3.7. Anticipate and manage conflicts S.3.11. Promote safety culture and learn attitude towards safety S.3.8. Evaluate individual and team performan	K.3.4.IndividualandteamsfulperformanceK.3.7.Teamcoordinationandmotivation	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes teams S.3.2. Plan training S.3.7. Anticipate and manage conflicts S.3.11. Promote safety culture and learn attitude towards safety S.3.8. Evaluate individual and team performan S.3.9. Promote individuals	K.3.4.IndividualandteamsfulperformanceK.3.7.Teamcoordinationandmotivation	advices
S.3.5. Develop teamwork S.3.6. Propose activities for building succes teams S.3.2. Plan training S.3.7. Anticipate and manage conflicts S.3.11. Promote safety culture and learn attitude towards safety S.3.8. Evaluate individual and team performan S.3.9. Promote individuals <b>M3.3 : Project management</b>	K.3.4.IndividualandteamsfulperformanceK.3.7.Teamcoordinationandmotivation	advices



S.3.12. Monitor project	K.3.5. Project management K.3.14 Budget, time and cost management	
Unit of learning outcomes No.4: INTERACT M4.1: INTERACTION WITH OTHER NUCLEA	ION WITH OTHER NUCLEAR ACTORS/D R ACTORS/DEPARTMENTS	PEPARTMENTS - TM Remarks/limits/ advices
<ul> <li>S.4.1. Integrate radwaste management strategi into the decommissioning plan</li> <li>S.4.2. Integrate radwaste management strategy into the overall management strategy of the plant</li> <li>S.4.3. Lead performance of complex analyses involving different facility's systems, structures, components and processes</li> <li>S.4.4. Perform proper communication in different areas of waste management</li> <li>S.4.5. Report activities and disseminate information</li> <li>S.4.6. Coordinate actors in waste management activities</li> <li>S.4.7. Share knowledge, information and experiences</li> <li>S.4.8. Analyse and upgrade decommissioning plans</li> </ul>	<ul> <li>K.4.1. General plant description and basic technical characteristics of nuclear facilities</li> <li>K.4.2. Nuclear fuel cycle</li> <li>K.4.3. Safety systems operation</li> <li>K.4.4. Radioactive waste treatment systems operation</li> <li>K.4.5. Applicable codes, regulations and standards for decommissioning phase</li> <li>K.4.6. Knowledge of plant (site, units) operational history</li> <li>K.4.7. Safety Analysis Report (SAR)</li> <li>K.4.8. Dismantling methods and techniques</li> <li>K.4.9. Key issues of facilities' maintenance, surveillance and inspection ; facility modifications</li> <li>K.4.10. Radiological characterization of the facility</li> <li>K.4.11. Decontamination techniques for equipment and SSCs</li> <li>K.4.12. Waste categorisation</li> <li>K.4.13. Knowledge management</li> </ul>	
Unit of learning outcomes No.5: EVA	LUATION AND OPTIMISATION OF INDI LECTIVE DOSES / BU (3.9.1; 2.3.1)	VIDUAL AND
M5.1: EVALUATION AND OPTIMISATION DOSES	OF INDIVIDUAL AND COLLECTIVE	Remarks/limits/ advices
<ul> <li>S.5.1. Monitor decommissioned areas</li> <li>S.5.2. Evaluate dose rates and radioactive contamination</li> <li>S.5.3. Evaluate the radiation situation</li> <li>S.5.4. Evaluate problems regarding radiation protection and dosimetry</li> </ul>	<ul> <li>K.5.1. Measurement of radioactive characteristics</li> <li>K.5.2. Detectors for radiation monitoring</li> <li>K.5.3. Dosimetry (limits and norms)</li> <li>K.5.4. Radiation protection measures and technics</li> </ul>	

