

## **Workshop on Qualifications for Nuclear Decommissioning**

*Lisbon (Portugal), 6-9 October 2015*

### **Summary, outcomes and presentations**



**Group picture of Lisbon workshop participants**

*Workshop coordinator:*

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## 1. Summary

### 1.1 Introduction

The Workshop (WS) on Qualifications for Nuclear Decommissioning, held in Lisbon on 6-9 October 2015, is an answer to the increasing Human Resources (HR) needs in the Nuclear Power Plant (NPP) decommissioning phase. As a consequence of increasing the decommissioning works volume in the period 2015-2030, a gap of 30%, between HR demand and supply, was identified.

The "nuclearization" was identified by the 1<sup>st</sup> EHRO-N<sup>1</sup> survey as the solution to fill the gap. "Nuclearization" is the process of hiring individuals from non-nuclear sectors and training them to get a nuclear qualification.

The European Credit system for Vocational Education and Training (ECVET) can help

i) as a first step by developing the Competence-Based Qualification System (CBQS) [structuring qualifications in Units of Learning Outcomes (ULOs) and Learning Outcomes (LOs)] and

ii) as a second step by designing a training programme for specific qualifications.

The ECVET training programme assumes the identification of prior learning and of delivering only the competences that are missing from the targeted qualification. This way the duration of an ECVET training programme is much shorter than a standard training programme.

The process of developing the Competence-Based Qualification System in decommissioning just started within the Lisbon Workshop by designing two qualifications based on the ECVET approach:

- a) Radiation Protection Expert (RPE) and
- b) Radioactive Waste Manager (RWM).

### 1.2 Participants

The Workshop was held in the Double Tree by Hilton Hotel, in Lisbon (Portugal) and was attended by the following participants (present in the group picture):

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<sup>1</sup> EHRO-N = European Human Resources Observatory for the Nuclear Sector

The invited experts:

Vladimir	SLUGEN	Slovak University of Technology
Vanesa	SANCHEZ	TECNATOM
Marinela	ILIEVA	Risk Engineering Ltd.
Eija-Karita	PUSKA	VTT
Pedro	DIEGUEZ PORRAS	ENEN
Marjatta	PALMU	POSYVA
Emilia	VASSILEVA	BG Knowledge Management Assoc.
Lyubomir	PIRONKOV	KNPP Training Center
Rolf	ASLAKSRUD KRISTIANSEN	EUROMASK
Abdelouas	ABDESSELAM	Ecole des Mines Nantes

The internal [European Commission (EC)] experts:

Concetta	FAZIO	EC JRC-ITU Karlsruhe
Rocco	SILVERII	EC JRC-IET Petten
Hans Guenther	SCHNEIDER	EC JRC-A4 Brussels

The ECVET facilitators:

Thierry	LEFUEVRE	ECVET Team
Alexandra	COSTA ARTUR	ECVET Team

The organisers:

Willy	MUNTJEWERF	EC JRC-IET Petten
Massimo	FLORE	EC JRC-IET Petten
Mihail	CECLAN	EC JRC-IET Petten

### 1.3 Workshop sessions

The Workshop consisted of six half-day sessions. Three half days (spread over the first, the second and the last days) were plenary and during the rest of them the participants were distributed in two working groups to carry out the decommissioning qualifications design.

#### 1.3.1. Plenary sessions

After the welcome and the self-introduction of the experts, Willy Muntjewerf provided some general information about the practical arrangements relevant to the participants.

Workshop scene set-up of the first plenary session:

Mihail CECLAN	Objectives and work plan
Massimo FLORE	HR demand and supply in nuclear energy (decommissioning) market
Thierry LEFUEVRE	ECVET for qualifications design: designing ULOs and LOs; most
Alexandra COSTA	required qualifications in nuclear (EQF <sup>2</sup> 5-7)

<sup>2</sup> EQF = European Qualifications Framework

Mihail CECLAN      European tools for achieving the single EU market:  
ESCO<sup>3</sup>, ECVET and EQF

Mihail Ceclan explained the objectives and work plan of the workshop.

Massimo FLORE described the main HR trends in the nuclear energy (including decommissioning) labour market.

Thierry LEFEUVRE and Alexandra COSTA explained the key ECVET concepts and definitions needed for the nuclear qualifications design (including decommissioning qualifications), and presented practical examples.

Mihail CECLAN put ECVET in the context of the common European tools and principles for education and training modernization, based on the Learning Outcome concept. ECVET should be applied in correlation with other tools, such as ESCO and EQF.

The second plenary session tackled the methodological aspects of the decommissioning qualifications design:

Mihail CECLAN      ECVET-oriented methodology for the design of decommissioning  
qualifications

Thierry LEFEUVRE    Ten questions before designing the nuclear qualifications  
Alexandra COSTA

The participants were distributed in two working groups, each group carrying out one decommissioning qualification design. The experts expressed their option for the working group better matching their expertise.

All interventions were followed by a round of questions and comments.

### **1.3.2 Outcomes of the work sessions**

The Workshop produced the four outcomes listed hereafter:

- 1) Decommissioning subgroup for the ESCO content development
- 2) Classification of decommissioning occupations, qualifications and jobs
- 3) Methodology for nuclear qualification design
  - 4a) Qualification no 1: RADIATION PROTECTION EXPERT
  - 4b) Qualification no 2: RADIOACTIVE WASTE MANAGER

The full content of the outcomes is shown in section two of this booklet.

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<sup>3</sup> ESCO = European Skills, Competences, Occupations and Qualifications

Each outcome is an answer to a specific objective of the WS, as shown in table 1.

1) The *Decommissioning subgroup for the ESCO content development* is an urgent necessity, because currently there is no nuclear Sectorial Reference subgroup to develop the content for ESCO. As a consequence the nuclear energy sector (including decommissioning) is not visible in the ESCO database. The list of the *Decommissioning subgroup for the ESCO content development* will be submitted to the ESCO secretariat.

**Table 1: Workshop objectives and deliverables**

Objectives		Deliverables
Main objective	Developing CBQS in nuclear decommissioning	-
Specific objectives	O1) Increasing the visibility of the nuclear energy sector in ESCO	Deliverable 1: Initiating the decommissioning subgroup for the ESCO content development
	O2) Development of an ECVET-oriented methodology for the design of decommissioning qualifications	Deliverable 2: Classification of occupations, qualifications and jobs in nuclear decommissioning
	O3) Designing 2 decommissioning qualifications	Deliverable 3: ECVET-oriented methodology for the design of decommissioning qualifications
		Deliverable 4a: Qualification no 1 – Radiation Protection Expert
O4) Assessment of Learning Outcomes	Deliverable 4b: Qualification no 2 – Radioactive Waste Manager	
		-

2) The *Classification of occupations, qualifications and jobs* in nuclear decommissioning is a precondition for registering the decommissioning jobs in the ESCO database.

3) Developing a customised *Methodology for nuclear qualification design* is a prerequisite for starting the process of designing decommissioning qualifications according to ECVET principles.

4a and 4b) *Decommissioning qualifications designed within the workshop*

### 1.3.3 Closure Session

Vladimir Slugen and Marjatta Palmu, the leaders of the two working groups, presented a short report on the groups' activity. They emphasised the difficulties that were overcome in qualifications design.

Thierry Lefeuvre and Alexandra Costa Artur, the ECVET facilitators, emphasised the twofold importance of the workshop: designing two qualifications in accordance with the ECVET approach, and experts' initiation in applying the ECVET principles and tools.

Finally the organisers summarised the results achieved during the workshop and thanked the participants for their contribution.

In addition, these are some of the participants' remarks from the feedback form:

VLADIMIR SLUGEN: Very good and useful discussion. First draft in qualification design was achieved.

MARINELA ILIEVA: The meeting was extremely useful; clarified some misunderstandings.

H. G. SCHNEIDER: Interesting concept, useful implementation is needed, obvious link to our (JRC-A.4) initiative in E&T<sup>4</sup> in decommissioning "Pooling of joint European School".

PEDRO DIEGUES PORAS (ENEN): ENEN's project ANNETTE WP 4 includes a pilot of ECVET application in cross border mobility in nuclear industry. We should reinforce ENEN&JRC collaboration.

#### **1.4 Next steps**

It is within the Lisbon Workshop that the idea was expressed that ECVET can have an added value for the decommissioning of the labour market, in particular for the initiative on E&T in decommissioning "Pooling of joint European School" and for ENEN's project ANNETTE.

In line with the above need of the decommissioning sector the next steps would be:

- Further efforts should be directed to strengthen the collaboration between JRC-IET and JRC-A.4 on the initiative in E&T in decommissioning "Pooling of joint European School",
- JRC-A.4 will identify the decommissioning qualifications, intended to develop training schemes based on ECVET,
- JRC-IET will organize a WS for designing the chosen qualifications by JRC-A.4 (max. 4 qualifications),
- JRC-A.4 will design training schemes, based on the ECVET approach, having the decommissioning qualifications structured in Units of Learning Outcomes and in Learning Outcomes.

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<sup>4</sup> E&T = Education and Training

## **2. Outcomes**

- 1) Decommissioning subgroup for the ESCO content development
- 2) Classification of occupations, qualifications and jobs
- 3) Methodology for nuclear qualification design
  - Annex 3.1 Template for Decommissioning qualification design
- 4a) Qualification no 1: RADIATION PROTECTION EXPERT
- 4b) Qualification no 2: RADIOACTIVE WASTE MANAGER





## Deliverable 2

### Classification of occupations, qualifications and jobs in nuclear decommissioning

The representative jobs, identified by the JRC-IET within the Nuclear Job Taxonomy/NJT, into the decommissioning phase of a Nuclear Power Plant/NPP are listed in the table 1.

**Table 1: The representative jobs in decommissioning phase of a NPP**

<b>3. DECOMMISSIONING PHASE</b>	
<b>Occupation PT (Preferred term)</b>	<b>Representative jobs in decommissioning</b>
3.1. MANAGEMENT	3.1.01. Project Manager
	3.1.02. Contractors Manager
	3.1.03. Management System Manager
	3.1.04. Training Manager
	3.1.05. Licensing Manager
	3.1.06. Communication Manager
	3.1.07. Financial Manager
	3.1.08. Site Manager
3.2. DECONTAMINATION	3.2.01. Decontamination Planner
	3.2.02. Decontamination Supervisor
	3.2.03. Decontamination Worker
3.3. PREPARATORY WORK FOR DECOMMISSIONING	3.3.01. Site Engineer
	3.3.02. Spent Fuel Management Engineer
	3.3.03. Engineering Support Manager
	3.3.04. Decommissioning Planner
	3.3.05. Decommissioning Supervisor
	3.3.06. Decommissioning Operator
	3.3.07. Decommissioning Worker
3.4. DISMANTLING/EQUIPMENT	3.4.01. Dismantling Planner
	3.4.02. Dismantling Supervisor
	3.4.03. Dismantling Worker
3.5. DEMOLITION (BUILDING AND STRUCTURES)	3.5.01. Demolition Planner
	3.5.02. Demolition Civil Engineer
	3.5.03. Demolition Worker
3.6. SITE CLEAN UP	3.6.01. Clean up Supervisor
	3.6.02. Clean up Worker
3.7. RADIOACTIVE WASTE	3.7.01. Radioactive Waste Manager
	3.7.02. Radioactive Waste Manager-characterisation
	3.7.03. Radioactive Waste Manager-processing
	3.7.04. Radioactive Waste Worker-characterisation
	3.7.05. Radioactive Waste Worker-processing
	3.7.06. Transport responsible
	3.7.07. Transport responsible
3.8. MAINTENANCE	3.8.01. Maintenance Engineer – Manager
	3.8.02. Maintenance Supervisor
	3.8.03. Maintenance Worker
3.9. HEALTH, SAFETY AND ENVIRONMENT	3.9.01. Radiation Protection Manager
	3.9.02. Radiation Protection Officer
	3.9.03. Radiation Protection Worker
	3.9.04. Industrial Safety Engineer
	3.9.05. Safety Case Expert
	3.9.06. Environmental Expert
	3.9.07. Radioprotection Technician
	3.9.08. Radiochemistry Manager
	3.9.09. Nuclear Laboratory Technician - Chemistry
3.10 SITE RELEASE	3.10.1 Final Release Process Supervisor

In order to register the representative jobs from decommissioning sub-sector, listed in the Table 1, in ESCO we have to identify the corresponding decommissioning occupations and qualifications.

The first draft of the Classification of occupations, qualifications and jobs in nuclear decommissioning is shown in the Table 2.

## 1.1 The criteria for qualification selection to be designed

Having the Classification of occupations, qualifications and jobs in the nuclear decommissioning there is a need for selection criteria of the qualifications to be designed.

The selection criteria and the qualifications assigned to be designed within the WS are shown in the Table 3.

**Table 3: The criteria for qualification selection to be designed**

Criteria					
NPP life cycle	Type and category of qualification	Awarding body	EQF level	No of jobs	Qualifications assigned for design
NB, O & D	International qualifications and certificates linked to occupations and sectors (directly in ESCO)	awarded at national level but regulated at European level DIRECTIVE 2013/59/ EURATOM /International level/ ISCO-08: Unit Group 2263	5 to 7, depending on the country and RPE's roles and duties [ENETRAP II-WD 4.2]	1	<b>Radiation Protection Expert</b>
O & D	-	awarded at national level	5 to 6, depending on the country	3	<b>Radioactive Waste Manager</b>

## 1.2 Input data for ESCO

The data required as input for ESCO on the two qualifications assigned to be designed within the workshop are gathered in the Table 4. These data will be fill in in the Section 2 of the Template for Decommissioning qualification design - Metadata of a qualification in ESCO.