	uosimetry		
S.5.5.	Ensure the maintenance of	K.5.5.	Statistical assessment of data
	radiation protection	K.5.6.	Modelling and simulation codes
	instruments and materials		applied in dosimetry
S.5.6.	Optimise radiation protection	K.5.7.	ALARA principles
	methods and techniques for	K.5.8.	Radionuclide vectors
	decommissioning		identification
S.5.7.	Provide information about	K.5.9.	Stochastic approach in radiation
	radiological situation		impact
S.5.8.	Analyse and upgrade	K.5.10.	Biological impacts of radiation
	decommissioning plans		doses
S.5.9.	Comply with legal requirements		
	of radiation protection and		
	dosimetry in national		
	regulations and rules		
S.5.10.	Recommend personal and		



collective protective equipment			
Unit of learning outcomes No.6: MANAGEMENT OF HEALTH, RADIOLOGICAL AND ENVIRONMENTAL RISKS / BU (3.9.1; 2.3.1)			
M6.1: Management of health, radiologic	al and environmental risks	Remarks/limits/ advices	
S.6.1. Evaluate health and radiological risks S.6.2. Evaluate environmental risks S.6.3. Apply risks assessment methods in decommissioning S.6.4. Provide internal information about risks assessment S.6.5. Undertake corrective measures S.6.6. Harmonise health and regulatory requirements S.6.7. Propose and implement corrective and preventive actions related to radiological and/or conventional risks S.6.8. Inform and/or train work teams to global approach "Health Safety Environment" S.6.9. Participate in workplace studies related to health, safety and medical department S.6.10. Create and use of health, radiological, and environmental databases	<ul> <li>K.6.1. Risks assessment and management</li> <li>K.6.2. Health and environmental standards, codes and guidelines</li> <li>K.6.3. Biological acceptance of irradiation</li> <li>K.6.4. Health protection</li> <li>K.6.5. Environmental protection</li> <li>K.6.6. Radiation protection measures and technics</li> <li>K.6.7. Human behaviour related to health, radiological, and environmental risks</li> <li>K.6.8. Individual and collective protective equipment</li> <li>K.6.9. Management of health, radiological, and environmental data</li> <li>K.6.10. Train the trainers methodology</li> </ul>		



# 2.4.4. MANAGEMENT OF MAINTENANCE IN DECOMMISSIONING (3.8.1.)

	Unit 1: MANAGEMENT OF DECOMMISSIONING PROJECTS/ TU (3.1.1; 3.3.1; 3.8.1)		
M1.1	1 Project Management		
	<ul> <li>S.1.1. Coordinate planning, scheduling, implementing and monitoring activities and projects</li> <li>S.1.2. Manage resources involved in the project</li> <li>S.1.4. Perform risk estimation and management and cost control.</li> <li>S.1.5. Select contractors and establish contracts</li> <li>S.1.6. Develop decommissioning project specifications, scopes-of-work, and prepare tender procedures</li> <li>S.1.7. Intervene, analyse, manage and resolve business and technical conflicts between the company and the contractors</li> </ul>	K.1.4. Risk estimation and management K.1.5. Management and workflow of the project K.1.6. Information technology K.1.12. Decommissioning funds and financial mechanism	
M1.2	Decommissioning of nuclear instalations		
	S.1.3. Monitor implementation of plans and procedures to ensure compliance with safety procedures and legislation S.1.6. Develop decommissioning project specifications, scopes-of-work, and prepare tender procedures S.1.8. Develop procedures and obtain permits (licensing for decommissioning)	<ul> <li>K.1.1. Decommissioning methodology, techniques and strategies</li> <li>K.1.2. Environmental impact of nuclear power;</li> <li>K.1.3. Remediation methods;</li> <li>K.1.7. Nuclear decommission practices: clean up of radioactivity (remediation) and plant demolition</li> <li>K.1.8. Radioactivity and nuclear science and engineering</li> <li>K.1.9. Managemente of civil engineering operations</li> <li>K.1.10. Decommissioning regulation and licensing: site characterization, dismantlement activities, plans for site remediation, detailed plans for final radiation surveys for release of the site, environmental change</li> </ul>	
		environmental change.	
M2 1	UNIT 2: SAFETY AND SECU	<b>KIIY</b> / IU (3.1.1; 3.3.1; 3.8.1)	
	S.2.4. Apply regulations issued by different authorities S.2.7. Perform appropriate hazard and accident analysis	K.2.2. National and international regulations and standards K.2.4. Industrial safety K.2.10. Risk assessment	
M2.2	Nuclear and radiological safety		
	<ul> <li>S.2.1. Provide training and information about the special procedures as emergency, potential risks on workers' health, nuclear safety and security</li> <li>S.2.2. Analyze and interpret the licensing requirements</li> <li>S.2.3. Identification of safety requirements</li> <li>S.2.6. Review processes, systems and activities in the facilities S.5.8. Develop and document the safety function, functional performance requirements and performance criteria</li> </ul>	<ul> <li>K.2.1. National licensing requirements</li> <li>K.2.3. Radiation protection (ALARA concept, dose commitment to workers and environment, radiation protection methods and tools)</li> <li>K.2.6. Waste and transport safety</li> <li>K.2.7. Emergency preparedness</li> <li>K.2.8. Clearance of material and site release</li> <li>K.2.12. Environmental site remediation</li> <li>K.2.11. Radiological hazard analysis</li> </ul>	



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	S.2.10. Prepare safety basis documents:	
	Broliminary Safety Design Reports,	
	Preliminary Safety Design Reports,	
	Documented Safety Analyses,	
M2 3	Security	
112.5	S 2 11 Monitor and control security	K 2.8 Nuclear security safeguard and non-
	safeguard and pop-proliferation	proliferation
	requirements	promeration
	Unit 3: FACILITY MA	INTENANCE/ SU 3.8.1
M3.1	Development of maintenance programs	
	S.3.1. Select the maintenance strategy(s)	K.3.6. Maintenance strategies: i.e.: reactive
	S.3.2. Select the maintenance	(RM), preventive (PM), predictive (PdM),
	technique(s)	proactive centered maintenance (PCM)
	S.3.3. Design the maintenance program	K.3.7. Maintenance techniques: i.e.:
	S.3.4. Search for new equipment and	condition monitoring (CM), reliability
	technology	centered maintenance (RCM), Failure Modes
		& Effects Analysis (FMEA), Failure Modes,
		Effects, and Criticality Analyses (FMECA),
		Root Cause Failure Analysis
		(RCFA),Computerized Maintenance
		Management System (CMMS), Taxonomy
M3.2	Conducting maintenance	
	S.3.5. Conducting regular site visits to	K.3.1. Plant systems including machines,
	ensure optimal maintenance performance	mechanical systems, electrical systems,
	S.3.6. Oversee the installation, repair and	buildings and structures
	maintenance of structures, systems and	K.3.3. Mechanical and electrical
	components	maintenance
M3.3	Waste management	
	S.3.7. Manage hazardous chemical and	K.3.4. Radioactive materials and waste
	radioactive wastes	fundamentals – characterization, processing,
		disposal, transportation