**Table 2: From jobs to occupations in nuclear decommissioning**

Occupations		Qualifications	Jobs
Broader (Occupation groups)	Occupation PT (Preferred term)		
<b>An occupation</b> = a grouping of jobs involving similar tasks and which require a similar skills set	<b>Preferred term</b> = occupation restricted; the family of jobs having similar core competences (KSC/A)	<b>A qualification</b> = is the formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards	<b>A job</b> = is bound to a specific work context and executed by one person
Decommissioning activities	3.1 Management	Decommissioning manager	3.1.01. Project Manager
			3.1.02. Contractors Manager
			3.1.03. Management System Manager
			3.1.04. Training Manager
			3.1.05. Licensing Manager
			3.1.06. Communication Manager
			3.1.07. Financial Manager
			3.1.08. Site Manager
	3.2 Decontamination	Decommissioning decontaminator	3.2.01. Decontamination Planner
			3.2.02. Decontamination Supervisor
			3.2.03. Decontamination Worker
	3.3 Preparatory work	Preparatory work manager	3.3.01. Site Engineer
			3.3.02. Spent Fuel Management Engineer
		Decommissioning preparatory	3.3.03. Engineering Support Manager
			3.3.04. Decommissioning Planner
			3.3.05. Decommissioning Supervisor
			3.3.06. Decommissioning Operator
			3.3.07. Decommissioning Worker
	3.4 Equipment dismantling	Equipment dismantler	3.4.01. Dismantling Planner
			3.4.02. Dismantling Supervisor
			3.4.03. Dismantling Worker
	3.5 Building and structures demolition	Building and structures demolition	3.5.01. Demolition Planner
3.5.02. Demolition Civil Engineer			
3.5.03. Demolition Worker			
3.6. Site clean up	Site clean up	3.6.01. Clean up Supervisor	
		3.6.02. Clean up Worker	

**Table 2: From jobs to occupations in nuclear decommissioning-Cont.**

Occupations		Qualifications	Jobs	
Broader (Occupation groups)	Occupation PT (Preferred term)			
<b>An occupation=</b> a grouping of jobs involving similar tasks and which require a similar skills set	<b>Preferred term=</b> occupation restricted; the family of jobs having similar core competences (KSC/A)	<b>A qualification=</b> is the formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards	<b>A job =</b> is bound to a specific work context and executed by one person	
Decommissioning activities	3.7. Radioactive waste	Radioactive Waste Manager	3.7.01. Radioactive Waste Manager 3.7.02. Radioactive Waste Manager- characterisation 3.7.03. Radioactive Waste Manager- processing	
		Radioactive Waste Worker	3.7.04. Radioactive Waste Worker-characterisation 3.7.05. Radioactive Waste Worker- processing 3.7.07. Transport responsible	
	3.8. Maintenance	Maintenance for decommissioning	3.8.01. Maintenance Engineer – Manager 3.8.02. Maintenance Supervisor 3.8.03. Maintenance Worker	
			Radiation Protection Expert Radiation Protection Officer Radiation Protection Worker	3.9.01. Radiation Protection Manager 3.9.02. Radiation Protection Officer 3.9.03. Radiation Protection Worker
			Industrial Safety and Environment Radiochemistry	3.9.04. Industrial Safety Engineer 3.9.05. Safety Case Expert 3.9.06. Environmental Expert 3.9.07. Radioprotection Technician 3.9.08. Radiochemistry Manager 3.9.09. Nuclear Laboratory Technician Chemistry
	3.10 Site release	Safety and Environmental worker	3.10.1. Final Release Process Supervisor	
	<b>1</b>	<b>10</b>	<b>16</b>	<b>45</b>

**Table 4: Input data for ESCO**

Occupations			Skills & competences	Qualifications	Jobs
Broader (Occupation groups)	Occupation PT (Preferred term)	Occupation Definition	Cross-sector skills and competences		
<b>An occupation=</b> a grouping of jobs involving similar tasks and which require a similar skills set	<b>Preferred term=</b> is used to represent a concept in ESCO in a specific language-	<b>Occupation Definition=</b> describes the tasks and skills set associated to the specific occupation		<b>A qualification=</b> is the formal outcome of an assessment and validation process, obtained when a competent body determines that an individual has achieved LOs to given standards	<b>A job =</b> is bound to a specific work context and executed by one person
Decommissioning activities	3.7. Radioactive waste	Ensure safe processing, handling (on-site), storage of all types of solid and liquid radioactive waste generated during decommissioning	A set of common competences necessary in order to support the implementation of: <ul style="list-style-type: none"> <li>• nuclear safety culture</li> <li>• nuclear security culture</li> <li>• radiation protection culture</li> <li>• ALARA culture which is embedded in the RP culture</li> <li>• health safety culture</li> </ul>	Radioactive Waste Manager	3.7.01. Radioactive Waste Manager
					3.7.02. Radioactive Waste Manager-characterisation
					3.7.03. Radioactive Waste Manager-processing
				Radioactive Waste Worker	3.7.04. Radioactive Waste Worker-characterisation
					3.7.05. Radioactive Waste Worker-processing
					3.7.07. Transport responsible
	3.9. Health, safety and environmental	Ensure compliance of decommissioning with the Radiation Protection, Health Physics and environmental principles, issues in order to ensure effective protection of individuals, general public and the environment during the decommissioning of Nuclear Power Plant		Radiation Protection Expert	3.9.01. Radiation Protection Manager
				Radiation Protection Officer	3.9.02. Radiation Protection Officer
				Radiation Protection Worker	3.9.03. Radiation Protection Worker
				Industrial Safety and Environment	3.9.04. Industrial Safety Eng.
					3.9.05. Safety Case Expert
					3.9.06. Environmental Expert
Radiochemistry	3.9.07. Radioprotection Technician				
	3.9.08. Radiochemistry Manager				
	3.9.09. Nuclear Laboratory Technician – Chemistry				

## Deliverable 3

### Methodology for nuclear qualifications design

The current methodology is focused on the ways to be followed in order to fulfil the ECVET requirements for nuclear qualifications design and to develop the competence based qualification system (CB-QS).

The prerequisites for starting the process of nuclear qualifications design are the following:

- Preparation of the toolbox, containing at list three tools: ESCO;EQF and ECVET (all based on key the concept of LOs)
- The working team should get a deep understanding and mastering of ECVET manifold innovations
- Preparing a Methodology for the nuclear (decommissioning) qualification design

#### 1. Modelling the European nuclear labour market

The dynamics of European energy labor market (EELM), in particular of European nuclear energy labor market (ENELM), is the effect of the feedback between individuals (workers and learners) and corporations (employers) through markets and the exchange of goods and services.

Based on the above remark, the **European nuclear energy labor market (ENELM)** would be modeled as a feedback system, illustrated in the Figure 1.

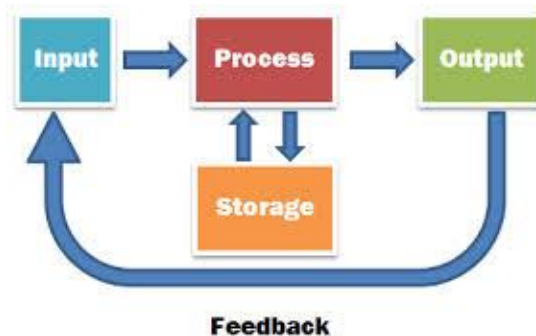


Fig. 1: The model of European nuclear energy labor market

The main features of the ENELM model are:

- **European nuclear energy labor market (ENELM)** has five components: nuclear industry (employers); workers and learners; competent authorities for occupations and qualifications; education and training (E&T) providers and Nuclear Regulatory Bodies (NRB);
- **ENELM-Dynamic system:** it means that the ENELM's behavior changes over time, often in response to external stimulation or forcing;
- **ENELM- modelled as Feedback system/FS:**
  - the term *feedback* refers to the connections between the five dynamic components (sub-systems) such that each system influences the other and their dynamics are strongly coupled;
  - the ENELM is seen as a whole (a black box) which interact with the environment through the Input, Output and Feedback

The dynamics of European nuclear energy labour market (ENELM) is consisting in the feedback between individuals (workers and learners) and corporations (employers) facilitated by specific tools such as:

- ESCO for online and skill-based job matching
- EQF for comparing qualifications awarded in different countries

- ECVET for understanding qualifications; for helping identify “skills gaps” against target qualifications; and upgrading the current qualification by recording their learning outcomes, whether acquired through formal, non-formal or informal learning

In the light of increasing the dynamics of European Energy Market (EEM) and of European nuclear energy market (ENEM) the development of the competence based qualification system (CB-QS) is an urgent need.

The first step in the development of the competence based qualification system (CB-QS) is to structure (or to design) the nuclear qualifications in units of learning outcomes (ULOs) and learning outcomes (LOs) as is illustrated in the Figure 2.

## 2. Input for the decommissioning qualifications design

The input elements of the qualifications design process are:

- Deliverable 1: Classification of occupations, qualifications and jobs in nuclear decommissioning
- Deliverable 3: Methodology- ECVET oriented-for the design of decommissioning qualifications
- WG 1: Input 1\_3.9.01\_Radiation Protection Manager(WG 1); Input 2\_ WD 4.2 (WG 1); Input 3\_ RPE Learning outcomes(WG 1)
- WG 2: Input 4\_3.7.01\_Radioactive Waste Manager; Input 5\_3.7.01\_Radioactive Waste Manager\_characterization; Input 6\_3.7.01\_Radioactive Waste Manager\_processing

## 3. Template for decommissioning qualifications design

The process of decommissioning qualifications design encompasses four steps, corresponding to the sections of the Template for Decommissioning qualification design (Annex 3.1):

- Section **1. DESIGN BASIS CONCEPTS**: concerns to the design basis concepts, the source for qualification features and references;
- Section **2. METADATA OF THE QUALIFICATION IN ESCO**: the key features of the concerned qualification to be published in ESCO;
- Section **3. QUALIFICATION CLASSIFICATION IN NUCLEAR JOB TAXONOMY**: cod of the representative job within Nuclear Job Taxonomy/NJT (Deliverable 2);
- Section **4. ECVET QUALIFICATION STRUCTURE**: according to ECVET approach, a qualification is structured in:
  - 4.1 Units of Learning Outcomes/ ULOs
  - 4.2 Learning Outcomes or S, C/A, K

## 4. Designing Units of Learning Outcomes

ECVET requirements for Units of Learning Outcomes/ULOs design are emphasised in the Table 1.

**Table 1: ECVET requirements for ULOs design**

No	ECVET requirements	Remarks
1	Unit of Learning Outcomes/ULOs = a set of knowledge, skills, and competences that represents the smallest part of a qualification that would be assessed and validated independently.	The qualification becomes more flexible/ adaptable to the market changes.
2	The title of the ULOs correspond to the main functions/role of the job/qualification	The qualification becomes transparent and understandable for someone who has no nuclear background.
3	Number of the ULOs would be between 5- 10	
4	Choosing the size of the ULO = problem of optimizing the time spent for assessment and validating of ULOs accumulated by an individual	

An example on designing Units of Learning Outcomes/ULOs for the NPP-Control Room Operator/CRO qualification is presented in the Table 2.

**Table 2: Example of Units of Learning Outcomes design for NPP-CRO qualification**

Checking questions	Job Description/JD 2.2.02_NPP CRO	
What is the main information source?	Job Description/JD 2.2.02_NPP CRO	
Question: Are the ULOs in line with the roles and functions of the job? Answer: the names of ULOs correspond to the main functions identified for the NPP-CRO. The qualification is transparent and understandable for someone without nuclear background.	<p><b>Senior Reactor Operator/CRO</b></p> <p>Formal validation of the competence for Senior Reactor Operator/CRO position</p> <p>Job requirements: the KSC required to perform the CRO's functions/roles (K,S, C/A defined in the JD 2.02.02; NucT8 and NucT9)</p>	Unit 6= Management of abnormal/emergency situation
Q: Would an ULO be an independent part of the CRO qualification? A: Each ULO would be an independent part of the NPP CRO qualification		Unit 5= Training programmes for control room crew
		Unit 4= Team and technical supervision
		Unit 3= Interfacing with other departments
		Unit 2= Maintenance and testing activities
		Unit 1= Operation of reactor facility

## 5. Designing S, C/A, K

ECVET definitions of K, S and C/A) are shown in the Table 3.

**Table 3: ECVET definitions of S, C/A, K**

No	ECVET definitions	Remarks
1	<b>The component S (skills)</b> of LO = shows what the learner is able to do-prepare; skills should be defined by suitable verbs that denote the learner's ability to carry out physical or intellectual tasks resulting into a concrete outcome.	In the nuclear sector the qualifications correspond mostly to the upper levels of EQF descriptors 5-7.
2	<b>The component C/A (competence/attitude)</b> of LO= refer the relevant personal and interpersonal attributes (attitudes) required for the function NPP-CRO.	
3	<b>The component K (knowledge/understanding)</b> of LO= is defined using verbs that offer to the learner the opportunity to demonstrate what he/she knows/understands.	

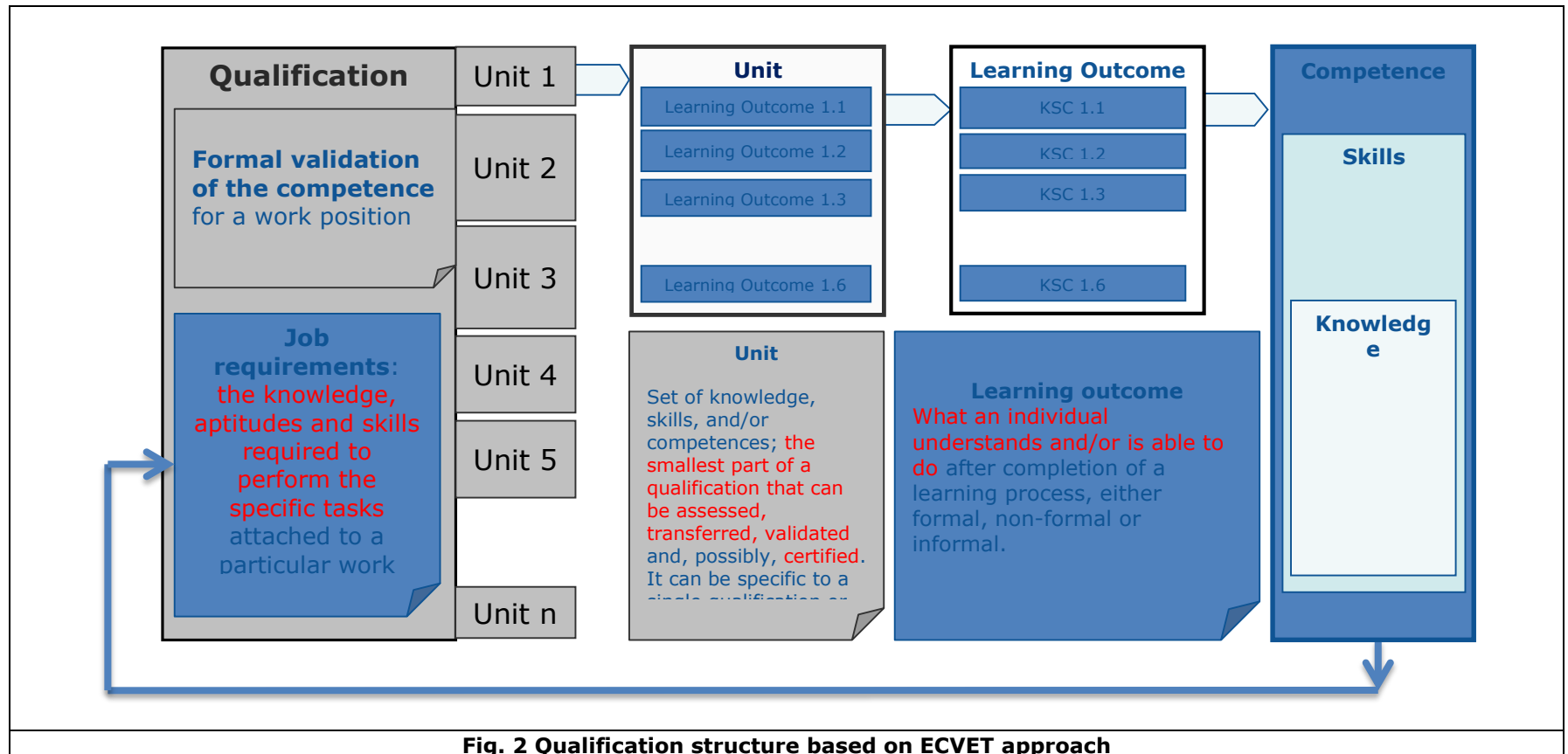
## 7. The design work flow

Within the WS will be organized two working groups. The work group's members and the qualification assigned to be designed are mentioned in the Table 4.