# 2.4.5. MANAGEMENT OF RADIOACTIVE WASTE & RP (2.3.1.)

Unit of learning outcomes No.1: RADIATION PROTECTION			
TU (3.9.1;2.3.1; 3.7.1)			
M1.1: Radiation sources and tools fo	r registration - TM	Remarks/limits/advices	
S.1.1. Develop specific provisions and procedures based on regulatory requirements on radioactive waste management S.1.6. Develop radiation protection procedures and framework in normal and emergency cases S.1.12. Characterise radiation sources and identify appropriate protection strategies	<ul> <li>K.1.1. The main types of ionizing radiation and their effects</li> <li>K.1.2. Relevant national and international legislation and guidelines</li> <li>K.1.3. Dose definition, dose types, dose measures, dose constraints and reference levels</li> <li>K.1.10 Classification of working areas and access control</li> </ul>	Basic experience in nuclear installation is recommended.	
M1.2: Control and measurement in ra	adiation protection - TM	Remarks/limits/advices	
S.1.7. Use radiation control and measurement equipment S.1.8. Develop technical specifications and procedures S.1.9. Monitor and maintain a safe working environment S.1.10. Apply appropriate radiation measurements for preliminary sample sorting	K.1.4. Radiation monitoring, workplace monitoring and individual monitoring K.1.9. Contamination control, decontamination and reduction of sources of radiation	Prerequisite: M1.1	
M1.3: Radiation protection implement	itation - TM	Remarks/limits/advices	
<ul> <li>S.1.2. Implement ALARA principle to define optimised radiation protection actions</li> <li>S.1.3. Confirm work permits</li> <li>S.1.4. Optimize the occupational radiation protection programme</li> <li>S.1.5. Define and/or apply principle strategies of a radiation protection programme during various phases of a nuclear installation</li> <li>S.1.11. Identify appropriate shielding for radiation sources</li> </ul>	<ul> <li>K.1.5. Radiation protection programs</li> <li>K.1.6. ALARA principle and procedures</li> <li>K.1.7. Health surveillance</li> <li>K.1.8. Radiological impacts on the environment</li> <li>K.1.11 Use of protective equipment such as shielding and protective clothing</li> <li>K.1.12 Storage arrangements for radioactive/contaminated items</li> <li>K.1.13 Emergency planning and emergency preparedness</li> </ul>	Prerequisite: M1.2 Experience from radiation protection is expected.	
Unit of learning outcom	AND 2: ACCIDENTS AND EMERG		
	TU (3.9.1;2.3.1; 3.7.1)		
M2.1: Nuclear safety fundamentals a	and safety assessment	Remarks/limits/advices	
S.2.6. Mitigate the consequences of accidental situation S.2.12. Implement protective actions for incidental and accidental conditions S.2.13. Participate in accident event analysis S.2.14. Identify root causes S.2.15. Classify events (INES) S.2.16. Implement corrective measures	K.2.3. Severe accident management K.2.4. Nuclear safety approaches, principles and requirements K.2.5. Relevant national and international legislation and guidelines K.2.8. Nuclear safety culture and human factor K.2.9. Nuclear facility components and systems K.2.14. International Nuclear Event Scale (INES) K.2.15. Safety assessment requirements	Basic skills and knowledge. Defense in depth is embedded in K.2.4 Determistic and probabilistic safety analysis is embedded in K.2.15	

M2.2: Emergency measures

Remarks/limits/advices



S.2.1. Ensure execution of emergency plans	K.2.1. Emergency preparedness K.2.2. Emergency planning	Prerequisite: M2.1
S.2.2. Identify and detect emergency	K.2.6. Health protection	
or hazards	K.2.7. Environmental protection	
S.2.3. Monitor radiation situation in	K.2.10. Radiation ecology	
emergency case	K.2.11. Contamination and	
S.2.4. Preparing emergency plans	decontamination	
S.2.5. Prepare emergency exercises	K.2.12. Protective clothing and	
S.2.7. Protect personnel in restricted	protective equipment	
areas as well as on site	K.2.13. Classification of area and	
S.2.8. Provide correct and prompt	access control	
information to organisations and		
public		
S.2.9. Evaluate radiation situation in		
emergency case		
S.2.10. Predict next development of		
emergency case		
S.2.11. Rate abnormal situation		