**Table 4: Working groups and qualifications assigned**

Group no	Qualification assigned	Members	Email	Remarks
Working Group 1	Radiation Protection Expert	Vladimir Slugen	vladimir.slugen@stuba.sk	Group leader
		Vanesa Sanchez	<a href="mailto:vsanchez@tecnatom.es">vsanchez@tecnatom.es</a>	
		Marinela Ilieva	<a href="mailto:marinela_ilieva@abv.bg">marinela_ilieva@abv.bg</a>	
		Eija Karita Puska	<a href="mailto:eija-karita.puska@vtt.fi">eija-karita.puska@vtt.fi</a>	
		Pedro Dieguez Porras	<a href="mailto:sec.enen@cea.fr">sec.enen@cea.fr</a>	
		Concetta FAZIO	<a href="mailto:concetta.fazio@ec.europa.eu">concetta.fazio@ec.europa.eu</a>	
Working Group 2	Radioactive Waste Manager	Marjatta Palmu	<a href="mailto:marjatta.palmu@posiva.fi">marjatta.palmu@posiva.fi</a>	Group leader
		Emilia Vassileva	<a href="mailto:evassileva@abv.bg">evassileva@abv.bg</a>	
		Liubomir Pironkov	<a href="mailto:lipironkov@npp.bg">lipironkov@npp.bg</a>	
		Rolf Aslaksrud Kristiansen	<a href="mailto:rolf@euromasc.org">rolf@euromasc.org</a>	
		Rocco Silverii	<a href="mailto:rocco.silverii@ec.europa.eu">rocco.silverii@ec.europa.eu</a>	
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**Template for decommissioning qualification design**

<b>1. DESIGN BASIS CONCEPTS</b>	
1.1 Design Basis Concepts	- the source of the qualification features: Role/Functions; Job requirements KSC/A (Ex.-JD developed within NJT; developed by the experts within the Lisbon WS) - ECVET reference documents
1.2 Other approaches developed by EFTS projects	- EFTS= Euratom Fission Training Scheme - EFTS project that developed similar qualification, ECVET oriented
1.3 References	- the list of information sources for designing process

<b>2. METADATA OF THE QUALIFICATION IN ESCO</b>	
2.1 Exact title of the qualification	- should be find in the Table 4, Deliverable 2
2.2 Type and category of qualification (Annex 2 - Types of qualifications in ESCO)	
2.3 Awarding body (if applicable)	- 2.3-2.10 - the key features of the concerned qualification to be published in ESCO;
2.4 Expiry date (if applicable)	
2.5 EQF level (if applicable)	
2.6 Relationship to one or more ESCO occupations	
2.7 Relationship to one or more knowledge, skills and competences	
2.8 Definitions (optional) = Role / Functions	
2.9 Scope note (optional)	
2.10 Expiry date (if applicable)	

<b>3. CLASSIFICATION OF THE QUALIFICATION IN THE NUCLEAR JOB TAXONOMY</b>	
3.1 Phase / Area	- the identification data of the JD developed by NJT corresponding to the concerned qualification; - should be find in the Table 4, Deliverable 2
3.2 Reference no.	
3.3 Occupational Category	
3.4 Functional Category	

<b>4. ECVET Qualification structure</b>			
<b>4.1 List of Units of Learning Outcomes</b>			
- Eg. Deliverable D 4a			
<b>4.2 S,C/A, K</b>			
	<b>S no.</b>	<b>Skills</b> (Technical and functional competence)	EQF level (1-8)
	S.1.1	- Eg. Deliverable D 4a	

<b>ULO 1</b>	...		
	S.1.9		
	<b>C/A no.</b>	<b>Competence</b> (Attitude; behavioural and personal competence)	EQF level (1-8)
	C.1.1.	- Eg. <a href="#">Deliverable D 4a</a>	
	....		
	C.1.6.		
	<b>K no.</b>	<b>Knowledge</b> (Cognitive competence)	EQF level (1-8)
	K.1.1.	- Eg. <a href="#">Deliverable D 4a</a>	
.....			
<b>ULO 5</b>			

**List of units of learning outcomes/ULOs:**

<b>1.</b>	<b>Radiation protection management</b>
<b>2.</b>	<b>Incidents, accidents, emergency preparedness and response plans</b>
<b>3.</b>	<b>Evaluation and optimisation of individual and collective doses</b>
<b>4.</b>	<b>Management of health, radiological and environmental risks</b>
<b>5.</b>	<b>Team and project management</b>

<b>Unit of learning outcomes No. 1: RADIATION PROTECTION MANAGEMENT</b>		
<b>Skills</b>	<b>Competences/Attitudes</b>	<b>Knowledge</b>
S.1.1. Define radiation protection priorities in decommissioning activities	C.1.1. Respect and apply national and international legislation	K.1.1. Radiation chemistry
S.1.2. Evaluate safety situation at the site from the radiation protection point of view	C.1.2. Built radiation protection procedures and framework in normal and emergency cases	K.1.2. Nuclear Physics
S.1.3. Select optimal solution for radiation characterisation of decommissioned components	C.1.3. Respect timeschedules	K.1.3. Dosimetry
S.1.4. Apply proper techniques for optimal performing radiological measurements	C.1.4. Keeping informed about changes in technology	K.1.4. Nuclear safety
S.1.5. Produce and update licencing and clearance documentation	C.1.5. Integrate the multirisk approach	K.1.5. Relevant national and international legislation and guidelines
S.1.6. Interpret collected radiological data	C.1.6. Ensure that safety culture is applied	K.1.6. Health protection
S.1.7. Ensure radiation protection support for dismantler		K.1.7. Environmental protection
S.1.8. Evaluate radiation situation in decontamination and dismantling process		K.1.8. Nuclear safety culture and human factor
S.1.9. Optimize radiation protection for transport and storage of radioactive waste		K.1.9. Nuclear facility components and systems
		K.1.10. Radiation ecology
		K.1.11. Contamination and decontamination
		K.1.12. Protective clothing and protective equipment
		K.1.13. Clasification of area and acces control
		K.1.14. Transport, handling and storage of radioactive waste
		K.1.15. Geological rad-waste disposal

**Assessment criteria:**

Knowledge in radiation protection including technology changes

Knowledge about radiation in environment

Knowledge about nuclear facility's SSC (structured Systems and components)

Ability to produce a prioritise list

Ability to organise work in rad. protection

Ability for correct interpretation and reporting of radiological parameters

Demonstrate safety culture behaviour

Ability to evaluate and implement corrective measures

Ability to take responsibility for operative decisions

Ability to produce the regulatory documentation comply with regularatary requirements

Ability to develop procedures for normal and emergency situation based on risk assessment

**Unit of learning outcomes No. 2: INCIDENTS, ACCIDENTS, EMERGENCY PREPAREDNESS AND RESPONSE PLANS**

Skills	Competences/Attitudes	Knowledge
<p>S.2.1. Ensure execution of emergency plans</p> <p>S.2.2. Identify and detect emergency or hazards</p> <p>S.2.3. Monitor radiation situation in emergency case</p> <p>S.2.4. Preparing emergency plans</p> <p>S.2.5. Prepare emergency exercises</p> <p>S.2.6. Mitigate the consequences of accidental situation</p> <p>S.2.7. Protect personnel in restricted areas as well as on site</p> <p>S.2.8. Support management to provide information to public</p> <p>S.2.9. Evaluate radiation situation in emergency case</p> <p>S.2.10. Predict next development of emergency case</p> <p>S.2.11. Rate abnormal situation</p> <p>S.2.12. Implement protective actions for incidental and accidental conditions</p>	<p>C.2.1. Assume position and responsibility in emergency plans</p> <p>C.2.2. Be reactive on changing situation in emergency case</p> <p>C.2.3. Decide about radiation situation in emergency case</p> <p>C.2.4. Distinguish and select the adequate data</p> <p>C.2.5. Stress control in emergency situation</p> <p>C.2.6. Report</p>	<p>K.2.1. Emergency preparedness</p> <p>K.2.2. Emergency planning</p> <p>K.2.3. Several accident management</p> <p>K.2.4. Nuclear safety</p> <p>K.2.5. Relevant national and international legislation and guidelines</p> <p>K.2.6. Health protection</p> <p>K.2.7. Environmental protection</p> <p>K.2.8. Nuclear safety culture and human factor</p> <p>K.2.9. Nuclear facility components and systems</p> <p>K.2.10. Radiation ecology</p> <p>K.2.11. Contamination and decontamination</p> <p>K.2.12. Protective clothing and protective equipment</p> <p>K.2.13. Classification of area and access control</p> <p>K.2.14 INES</p>

**Assessment criteria:**

**Unit of learning outcomes No. 3: EVALUATION AND OPTIMISATION OF INDIVIDUAL AND COLLECTIVE DOSES**

<b>Skills</b>	<b>Competences/Attitudes</b>	<b>Knowledge</b>
S.3.1. Monitor decommissioned areas S.3.2. Evaluate dose rates and radioactive contamination S.3.3. Evaluate the radiation situation S.3.4. Evaluate problems regarding radiation protection and dosimetry S.3.5. Ensure the maintenance of radiation protection instruments and materials S.3.6. Optimise radiation protection methods and techniques for decommissioning S.3.7. Provide information about radiological situation	C.3.1. Monitor the state of science and technology in the field of radiation protection in decommissioning C.3.2. Comply with legal requirements of radiation protection and dosimetry in national regulations and rules C.3.3. Adopt advisor role to various decommissioning staff	K.3.1. Measurement of radioactive characteristics K.3.2. Detectors for radiation monitoring K.3.3. Dosimetry K.3.4. Radiation protection K.3.5. Limits and norms K.3.7. Statistical assessment of data K.3.8. Computer modelling simulation K.3.9. ALARA principles

**Assessment criteria:**



**Unit of learning outcomes No. 4: MANAGEMENT OF HEALTH, RADIOLOGICAL AND ENVIRONMENTAL RISKS**

Skills	Competences/Attitudes	Knowledge
S.4.1. Evaluate health and radiological risks S.4.2. Evaluate environmental risks S.4.3. Apply risks assessment methods in decommissioning S.4.4. Provide internal information about risks assessment S.4.5. Undertake corrective measures S.4.7. Harmonise health and regulatory requirements	C.4.1. Ensure compliance with national and international regulations and standards C.4.2. Identify and share information at internal and external level C.4.3. Decide about corrective measures C.4.4. Act respecting safety standards	K.4.1. Risks assessment and management K.4.2. Health and environmental standards, codes and guidelines K.4.3. Biological acceptance of irradiation K.4.4. Health protection K.4.5. Environmental protection K.4.6. Radiation protection K.4.7. Human behaviour in stress condition K.4.8. Human behaviour and radiological risks
<p><b>Assessment criteria:</b></p>		

## Unit of learning outcomes No. 5: TEAM AND PROJECT MANAGEMENT

Skills	Competences/Attitudes	Knowledge
S.5.1. Participate in recruitment process S.5.2. Plan and provide solutions for initial and continuing specialised training for employees S.5.3. Processing of activities S.5.4. Prioritise objectives S.5.5. Work planning S.5.6. Allocate tasks and assign personnel S.5.7. Develop teamwork S.5.8. Anticipate to unsolved conflicts S.5.9. Monitor project S.5.10. Evaluate individual and team performance S.5.11. Perform managerial communication	C.5.1. Lead the working teams C.5.2. Motivate personnel via awards and rewards C.5.3. Manage working tasks C.5.4. Report to leaders C.5.5. Be open to progressive suggestions from team C.5.6. Support the organisational change C.5.7. Be critical C.5.8. Show conviction C.5.9. Anticipate and reduce stress and tension C.5.10. Comply with legislation, convention and standards C.5.11. Demonstrate authority C.5.12. Demonstrate equitability	K.5.1. Organisation of human resources K.5.2. Social regulation K.5.3. Recruitment process K.5.4. Individual and team performance K.5.5. Project management K.5.6. Managerial communication principles K.5.7. Principles of coordination and motivation of team K.5.8. Resolution of conflict K.5.9. Work planning K.5.10. Training solutions

**Assessment criteria:**

## Qualification no 2/Q 2: RADIOACTIVE WASTE MANAGER

Level 6 EQF

### List of units of learning outcomes/ULOs:

<b>1.</b>	<b>Management</b>
<b>2.</b>	<b>Waste characterization and inventory [for decommissioning]</b>
<b>3.</b>	<b>Radioactive waste sorting and processing for decommissioning</b>
<b>4.</b>	<b>Operations management</b> (Logistics e.g. transfer/transport, procurement, materials, information, measurements, etc.)
<b>5.</b>	<b>Safety and security/Radiation and environmental protection</b>
<b>6.</b>	<b>Facility operation and maintenance</b>

<b>Unit of learning outcomes No. 1: MANAGEMENT</b>		
<b>Skills</b>	<b>Competences/Attitudes</b>	<b>Knowledge</b>
S.1.1. Occupational safety S.1.2. Quality and environmental management S.1.3. Compliance with requirements S.1.4. Resource management: Finance; HR devel + training S.1.5. Team Leadership S.1.6. Human performance improvement programmes		
<b>Assessment criteria:</b>		

<b>Unit of learning outcomes No. 2: WASTE CHARACTERIZATION AND INVENTORY [FOR DECOMMISSIONING]</b>		
<b>Skills (29)</b>	<b>Competences/Attitudes (12)</b>	<b>Knowledge (24)</b>
<p><b>S2.1. Categories of waste by type</b></p> <p>S2.1.1. Analyse radiological hazards using risk analysis techniques</p> <p>S2.1.2. Analyse radiological hazards using risk analysis techniques</p> <p>S2.1.3. Use radiation protection measures in carrying out the characterization</p> <p>S2.1.4. Use dosimetry instrumentation and equipment to measure contamination levels</p> <p>S2.1.5. Use dosimetry instrumentation and equipment to measure contamination levels</p> <p>S2.1.6. Apply measurement analysis using the waste classification system</p> <p>S2.1.7. Apply measurement analysis using the waste classification system</p> <p>S2.1.8. Analyse and produce detailed analysis reports (document)</p>	<p>C2.1. Apply the conservatism principle in regard to radiation and nuclear safety</p> <p>C2.2. Question when in doubt</p> <p>C2.3. Comply with existing conventions</p> <p>C2.4. Pay attention to detail</p> <p>C2.5. Comply with statistical convention in data/records interpretation</p> <p>C2.6. Analytical thinking</p> <p>C2.7. Numeracy</p> <p>C2.8. Work according to set plans and timetables;</p> <p>C2.9. Priority setting</p> <p>C2.10. Develop datas</p> <p>C2.11. Problem-solving</p> <p>C2.12. Punctuality</p>	<p>K2.1. Radioactivity</p> <p>K2.2. Radiation effects (human/environment, materials)</p> <p>K2.3 Safety culture accuracy</p> <p>K2.4. Dosimetry, equipment and techniques for radionuclide identification and quantification</p> <p>K2.5. Radiological Contamination</p> <p>K2.6. Risk analysis techniques and radiological hazard</p> <p>K2.7. Waste classification system and regulatory requirements on wastes</p> <p>K2.8. Statistics and data analysis methodology</p> <p>K2.9 Waste sources and types (solid, liquid, gas)</p> <p>K2.10. Radiochemistry</p> <p>K2.11. NPP systems and structures</p> <p>K2.12 NPP operation and modification history and trends in waste volumes over time</p> <p>K2.13. Decom strategy and plan</p> <p>K2.14. Database/software application for characterisation /inventory (e.g. facility database)</p>

<p>S2.1.9. Describe sources of different types of wastes  S2.1.10. Analyse the chemical composition of the wastes  S2.1.11. Describe sources of different types of wastes  <b>S2.2 Estimate waste volume by each category (inventory)</b>  S2.2.1. Calculate the volumes by type of waste  S2.2.2. Analyse the progression of waste accumulation at different stages of the plant life  S2.2.3. Record inventory, inventory results, and store the inventory data into the facility database  S2.2.4. Develop working level plans related to the inventory and to the set timetable  S2.2.5. Record inventory results and store the inventory data into the facility database  <b>S2.3 Develop characterisation plan (including criteria)</b>  S2.3.1. Develop working level plans related to the inventory and to the set timetable  S2.3.2. Apply the regulatory</p>		<p>K2.15. Decom strategy and plan  K2.16 Regulatory requirements  K2.17 Problem-solving, Management of people;  K2.18. Corporate culture  K1.19. Communication (internal&amp;external)  K2.20. Interactive communication  K2.21 Regulatory requirements for waste clearance  K2.22. Criteria for waste clearance  K2.23. Accountability; planning and evaluation  K2.24. Supervision, monitoring and appraisal abilities</p>
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<p>criteria on the waste types</p> <p>S2.3.3. Select the appropriate measurement techniques and instruments</p> <p>S2.3.4. Use database/software application for characterisation /inventory (facility database)</p> <p>S2.3.5. Use the records and data and produce summary reports</p> <p>S2.3.6. Produce work instructions for the data insertion</p> <p>S1.3.7. Define the functional requirements for the database modifications</p> <p><b>S2.4 Implement waste clearance process</b></p> <p>S2.4.1. Apply regulatory requirements to the characterised waste for clearance</p> <p>S2.4.2. Producing records according to regulation for clearance</p> <p>S2.4.3. Marking of the waste designated for clearance</p> <p>S2.4.4. Organise for the participation of regulatory inspections and interaction; planning and evaluation</p> <p>S2.4.5. Use the criteria for waste</p>		
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clearance S2.4.6. Communicate with the regulator in compliance with the requirements		
<b>Assessment criteria:</b>		

<b>Unit of learning outcomes No. 3: RADIOACTIVE WASTE SORTING AND PROCESSING FOR DECOMMISSIONING</b>		
<b>Skills</b>	<b>Competences/Attitudes</b>	<b>Knowledge</b>
<b>S.3.1. Show knowledge of nuclear installations systems</b> S.3.1.1 Estimate radiation source activities S.3.2. ....		
<b>Assessment criteria:</b>		

<b>Unit of learning outcomes No. 4: Operations management</b> (Logistics e.g. transfer/transport, procurement, materials, information, measurements, etc.)		
<b>Skills</b>	<b>Competences/Attitudes</b>	<b>Knowledge</b>
S.4.1. Monitor .....	C.4.1. ....	
S.4.2. Evaluate .....	C.4.2. ....	
	C.4.3. ....	
<b>Assessment criteria:</b>		



<b>Unit of learning outcomes No. 5: SAFETY AND SECURITY/RADIATION AND ENVIRONMENTAL PROTECTION</b>		
<b>Skills</b>	<b>Competences/Attitudes</b>	<b>Knowledge</b>
S.5.1. .... S.5.2. .... S.5.3. ....	C.5.1. .... C.5.2. .... C.5.3. ....	K.5.1. .... K.5.2. .... K.5.3. ....
<b>Assessment criteria:</b>		

<b>Unit of learning outcomes No. 6: Facility operation and maintenance</b>		
<b>Skills</b>	<b>Competences/Attitudes</b>	<b>Knowledge</b>
S.6.1. .... S.6.2. .... S.6.3. ....	C.6.1. .... C.6.2. .... C.6.3. ....	K.6.1. .... K.6.2. .... K.6.3. ....
<b>Assessment criteria:</b>		

### **3. Presentations**

- Mihail CECLAN Objectives and work plan
- Massimo FLORE HR demand and supply in nuclear energy (decommissioning) market
- Thierry LEFEUVRE ECVET for qualifications design: designing ULOs and LOs;  
Alexandra COSTA most required qualifications in nuclear (EQF 5-7)
- Mihail CECLAN European tools for achieving the single EU market-ESCO, ECVET and EQF
- Mihail CECLAN ECVET-oriented methodology for the design of decommissioning qualifications

# Joint Research Centre

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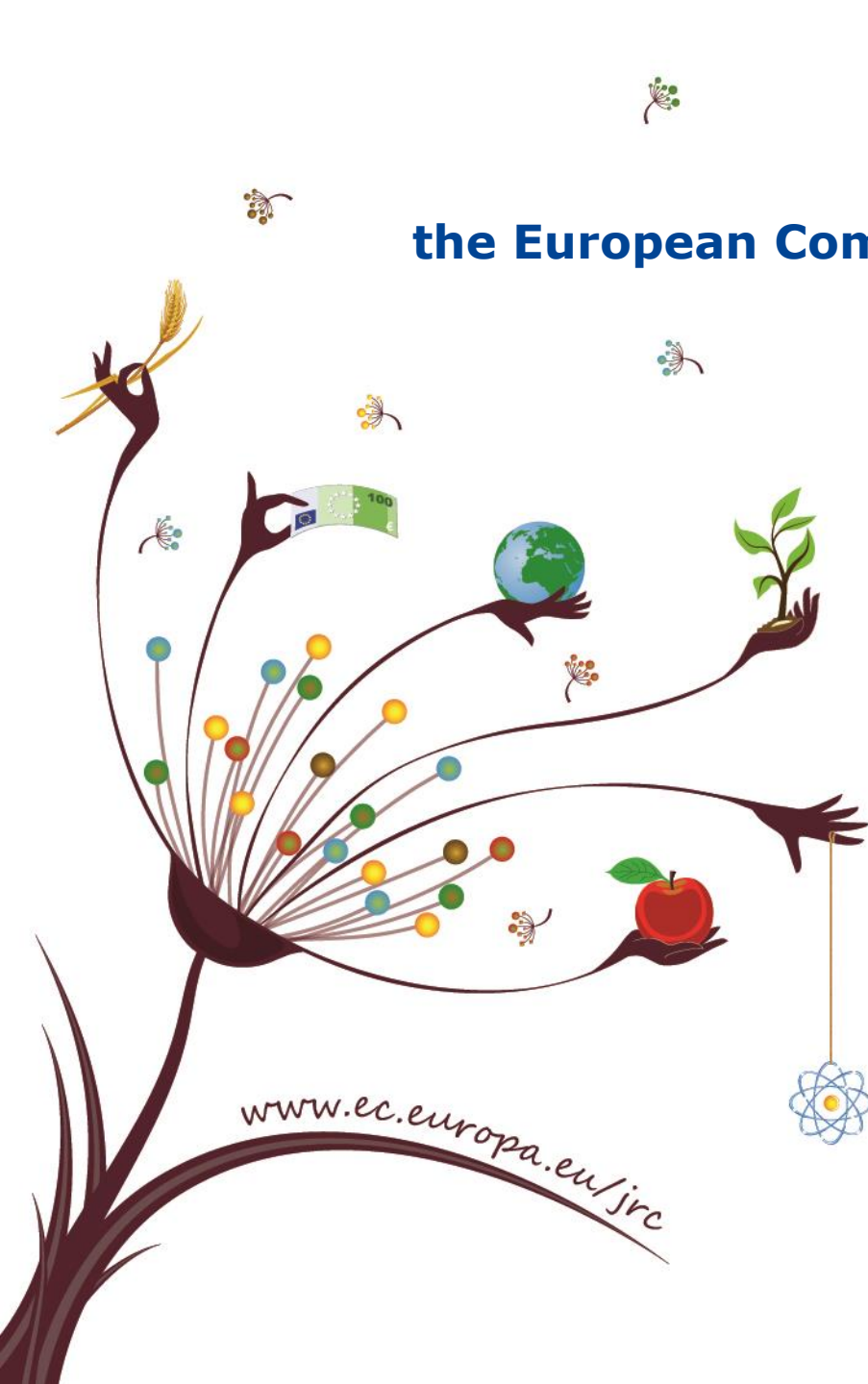
## Workshop on-Qualifications for Nuclear Decommissioning

### Objectives & Work plan

**Mihail CECLAN,**

Project Officer-EU Policies

**Lisbon, 6.10.2015**



# Agenda

- 1. The JRC sectorial approach on ECVET implementation in the NES**
- 2. Workshop's objectives, work plan and deliverables**

# 1. The JRC sectorial approach on ECVET implementation in the NES

- The ECVET implementation in the NES is guided – **JRC/EHRO-N strategy and road map for ECVET implementation**

## • Articles:

- **The road map for ECVET impl. in the NES**
- **ECVET Toolkit Customization for the NES**

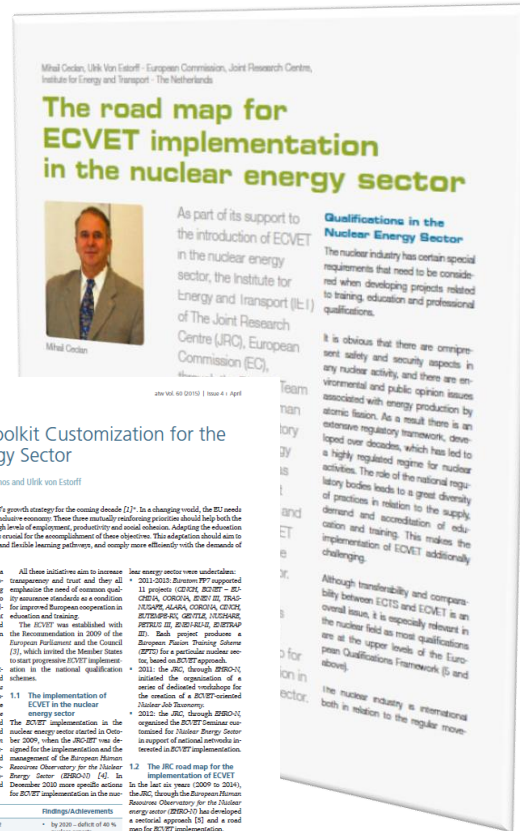
published in:

## ECVET Magazine- June issue 2014

<http://www.ecvet-team.eu/en/magazine/ecvet-magazine-20>

## ATW April issue 2015

<http://mobile.kernenergie.de/kernenergie-en/service/fachzeitschrift-atw/hefte-themen/2015/apr/04>



OPERATION AND NEW BUILD 228

### The ECVET Toolkit Customization for the Nuclear Energy Sector

Mikael Cocard, César Cheloni Ramos and Ulrik von Estorff

"Europe 2020" strategy is the EU's growth strategy for the coming decade (2). In a changing world, the EU needs to develop a smart, sustainable and inclusive economy. These three mutually reinforcing priorities should help with the EU and the Member States define high levels of employment, productivity and social cohesion. Adapting the education and training systems across Europe is crucial for the economic fulfilment of these objectives. This adaptation should aim to facilitate lifelong learning, mobility and flexible learning pathways, and comply more efficiently with the demands of the labour market.

In the context of "Europe 2020", a strategic framework for European cooperation in education and training (ET 2020) (2) was set up in order to achieve, among other goals, the modernisation of the education systems at all levels (school, vocational and higher education) and the promotion of lifelong learning.

**1. Introduction**  
ECVET is part of the European initiative for an enhanced education and training (the European Qualifications Framework (EQF) and the related national qualification frameworks), the European Quality Assurance Reference Framework for VET (EQAVET), and the European Quality Assurance Reference Framework for VET (EQAVET), and the European Quality Assurance Reference Framework for VET (EQAVET), and the European Quality Assurance Reference Framework for VET (EQAVET).

All these initiatives aim to increase transparency and trust and they all emphasize the need of common quality assurance standards as a condition for improved European cooperation in education and training. The ECVET was established with the recommendation in 2009 of the European Parliament and the Council (2), which invited the Member States to start progressive ECVET implementation in the national qualification systems.