Unit of learning outcomes No.3: TEAM AND PROJECT MANAGEMENT			
10 (3.9.1;2.3.1; 3.7.1)			
M3.1: Recruitment and Work organ	Isation	Remarks/limits/advices	
S.3.1. Participate in recruitment	K.3.1. Organisation of human		
process	resources		
S.3.3. Allocate tasks and assign	K.3.2. Social regulation		
personnel	K.3.3. Recruitment process		
S.3.4. Prioritise objectives	K.3.6. Managerial communication		
S.3.10. Perform managerial	K.3.9. Work planning		
communication	K.3.14. Organizational changes		
	from operation to decommissioning		
	K.3.16. Policies and key issues of		
	facilities' maintenance, surveillance		
	and inspection. Facility		
	modifications; basics of		
	configuration management		
M3.2 :Team coaching		Remarks/limits/advices	
S.3.5. Develop teamwork	K.3.4. Individual and team		
S.3.6. Propose activities for building	performance		
successful teams	K.3.7. Team coordination and		
S.3.2. Plan training	motivation		
S.3.7. Anticipate and manage	K.3.8. Resolution of conflict		
conflicts	K.3.10. Training solutions		
S.3.11. Promote safety culture and	K.3.5. Change management		
learning attitude towards safety	K.3.12 Quality Management		
S.3.8. Evaluate individual and team	K.3.13 Knowledge Management		
performance			
S.3.9. Promote individuals			
M3.3 : Project management		Remarks/limits/advices	
S.3.12. Monitor project	K.3.5. Project management		
	K.3.14 Budget, time and cost		
	management		
Unit of learning outcomes No.4: INTERACTION WITH OTHER NUCLEAR ACTORS/DEPARTMENT			

10(3.3.1, 2.3.1, 3.7.1)		
M4.1: INTERACTION WITH OTHER	NUCLEAR ACTORS/DEPARTMENTS	Remarks/limits/advices
S.4.1. Integrate radwaste	K.4.1. General plant description and	
management strategy into the	basic technical characteristics of	
decommissioning plan	nuclear facilities	
S.4.2. Integrate radwaste	K.4.2. Nuclear fuel cycle	
management strategy into the overall	K.4.3. Safety systems operation	



management strategy of the plant S.4.3. Lead performance of complex analyses involving different facility's systems, structures, components and processes S.4.4. Perform proper communication in different areas of waste management S.4.5. Report activities and disseminate information S.4.6. Coordinate actors in waste management activities S.4.7. Share knowledge, information and experiences S.4.8. Analyse and upgrade decommissioning plans	K.4.4. Radioactive waste treatment systems operation K.4.5. Applicable codes, regulations and standards for decommissioning phase K.4.6. Knowledge of plant (site, units') operational history K.4.7. Safety Analysis Report (SAR) K.4.8. Dismantling methods and techniques K.4.9. Key issues of facilities' maintenance, surveillance and inspection. Facility modifications K.4.10. Radiological characterization of the facility K 4 11 Decontamination techniques	
S.4.8. Analyse and upgrade	of the facility	
decommissioning plans	K.4.11. Decontamination techniques	
	for equipment and SSCs	
	K.4.12. Waste categorisation	
	K.4.13. Knowledge management	

#### Unit of learning outcomes No.5: EVALUATION AND OPTIMISATION OF INDIVIDUAL AND COLLECTIVE DOSES / BU (3.9.1; 2.3.1)

M5.1: EVALUATION AND OPTIMISATION OF INDIVIDUAL AND		Remarks/limits/advices
COLLECTIVE DOSES		
S.5.1. Monitor decommissioned areasK.S.5.2. Evaluate dose rates and radioactive contaminationK.S.5.3. Evaluate the radiation situationK.S.5.4. Evaluate problems regardingK.radiation protection and dosimetryK.S.5.5. Ensure the maintenance of radiation protection instruments and materialsK.S.5.6. Optimise radiation protection methods and techniques for decommissioningK.S.5.7. Provide information about radiological situationK.S.5.8. Analyse and upgrade decommissioning plansK.S.5.9. Comply with legal requirements of radiation protection and dosimetry in national regulations and rulesR.S.5.10. Recommend personal and collective protective equipmentS.	<ul> <li>.5.1. Measurement of radioactive naracteristics</li> <li>.5.2. Detectors for radiation nonitoring</li> <li>.5.3. Dosimetry (limits and norms)</li> <li>.5.4. Radiation protection neasures and technics</li> <li>.5.5. Statistical assessment of data</li> <li>.5.6. Modelling and simulation odes applied in dosimetry</li> <li>.5.7. ALARA principles</li> <li>.5.8. Radionuclide vectors lentification</li> <li>.5.9. Stochastic approach in adiation impact</li> <li>.5.10. Biological impacts of adiation doses</li> </ul>	

#### Unit of learning outcomes No.6: MANAGEMENT OF HEALTH, RADIOLOGICAL AND ENVIRONMENTAL RISKS/ BU (3.9.1; 2.3.1)

M6.1: Management of health, radio	ogical and environmental risks	Remarks/limits/advices
S.6.1. Evaluate health and	K.6.1. Risks assessment and	
radiological risks	management	
S.6.2. Evaluate environmental risks	K.6.2. Health and environmental	
S.6.3. Apply risks assessment	standards, codes and guidelines	
methods in decommissioning	K.6.3. Biological acceptance of	
S.6.4. Provide internal information	irradiation	
about risks assessment	K.6.4. Health protection	
S.6.5. Undertake corrective measures	K.6.5. Environmental protection	
S.6.6. Harmonise health and	K.6.6. Radiation protection	
regulatory requirements	measures and technics	



S.6.7. Propose and implement corrective and preventive actions related to radiological and/or conventional risks S.6.8. Inform and/or train work teams to global approach "Health Safety Environment" S.6.9. Participate in workplace studies related to health, safety and medical department S.6.10. Create and use of health, radiological, and environmental databases	K.6.7. Human behaviour related to health, radiological, and environmental risks K.6.8. Individual and collective protective equipment K.6.9. Management of health, radiological, and environmental data K.6.10. Train the trainers methodology	

Unit of learning outcomes No.7: RADIOACTIVE WASTE MANAGEMENT/ BU (3.9.1; 2.3.1)		
M7.1: Handling and transport radio	active waste	Remarks/limits/advices
S.7.1. Evaluate and control the level of contamination and induced activities of radioactive waste S.7.2. Select optimal solution and manage radioactive waste categorisation S.7.3. Manage radioactive waste handling and transport S.7.5 Apply proper criteria for treated waste classif. and handling S.7.6. Evaluate and manage collected data about waste characteristics S.7.9. Comply activities with national program in decommissioning S.7.10. Developing waste management program, specifications and procedures S.7.11. Apply appropriate solutions in packacing	K.7.1. Waste characterisation and categorisation K.7.2. Dosimetry K.7.3. Nuclear safety and radiation protection K.7.5. Health protection K.6.6. Environmental protection K.7.7. Nuclear safety culture and human factor K.7.8. Protective clothing and protective equipment K.7.9. Transport, handling and storage of radioactive waste K.7.12. Waste conditioning including packaging	
M7.2: Storage radioactive waste		
S.7.4. Apply proper techniques for optimal storage of waste S.7.7. Ensure radiation protection support for waste manipulation and storage S.7.8. Evaluate radiation situation in decontamination, handling, transport and storage process	K.7.4. Relevant national and international legislation and guidelines K.7.10. Treatment and long term storage K.6711. National policy and program in decommissioning	M7.1 is recommended as a prerequisite



Unit of learning outcomes No.5: DECOMMISSIONING MANAGEMENT			
M5.1: Decommissio	ning management		
S.5.1. Participate and/or organize decommissioning activities S.5.2. Organise decommissioning work S.5.3. Prioritise objectives S.5.4. Use the optimal tools and technology in decommissioning S.5.5. Evaluate efficiency of decontamination S.5.6. Monitor waste accumulation and transport	K.5.1.WasteoriginandhandlingsK.5.2.Contamination,decontaminationK.5.3.Decontaminationtechnologies and toolsK.5.4.Radioecologyand environmental remediationK.5.5.Partitioningand compactingK.5.6.DecommissioningproceduresK.5.7.Limits for free releaseK.5.8.Prediction and simulatingof activation	The module M5.1 - Decommissioning management from qualification 3.7.1. will be merge with the module Management of Decommissioning projects which is transversal module/TM over three qualifications (3.1.1; 3.3.1 and 3.8.1)	
Assessment criteria: Ability to evaluate waste activity			