**1.1 The implementation of ECVET in the nuclear energy sector**  
The ECVET implementation in the nuclear energy sector started in 2009, when the JRC-ET was designed for the implementation and management of the European Reference Framework for the Nuclear Energy Sector (ERF-NES) (4). In December 2010 more specific actions for ECVET implementation in the nuclear energy sector were undertaken:

No	Goal	Activities	Findings/Achievements
1	Scoping the HR demand & supply of the NES	1 <sup>st</sup> ERF-NES survey, 2012	• by 2020 - deficit of 40 % nuclear experts • The ECVET project was recommended for Nuclear Energy Sector (NES) as a key priority
2	The main knowledge based qualification to complete based on the nuclear industry	• Nuclear job taxonomy • Job description tool • Competence Catalogue (CC) based on the nuclear industry	• 100 jobs • 140 (1+ job) requirements defined in terms of NES • 2200 new entries
3	Developing competence based qualification system for NES	Developing nuclear qualifications based on ECVET approach	• 100 nuclear qualifications developed • 1000 new entries • 1000 new entries
4	The development of the mobility tools for NES	Memoranda of understanding, learning agreements and learners' transcripts of records	• Covered through the national qualification systems (NQS) projects supported by the ECVET
5	The qualification achievement process for NES	Developing specific tools for assessment, validation, recognition and accumulation of learning outcomes	• 100 tools developed • 1000 new entries
6	Supporting NCVET networks in setting up an NCVET pilot project	• 100 workshops • 1000 new entries	• testing the ECVET implementation • 1000 new entries

Tab. 1  
The ECVET road map for ECVET implementation in the nuclear energy sector

Operation and New Build  
The ECVET Toolkit Customization for the Nuclear Energy Sector | Mikael Cocard, César Cheloni Ramos and Ulrik von Estorff



# 1. The JRC sectorial approach for ECVET implementation in the NES

## The road map

✓ **First component – identifying the nuclear market needs in terms of HR**

→ **The gap between the Demand & Supply in the NES**

→ **How to fill the GAP by "nuclearization"**

✓ **The component 2 - defining job requirements in terms of KSC/A**

→ **NJT: 140 jobs in NPP-3 phases of NPP life cycle + JD**

✓ **The component 3 - developing CB-QS**

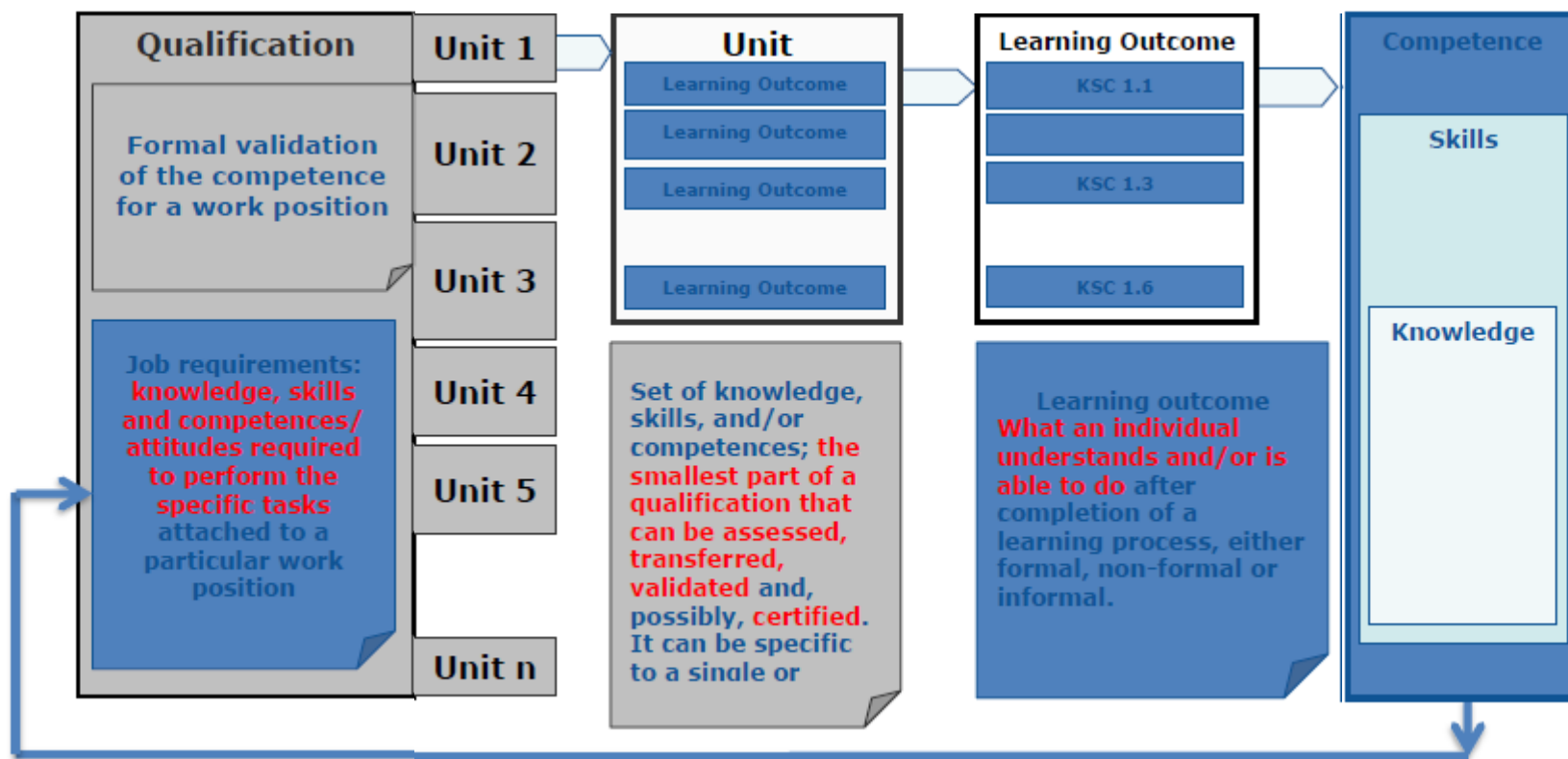
→ **to structure nuc. qualif. in ULOs & LOs → the WS main goal**

No	Goal	Activities	Findings/ Achievements
1	Scanning the HR demand & supply of the NES/ market	<ul style="list-style-type: none"> <li>1st EHRO-N survey - 2012</li> <li>2nd EHRO-N survey - 2014</li> </ul>	<ul style="list-style-type: none"> <li>by 2020- deficit of 30 % nuclear experts</li> </ul>
2	The shift from KB-QS to CB-QS	<ul style="list-style-type: none"> <li>Nuclear Job Taxonomy</li> <li>JD-job requirements defined KSC</li> </ul>	<ul style="list-style-type: none"> <li>140 jobs;</li> <li>140-JD</li> </ul>
3	Developing competence based-qualification system	Designing nuclear qualifications based on ECVET approach	1st exercise on designing NPP Operator qualifications
4	The development of the mobility tools for NES	MoU, learning agreements and learners' transcripts of records;	Covered through the indirect actions (EFTS projects) supported by the DG RTD
5	The qualification achievement process for NES	Developing specific tools for assessment, validation, recognition and accumulation of LOs.	
6	Collaboration with ENSREG, ENS and other nuclear stakeholders	Seminar on How ECVET can have an added value for the nuclear labour market	
7	Testing the ECVET at small scale	Supporting NUC-VET networks in setting up an ECVET pilot projects	

# 1. The JRC sectorial approach for ECVET implementation in the NES

The prerequisite to develop CB-QS: **deep understanding and mastering of ECVET manifold innovations**

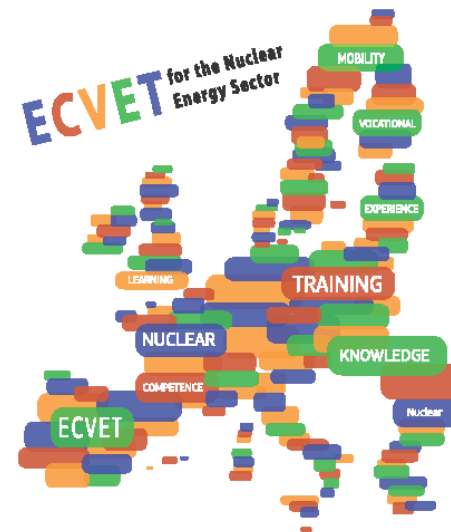
## ECVET dimensions & structure of a qualification



# 2. Workshop's objectives, work plan and deliverables

## Workshop's objectives, WP and deliverables

Objectives	
<b>Main objective</b>	To develop CB-QS in the nuclear decommissioning
<b>Specific objectives</b>	O1) Increasing the visibility of decommissioning sub-sector in ESCO
	O2) Development of a methodology -ECVET oriented- for decommissioning qualifications design
	O3) Designing 2 decommissioning qualifications
	O4) Assessment of Learning Outcomes



### Workshop on - Qualifications for Nuclear Decommissioning

6th - 9th October 2015  
Hotel DoubleTree by Hilton, Fontana Park, Lisbon,  
Portugal (PT)



# 2. Workshop's objectives, work plan and deliverables

## Workshop's objectives, WP and deliverables

Objectives		Work Plan
<b>Main objective</b>	To boost ECVET implementation in NPP Decommissioning	
<b>Specific objectives</b>	O1) Increasing the visibility of decommissioning sub-sector in ESCO	Work session 1
	O2) Development of a methodology -ECVET oriented- for decommissioning qualifications design	Work session 2
	O3) Designing 2 decommissioning qualifications	Work session 3
	O4) Assessment of Learning Outcomes	Work session 4



Workshop on -  
Qualifications for  
Nuclear Decommissioning

6th - 9th October 2015  
Hotel DoubleTree by Hilton, Fontana Park, Lisbon,  
Portugal (PT)

## 2. Workshop's objectives, work plan and deliverables

### Workshop's objectives, WP and deliverables

Objectives		Work Plan	Deliverables
<b>Main objective</b>	Developing CB-QS in nuclear decommissioning		
<b>Specific objectives</b>	O1) Increasing the visibility of nuclear energy sector in ESCO	Work session 1	<b>Deliverable 1-</b> Initiating the decommissioning sub-group for ESCO content development
			<b>Deliverable 2 -</b> Classification of occupations, qualifications and jobs in nuclear decommissioning
	O2) Development of a methodology -ECVET oriented- for decommissioning qualifications design	Work session 2	<b>Deliverable 3-</b> Methodology - ECVET oriented- for decommissioning qualifications design
	O3) Designing 2 decommissioning qualifications	Work session 3	<b>Deliverable 4-</b> Complete design of the RPE & the RW Manager qualifications
	O4) Assessment of Learning Outcomes	Work session 4	-





**Human Resources Trends and Analysis for the  
Nuclear Energy Sector. Post-Fukushima Report.**

Massimo FLORE  
*Scientific Officer*

*Lisboa, 6 October 2015*



**Institute for Energy  
and Transport**

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European Union policies  
and technology innovation to  
ensure sustainable, safe,  
secure and efficient energy  
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use and to foster sustainable  
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- ❖ Organization
- ❖ Bottom-up Approach
- ❖ Top-down Approach



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The logo for the Institute for Energy and Transport (iet), consisting of the lowercase letters 'iet' in a blue, cursive, handwritten-style font.

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# Senior Advisory Group Members



SCK-CEN ACADEMY  
FOR NUCLEAR SCIENCE AND TECHNOLOGY







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JRC SCIENTIFIC AND POLICY REPORTS

# PUTTING INTO PERSPECTIVE THE SUPPLY OF AND DEMAND FOR NUCLEAR EXPERTS BY 2020 WITHIN THE EU-27 NUCLEAR ENERGY SECTOR

*An EHRO-N report*

Veronika Simonovska  
Ulrik von Estorff

2012



Joint  
Research  
Centre

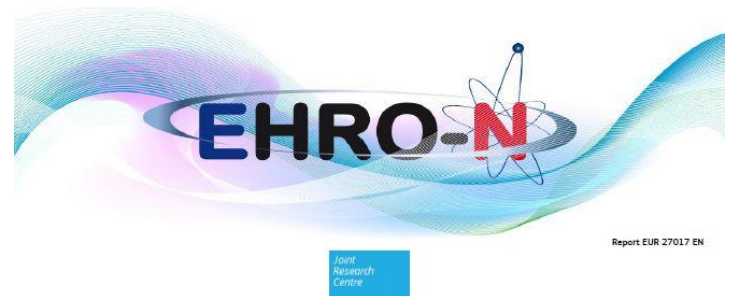


JRC SCIENCE AND POLICY REPORTS

# POST-FUKUSHIMA ANALYSIS OF HR SUPPLY AND DEMAND

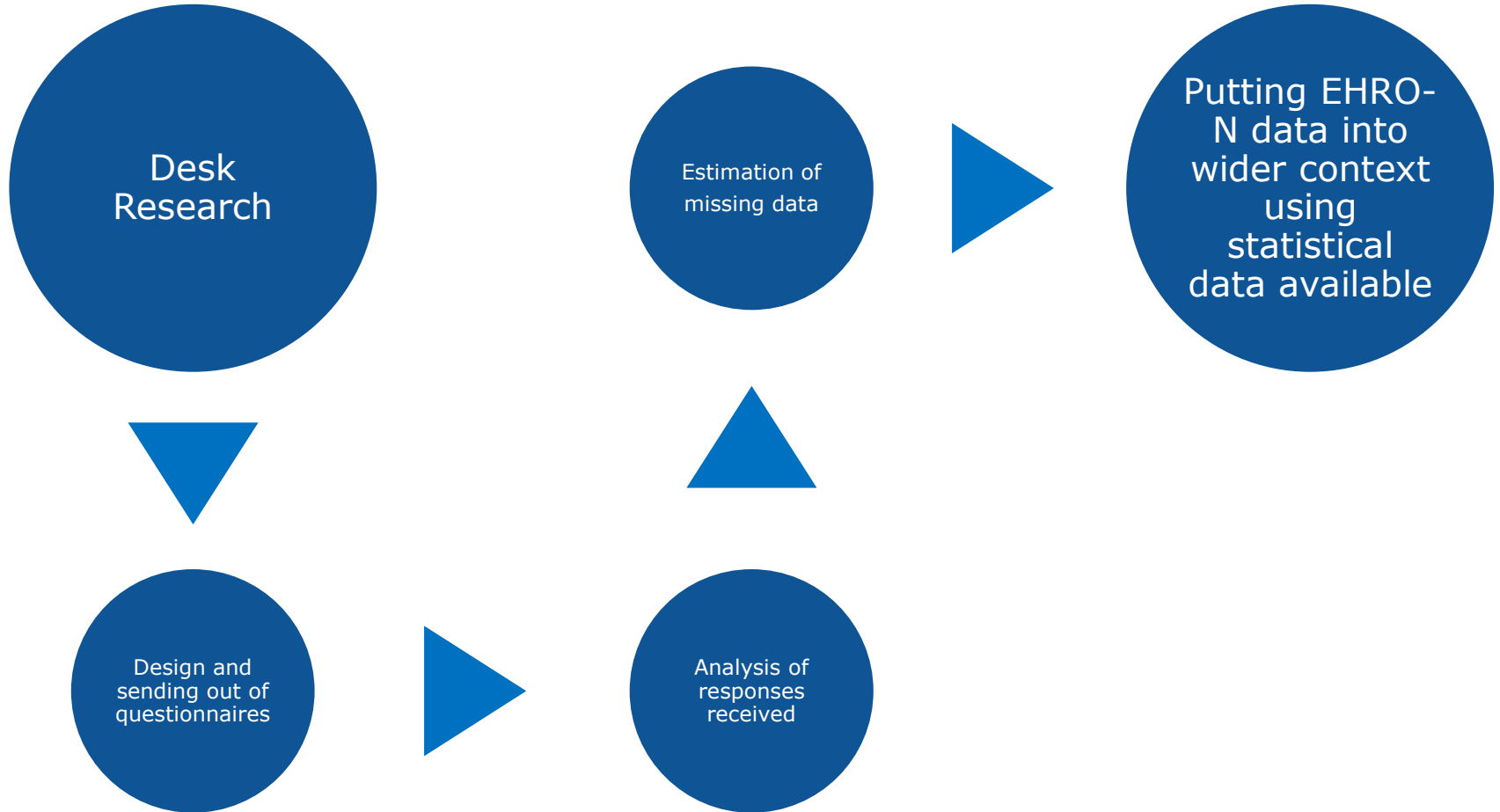
Roberto Brancucci  
Massimo Flore  
Ulrik von Estorff