**ASSESSMENT MODULE TEMPLATE** 



Performance of decommissioning strategy and program Ability to organize decommissioning works and activities Feedback on operational events Pertinence of decommissioning selected tools and techniques **Recommended assessment methods:** Written test: problem solving, study case ... Situational judgement test Oral test Practical test



# Annex I: Agenda



# 2<sup>nd</sup> Workshop on- Qualifications for Nuclear Decommissioning Bergen (The Netherlands) 24 – 28 October 2016

# AGENDA

(v.7-draft) Petten, Oct. 2016 G.10/MC

# Day 1/Monday 24 October - afternoon

13:00 Lunch

# **OPENING SESSION**

14:00	Setting the scene Objectives and work plan Welcome and introduction of the participants	M. Ceclan
14:30	Practical arrangements and logistics	C. Chenel- Ramos All
14:35	Presentation: JRC contribution to ECVET infrastructure development Questions and debate	F. Wastin
14:45	Presentation: ELINDER- Plans for a future application of ECVET	P.Kockerols
15:05	Coffee break	
15:20	Presentation: Changes in nuclear qualifications design Questions and debate	T. Lefeuvre A. Costa Artur All
16:15	Presentation: <i>Questions for training design using ECVET principles</i> Questions and debate	T. Lefeuvre A. Costa Artur All

# **17:30** End of the first day

Henceforth the meeting shall split in two working groups

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# Day 2/Tuesday 25 October- morning

# **09:00** Group review of the qualifications 3.7.1 and 3.1.1

WG 1	Activity	Moderator
	Qualification review: 3.7.1. Radioactive Waste Management	T. Lefeuvre; M. Ceclan
WG 2	Activity	Moderator

# **10:30** Coffee break

**11:00** Group preparation of the ECVET input for the Training programs linked to the qualifications 3.7.1 and 3.1.1

WG 1	Activity	Moderator
	Preparation of the ECVET input for the Training program	T. Lefeuvre; M. Ceclan
	linked to the qualification 3.7.1	
WG 2	Activity	Moderator
	Preparation of the ECVET input for the TP linked to the	A. Costa Artur; C. Chenel

# 12:30 Lunch

# Day 2/Tuesday 25 October - afternoon

**13:30** Group cross analysis of qualifications 3.7.1 & 3.1.1 and corresponding ECVET input for Training programs-market oriented

WG 1	Activity	Moderator
	Review of the qualification 3.1.1 and ECVET input for TP-	T. Lefeuvre; M. Ceclan
	market oriented. Recommendations for the WG 2.	
WG 2	Activity	Moderator
	Review of the qualification 3.7.1 and ECVET input for TP-	A. Costa Artur; C. Chenel
	market oriented. Recommendations for the WG 1	

15:30 Coffee break

# 16:00 Plenary session

WG 1+2	Activity	Moderator
WG 1	Deliverable 2: Updated qualification 3.7.1 and ECVET	V. Slugen
	input for TP - market oriented.	_
WG 2	Deliverable 1: Updated qualification 3.1.1 and ECVET	L. Pironkov
	input for TP - market oriented.	
	Conclusions on the updated qualifications and ECVET	T. Lefeuvre; A. Costa
	input for TP- market oriented.	Artur

**17:30** End of the second day



# Day 3/Wednesday 26 October - morning

#### 09:00 Group review of the qualifications 3.9.1 and 3.3.1

WG 1	Activity	Moderator
	Qualification review:	T. Lefeuvre; M. Ceclan
	3.9.1. Radiation Protection Expert	
WG 2	Activity	Moderator
	Qualification review:	A. Costa Artur; C. Chenel
	3.3.1. Preparatory work Management	