2014



Joint  
Research  
Centre

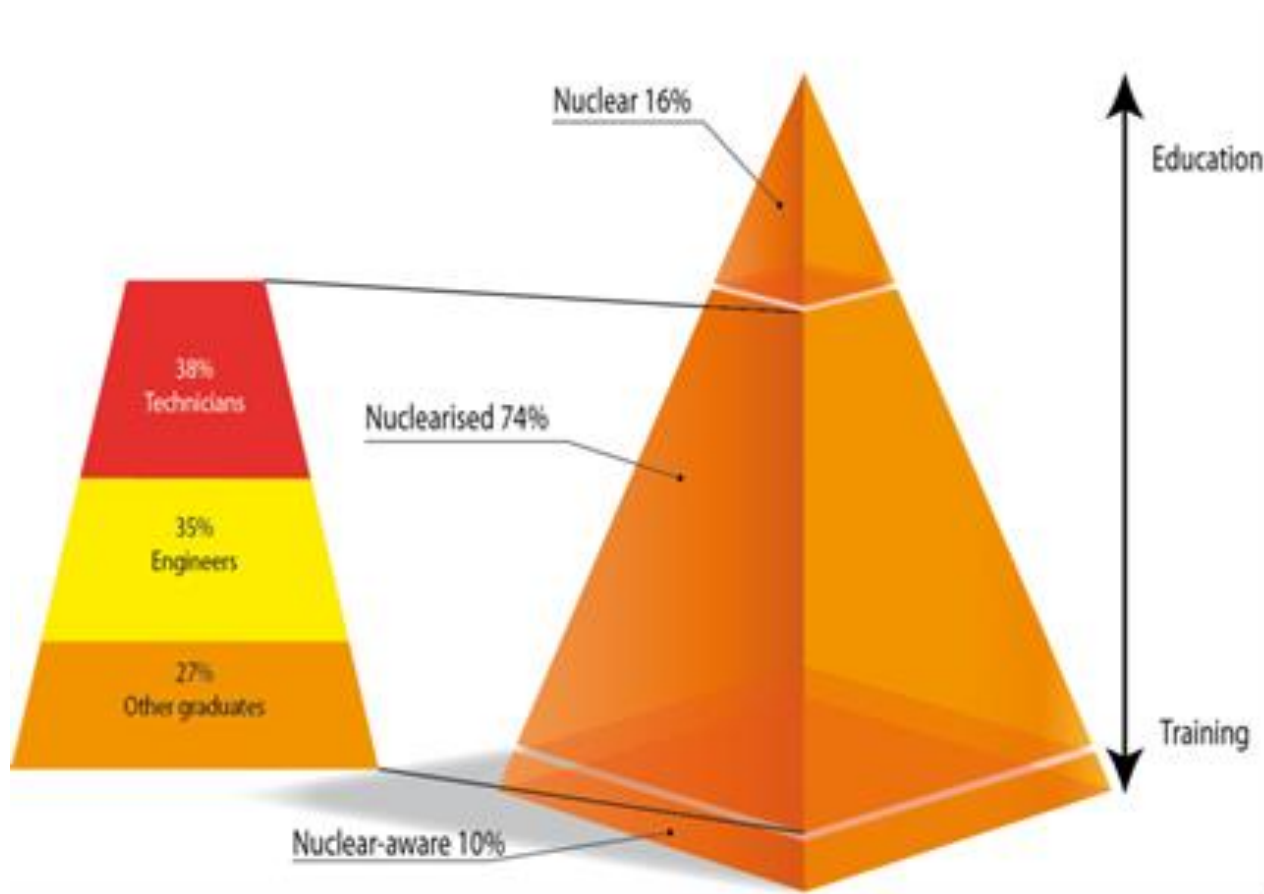
# Methodology



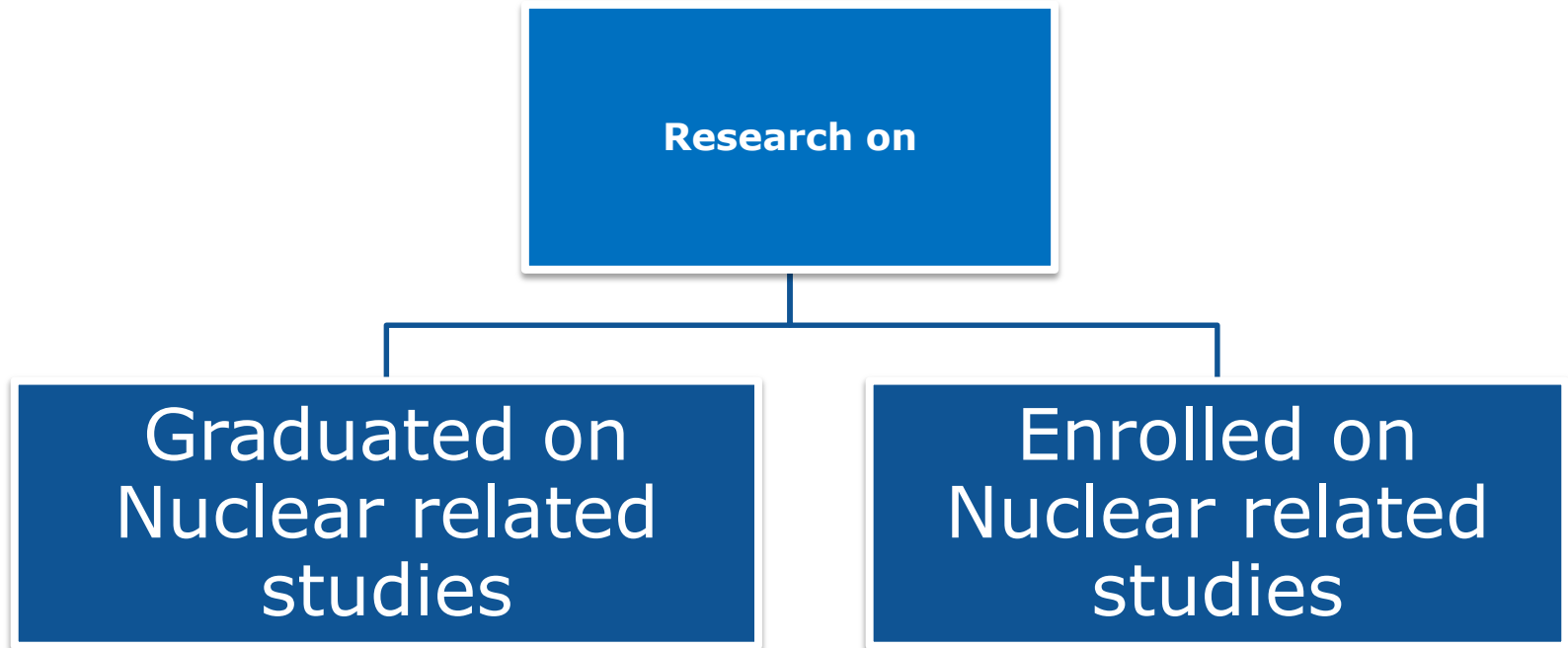


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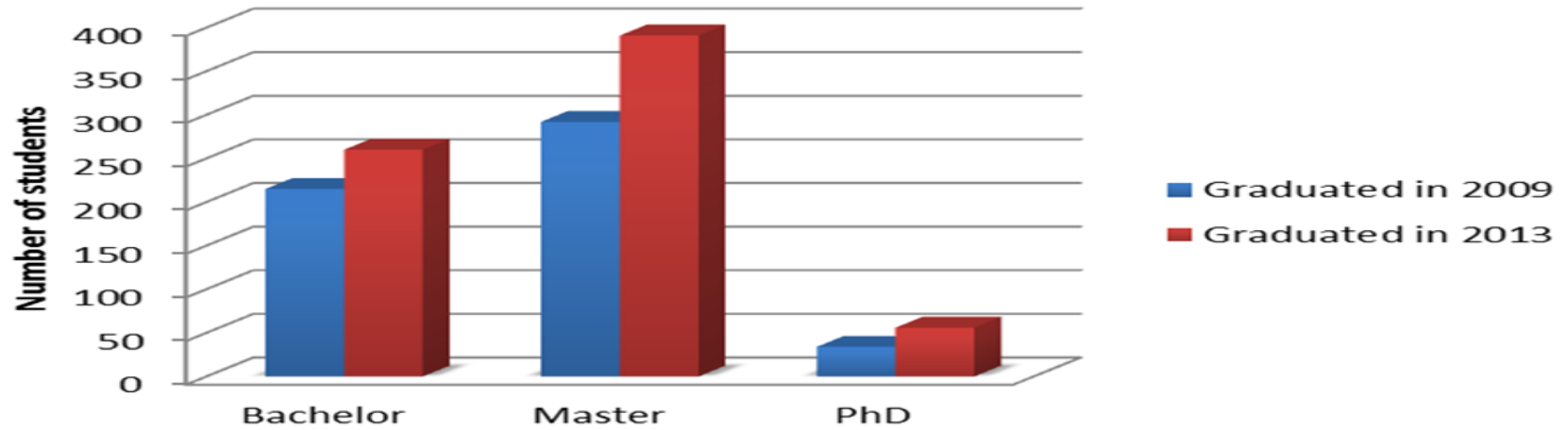
# Nuclear Skills Pyramid



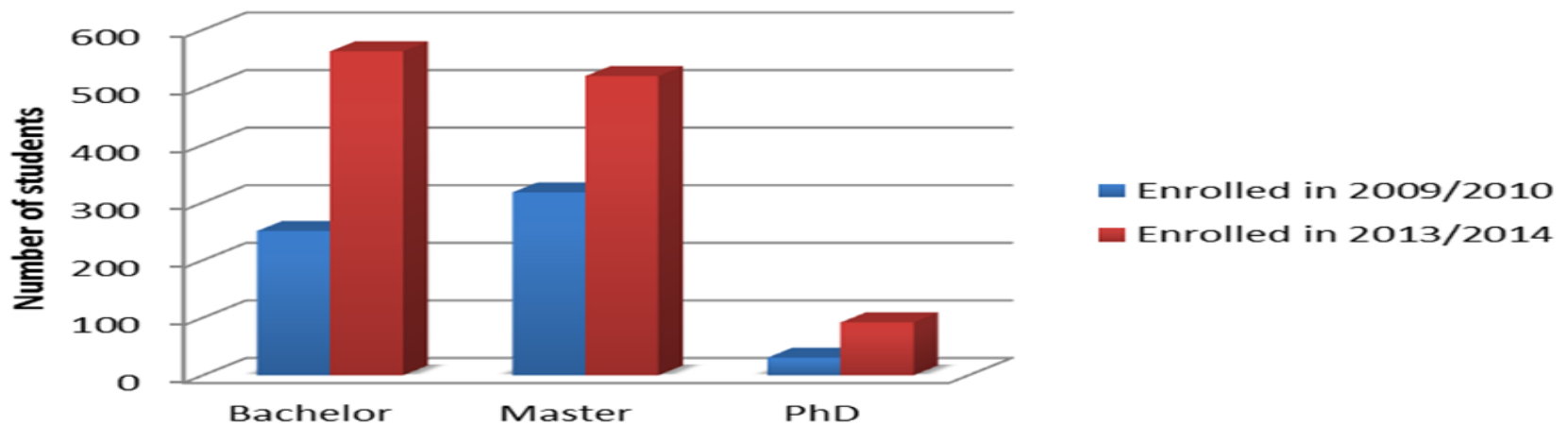
# Supply Side



### Students graduated in nuclear related studies



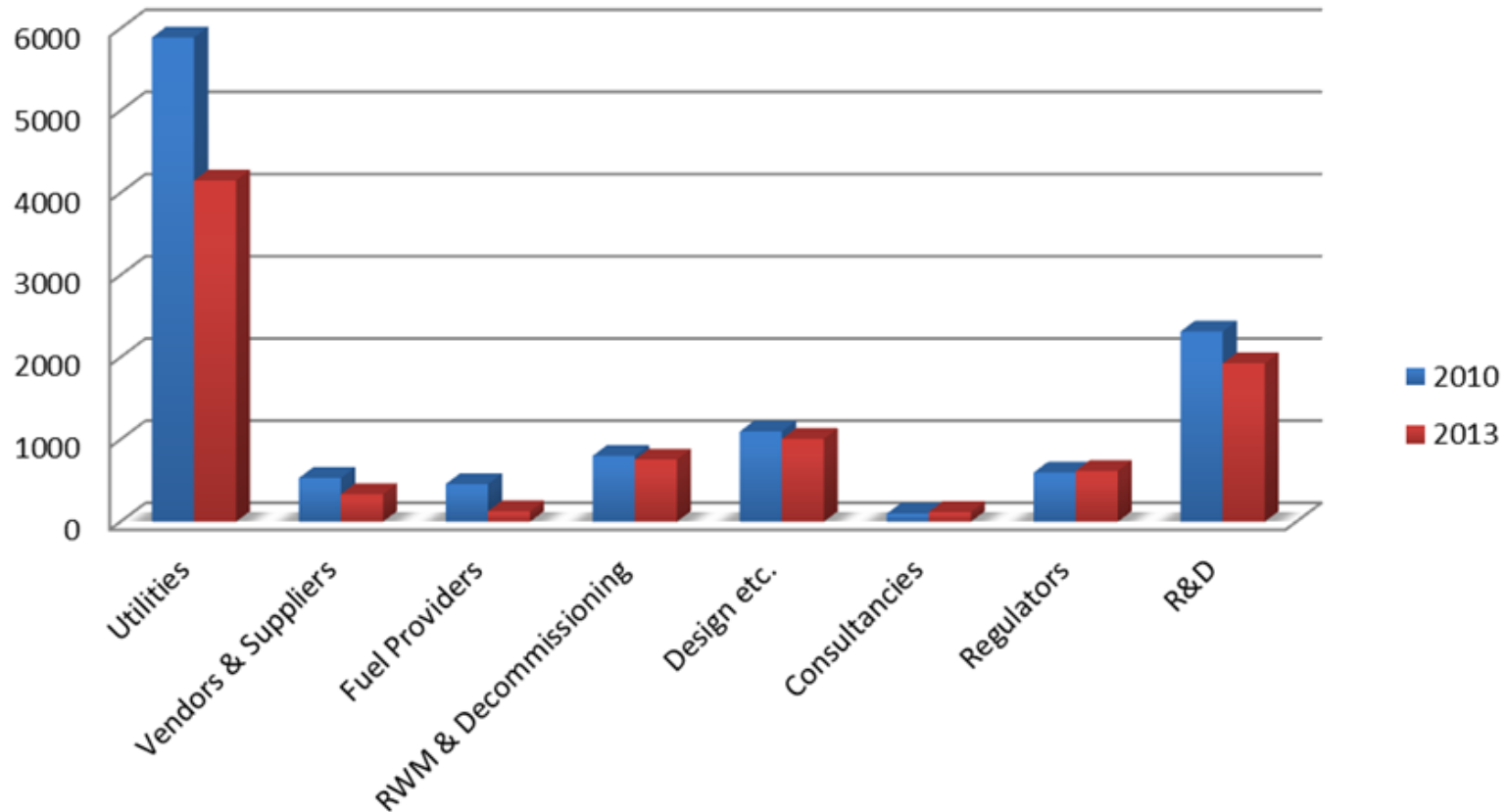
### Students enrolled in nuclear related studies



## Demand Side

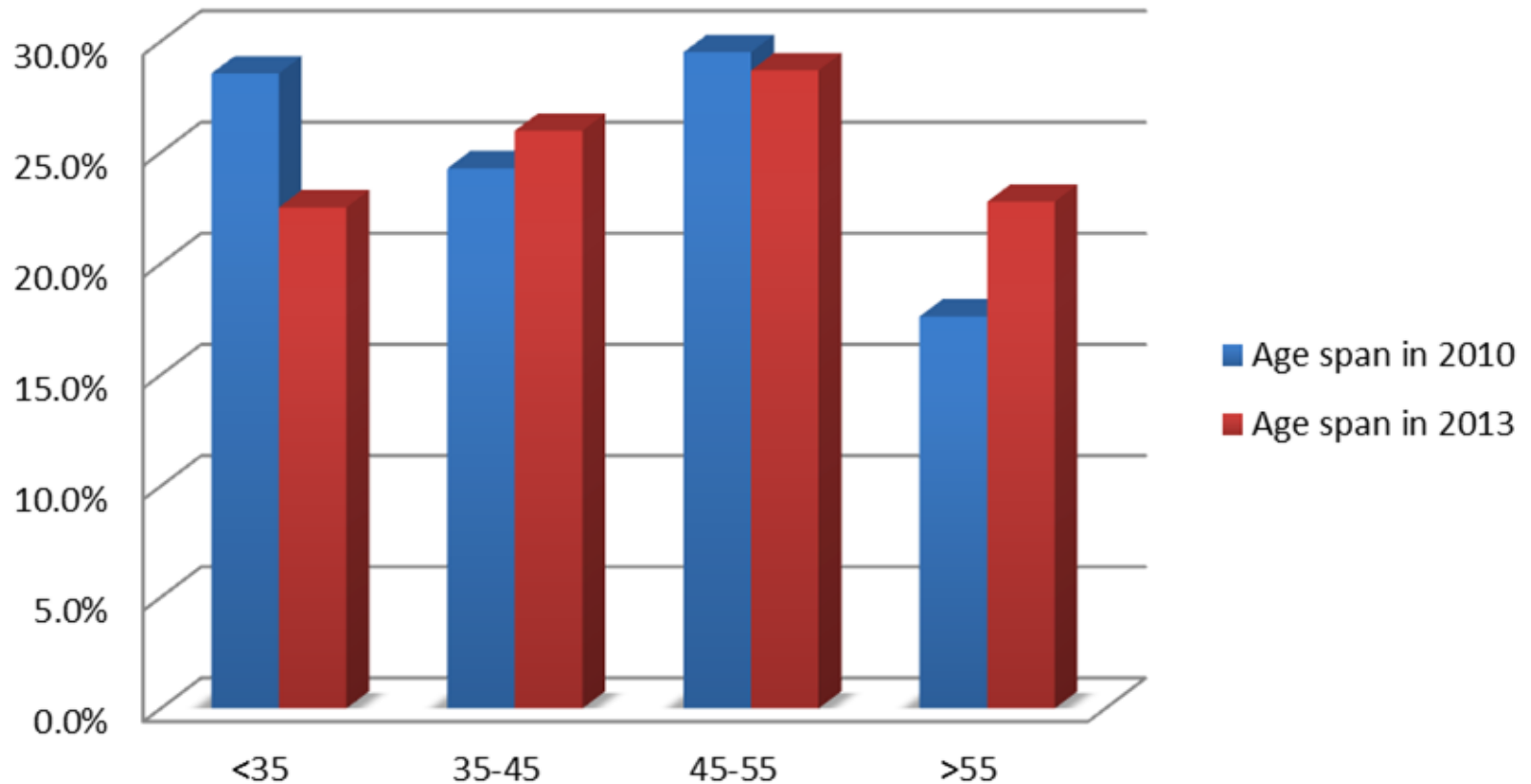


## Nuclear experts employed in 2010 & 2013





## Age distribution of nuclear workforce





- ❖ Organization
- ❖ Bottom-up Approach
- ❖ Top-down Approach



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European Commission  
Energy Roadmap 2050



OECD/IEA  
Technology Roadmap  
Nuclear Energy



JRC SCIENTIFIC AND POLICY REPORTS

Top-down workforce demand  
extrapolation from nuclear energy  
scenarios

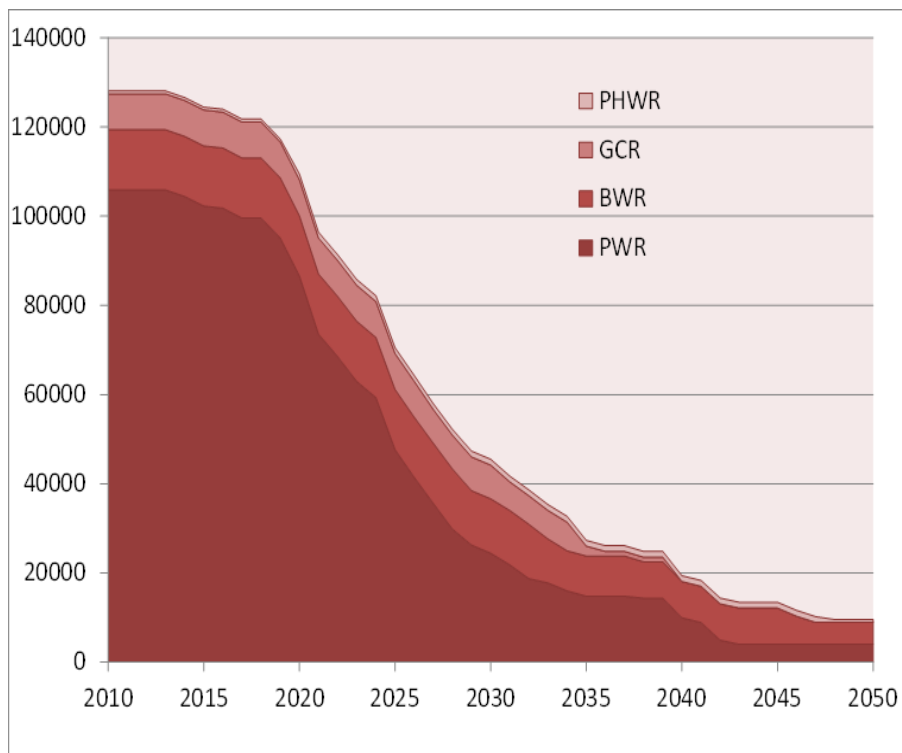
Ferry Roelofs  
Ulrik von Estorff

2013

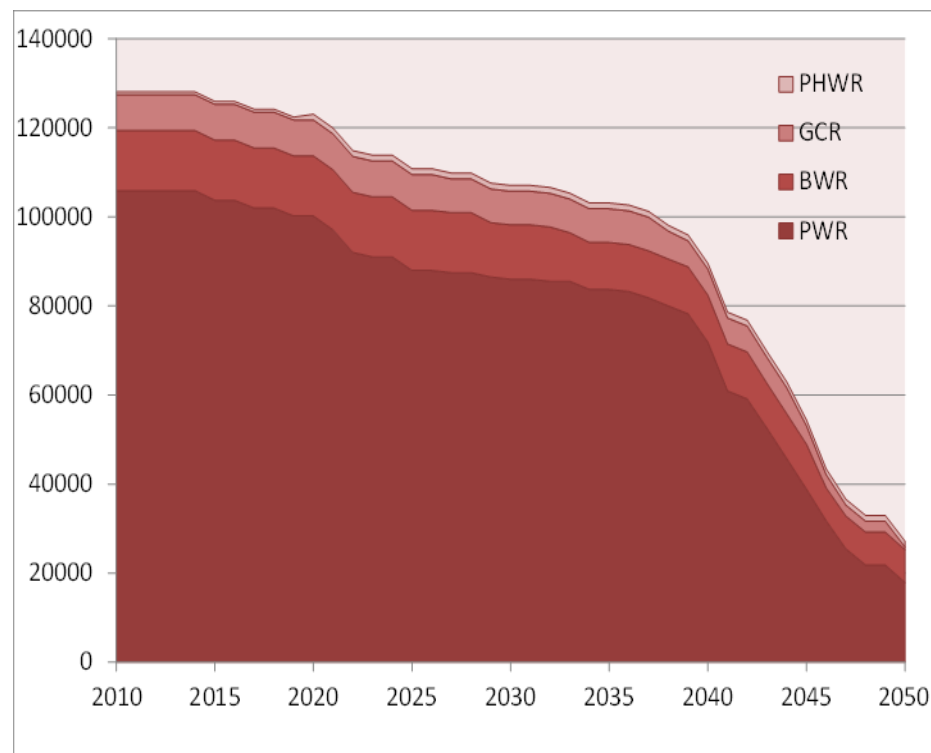


Report EUR 26000 EN

## Shutdown profile (installed power) of the current reactor park



No LTO

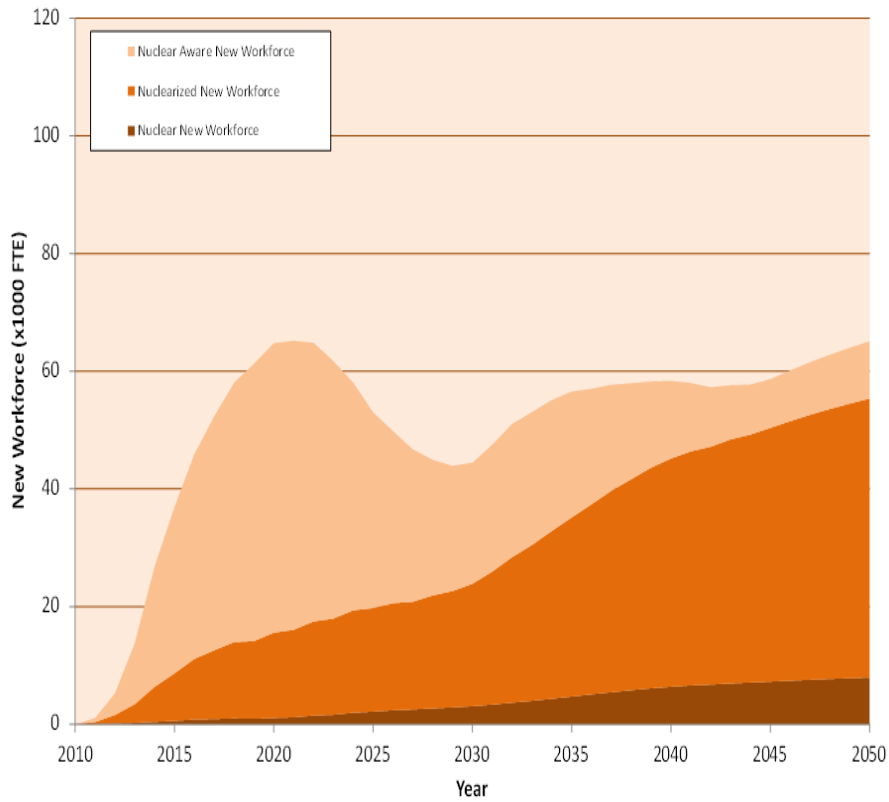


LTO

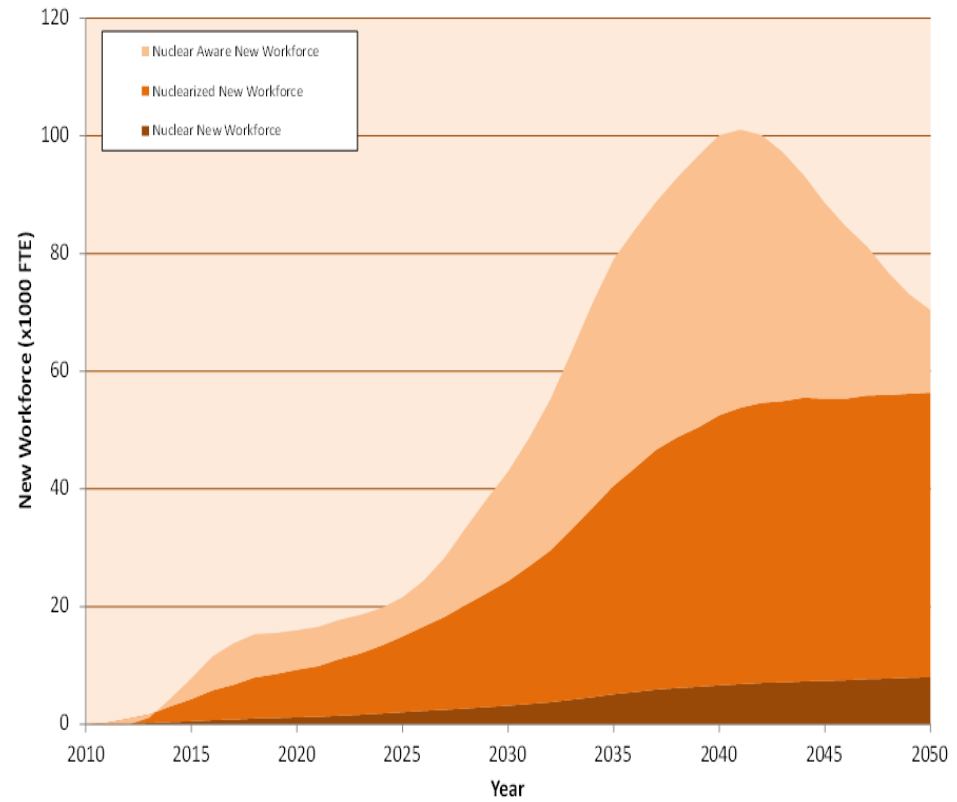


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## New workforce operations and construction



No LTO



LTO



## Massimo FLORE

*Scientific Officer*

European Commission  
Joint Research Centre – IET

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# **“Qualifications for Nuclear Decommissioning”**

**Lisbon 6th – 9th October 2015**

**Day 1**



## The common EU instruments

<b>EQF</b>	European qualifications framework
<b>QF-EHEA</b>	Qualifications framework for the European Higher Education Area
<b>EQAVET</b>	European quality assurance reference framework for VET
<b>ESG</b>	Standards and guidelines for quality assurance in the European Higher Education Area
<b>Europass</b>	CV, Language Passport, Certificate Supplement, Diploma Supplement, Mobility
<b>ECVET</b>	European credit system for VET
<b>ECTS</b>	European credit transfer and accumulation system for HE
<b>Validation principles</b>	Common European principles on validation on non-formal and informal learning
<b>ESCO</b>	European terminology on skills, competences, occupations and qualifications



# ECVET: one of several EU tools



- One of several European tools designed to: make **qualifications systems more easily understood and flexible** throughout the European Union (EU) to **support more mobility for workers and learners**

# ECVET objectives and technical components



## What are the general objectives of ECVET?

Transnational mobility

Lifelong learning

**R  
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Learning outcomes**

## How does ECVET contribute to mobility &LLL

Transparency of qualifications

Accumulation process

Transfer process

## ECVET technical components

Units of learning outcomes

ECVET points

Learners' personal transcript

Assessment of LO

Validation of LO

Recognition

Memorandum of understanding (partnership)

Learning agreements

Learners' personal transcript



- Learning outcomes are statements of what a learner knows, understands and is able to do on completion of a learning process and which are defined in terms of **knowledge**, **skills** and **competence**



- **'Knowledge'** means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study.