### 11:15 Coffee break

**11:45** Group preparation of the ECVET input for the Training programs linked to the qualifications 3.9.1 and 3.3.1

WG 1	Activity	Moderator
	Preparation of the ECVET input for the TP linked to the qualification 3.9.1	T. Lefeuvre; M. Ceclan
WG 2	Activity	Moderator
	Preparation of the ECVET input for the TP linked to the qualification 3.3.1	A. Costa Artur; C. Chenel

## 13:00 Lunch

# Day 3/Wednesday 26 October - afternoon

**14:00** Group cross analysis of qualifications 3.3.1 & 3.9.1 and corresponding ECVET input for TP -market oriented

WG 1	Activity	Moderator
	Review of the qualification 3.3.1 and ECVET input for TP -	T. Lefeuvre; M. Ceclan
	market oriented. Recommendations for the WG 2.	
WG 2	Activity	Moderator
WG 2	Activity Review of the qualification 3.9.1 and ECVET input for TP -	Moderator A. Costa Artur; C. Chenel

# 15:30 Coffee break

# 16:00 Plenary session

WG 1+2	Activity	Moderator
WG 1	Deliverable 3: Updated qualification 3.9.1 and ECVET input	V. Slugen
	for TP –qualification oriented.	
WG 2	Deliverable 4: Updated qualification 3.3.1 and ECVET input	L. Pironkov
	for TP -market oriented	
	Conclusions on the updated qualifications and ECVET input	T. Lefeuvre; A. Costa Artur
	for TP -market oriented.	

**17:30** End of the third day



# Day 4/Thursday 27 October - morning

### **09:00** Group review of the qualifications 2.3.1 and 3.8.1

WG 1	Activity	Moderator
	Qualification review:	T. Lefeuvre; M. Ceclan
	2.3.1. Management of Radioactive Waste & RP	
WG 2	Activity	Moderator
	Qualification review:	A. Costa Artur; C. Chenel
	3.8.1 Management of maintenance in decommissioning	

#### 11:00 Coffee break

**11:30** Group preparation of ECVET input for the Training programs linked to the qualifications 2.3.1 and 3.8.1

WG 1	Activity	Moderator
	Preparation of the ECVET input for the TP linked to the qualification 2.3.1.	T. Lefeuvre; M. Ceclan
WG 2	Activity	Moderator
	Preparation of the ECVET input for the TP linked to the qualification 3.8.1.	A. Costa Artur; C. Chenel

13:00 Lunch and visit in Kranenburgh museum

## 14:30 End of the fourth day

# Day 5/Friday 28 October - morning

**09:00** Group cross analysis of qualifications 2.3.1 & 3.8.1 and corresponding ECVET input for TP –market oriented

WG 1	Activity	Moderator
	Review of the qualification 3.8.1 and ECVET input for TP –	T. Lefeuvre; M. Ceclan
	market oriented. Recommendations for the WG 2	
WG 2	Activity	Moderator
	Review of the qualification 2.3.1 and ECVET input for TP –	A. Costa Artur; C. Chenel
	market oriented. Recommendations for the WG 1	

#### **11:00** Coffee break

#### 11:30 Plenary session

WG 1+2	Activity	Moderator
WG 1	Deliverable 5: Updated qualification 2.3.1 and ECVET input	V. Slugen
	for TP – market oriented.	
WG 2	Deliverable 6: Updated qualification 3.8.1 and ECVET input	L. Pironkov
	for TP – market oriented.	
	Conclusions on the 2 <sup>nd</sup> WS	T. Lefeuvre; A. Costa Artur
	Other closure presentations	M. Ceclan
	Questions and debate	All

# 13:00 Lunch

# 14:00 End of the Workshop.





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