- **'Skills'** means the ability to apply knowledge and know-how to complete tasks and solve problems.



- **'Competence'** means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.

# Descriptors defining levels in EQF



Each of the 8 levels is defined by a set of descriptors indicating the L.O. relevant to qualifications at that level in any qualification system

Knowledge	Skills	Competence
Is described as theoretical and/or factual	Are described as <b>cognitive</b> (involving the use of logical, intuitive and creative thinking) and <b>practical</b> ( involving manual dexterity and the use of methods, materials, tools and instruments)	Is described in terms of responsibility and autonomy
<p><b>Level 1: Basic general knowledge</b>  <i>Level 2-7 hierarchy of 'knowledge':</i>  <i>Factual</i>  <i>Facts, principles, processes and general concepts</i>  <i>Comprehensive, specialised</i>  <i>Awareness of boundaries</i>  <i>Advanced</i>  <i>Highly specialised</i></p> <p><b>Level 8: Knowledge at the most advanced frontier of a field of work or study and at the interface between fields</b></p>	<p><b>Level 1: Basic skills required to carry out simple tasks</b>  <i>Level 2-7 hierarchy of 'solve problems':</i>  <i>routine – specific– abstract– complex and unpredictable – critical</i></p> <p><b>Level 8: The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice</b></p>	<p><b>Level 1: Work or study under direct supervision in a structured context</b>  <i>Level 2-7 hierarchy of 'contexts':</i>  <i>usually predictable – unpredictable change – unpredictable – complex, unpredictable and require new strategic approaches</i></p> <p><b>Level 8: Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes in the forefront of work or study contexts including research</b></p>

# Descriptors defining levels in EQF



Knowledge	Skills	Competence
Is described as theoretical and/or factual	Are described as cognitive and practical	Is described in terms of responsibility and autonomy
<b>Level 6</b> Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	<b>Level 6</b> Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study	<b>Level 6</b> Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups



# LO Exercise (K, S or C?)



- He/she is able to
  - ... receive orders and plan own procedural steps
  - ... explain regulations concerning the handling of hazardous substances
  - ... delegate the service and maintenance tasks taking into account specifications
  - ... communicate sincerely with clients
  - ... analyse data and present it as a basis for decisions
  - ... differentiate between separation and mix principles and corresponding procedures
  - ... develop a marketing plan and use marketing and PR instruments
  - ... reflect upon his/her own action
  - ... assign the necessary documents for service and maintenance

# LO Exercise (K, S or C?)

## How are LO formulated?



- Competence - He/she is able to
  - ... delegate the service and maintenance tasks taking into account specifications
  - ... reflect upon his/her own action
  - ... communicate sincerely with clients
- Skills - He/she is able to
  - ... receive orders and plan own procedural steps
  - ... analyse data and present it as a basis for decisions
  - ... develop a marketing plan and use marketing and PR instruments
- Knowledge - He/she is able to
  - ... explain regulations concerning the handling of hazardous substances
  - ... assign the necessary documents for service and maintenance
  - ... differentiate between separation and mix principles and corresponding procedures

# LO exercise EQF level



- take responsibility of planning their own work
- make creative solutions to abstract problems of the marketing concept after possible consultation with the marketing department and to filter important information for them
- follow concrete instructions of the team manager on tasks to be performed
- carry out simple tasks on planning the design process (textile)
- differentiate processing methods, production possibilities, quality standards and production means



- take responsibility of planning their own work (3)
- make creative solutions to abstract problems of the marketing concept after possible consultation with the marketing department and to filter important information for them (5)
- follow concrete instructions of the team manager on tasks to be performed (1)
- carry out simple tasks on planning the design process (textile) (2)
- differentiate processing methods, production possibilities, quality standards and production means (4)



- A unit is a **component of a qualification**, consisting of a **coherent set of knowledge, skills and competence** that can be **assessed and validated**
  - Reflect what learners can learn
  - List the learning outcomes that the learner is expected to achieve
  - What is to achieve is feasible

# How can learning outcomes be grouped to create units?



- Units should be constructed and organised in a coherent way with regard to the overall qualification,
- criteria according to which learning outcomes can be grouped:
  - related to the same set of occupational activities/tasks
  - related to the same product or production technique
  - related to the stages in the production process or process of performing a service
  - related to the same field of knowledge, skills or competence

# What information can be used for designing a unit?



- Identification of transferable parts of qualifications in units is relatively easy when:

The design is based on **activities/tasks/processes** the **qualification prepares for...**

- Units must
  - facilitates the **communication** of the content of the qualification to stakeholders outside the area of education and training: for example employers.
  - be **compatible with the assessment** of learning outcomes in the work place or in work-related situations.
  - are suitable for assessment, validation and recognition of learning outcomes achieved through **non-formal or informal learning**.



## Advantages

- Units can be obtained in a rather short period of learning and therefore are particularly **suitable for geographical mobility**
- They can also be suitable for adult learners who combine learning and employment or learners who are at risk of dropping out from longer programmes

## Disadvantages

- Because of the greater number of units in a qualification, this approach implies putting in place **a large number of assessments**
- Fragmentation of qualifications and of assessments may **make it more difficult to identify whether the learner can combine all the knowledge, skills and competence in a more complex manner**





## Advantages

- Assessment of a larger unit enables learners to demonstrate their capacity to **combine knowledge, skills and competence in view of delivering a more complex service or a product**
- The **number** of summative **assessments is small**

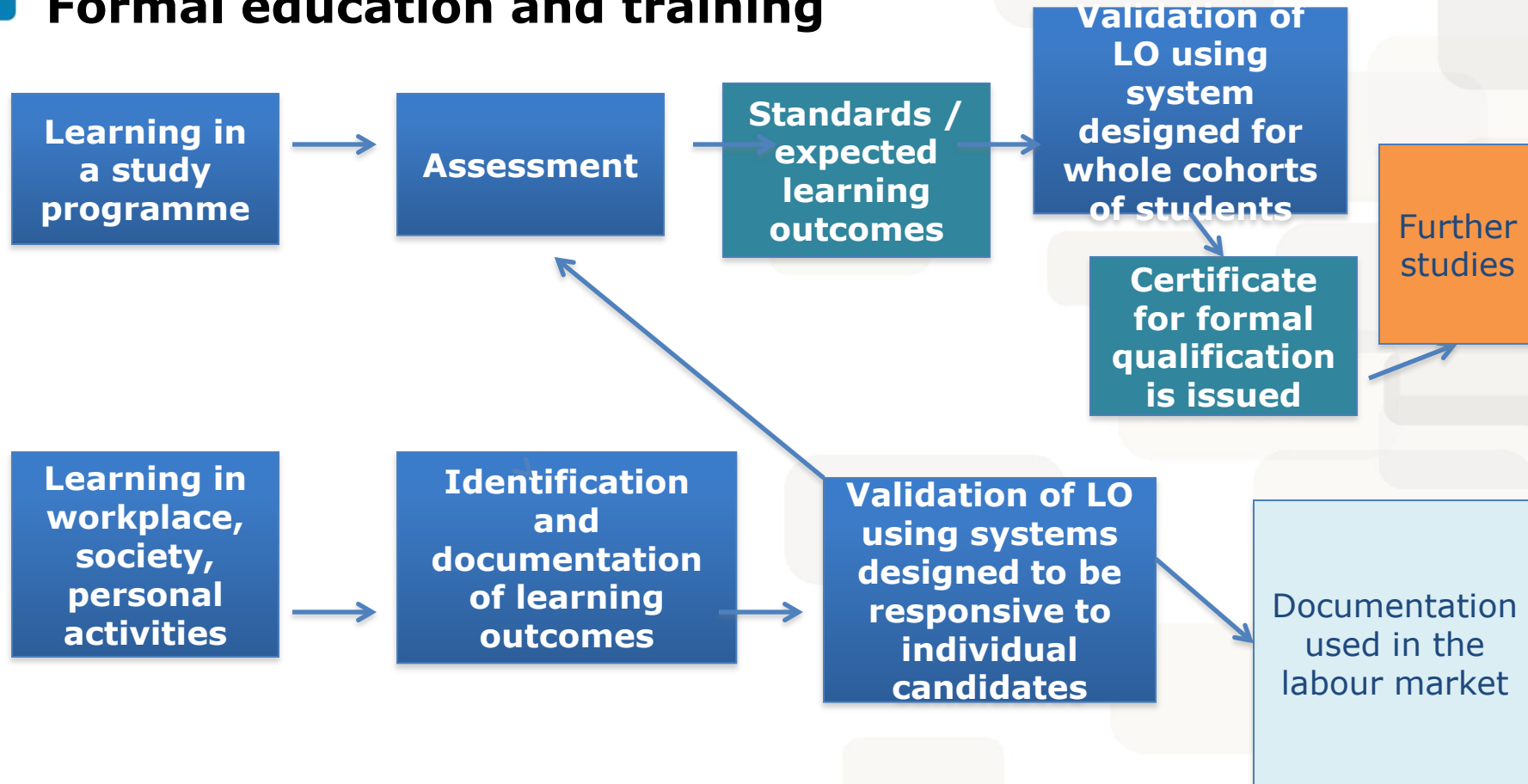
## Disadvantages

- **More substantial amount of learning activities is required to prepare for a unit.** Hence it may be difficult to achieve a full unit in the context of a short transnational mobility period
- The duration of learning activities preparing for the unit may be **too substantial for learners outside initial VET** to be able to benefit from accumulation

# The "old" learning pathway

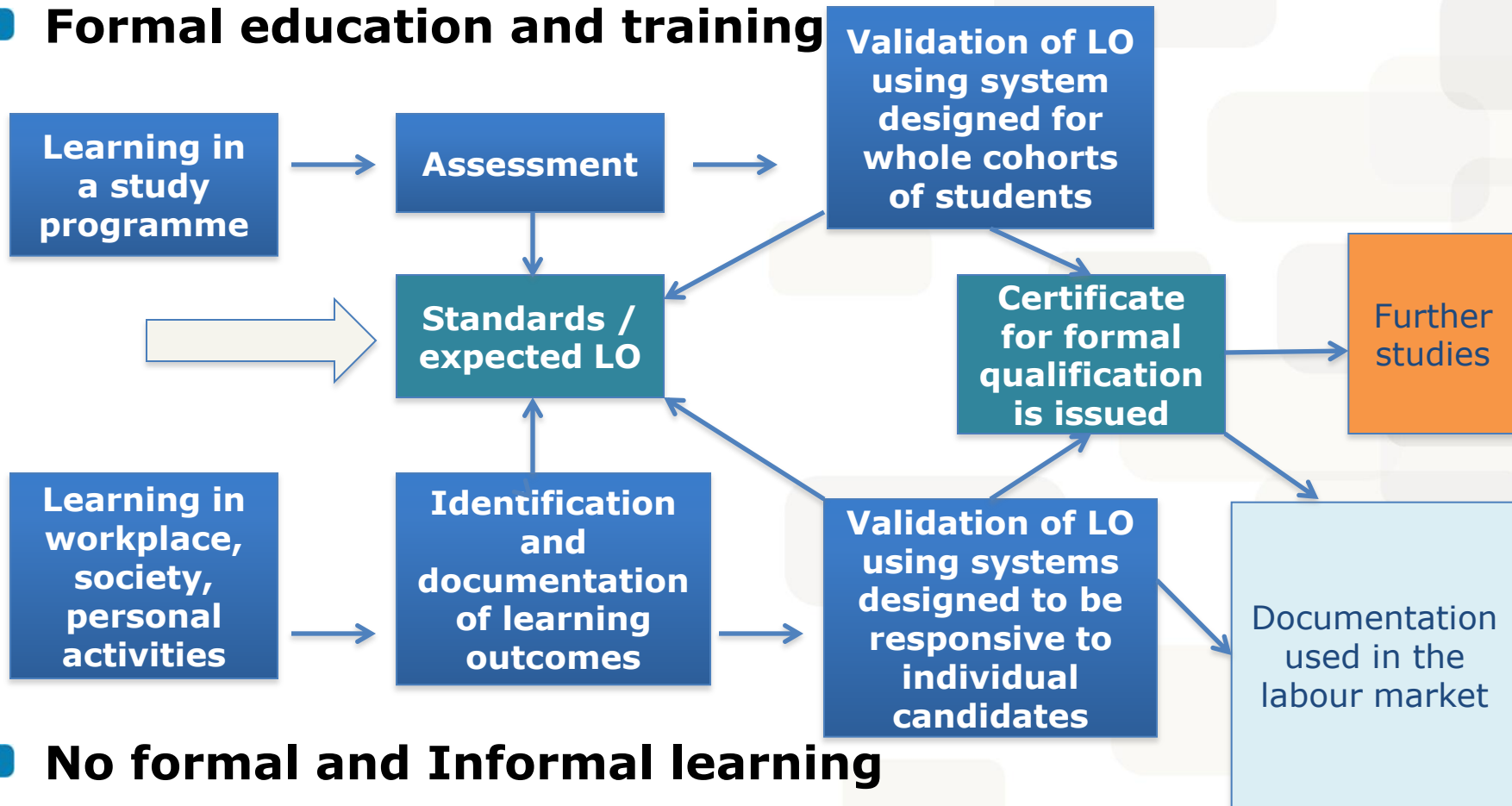


## Formal education and training





## ■ Formal education and training



## ■ No formal and Informal learning



## ■ Formal learning:

Learning that occurs in an organized and structured environment (in a school/training center or on the job) and is explicitly designated as learning (in terms of objectives, time or resources). Formal learning is intentional from the learner's point of view. It typically leads to certification



## ■ Non formal learning:

Learning which is embedded in planned activities not explicitly designated as learning (in terms of learning objectives, learning time or learning support), but which contain an important learning element. Non-formal learning is intentional from the learner's point of view.



## ■ Informal learning:

Learning resulting from daily activities related to work, family or leisure. It is not organized or structured in terms of objectives, time or learning support. Informal learning is in most cases unintentional from the learner's perspective. It typically does not lead to certification

# What are we talking about?



- Being competent is not only about what you know and what you are able to do, but also about your limitations and what you still have to learn and how you deal with that in practice.



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# “Qualifications for Nuclear Decommissioning” Day 2

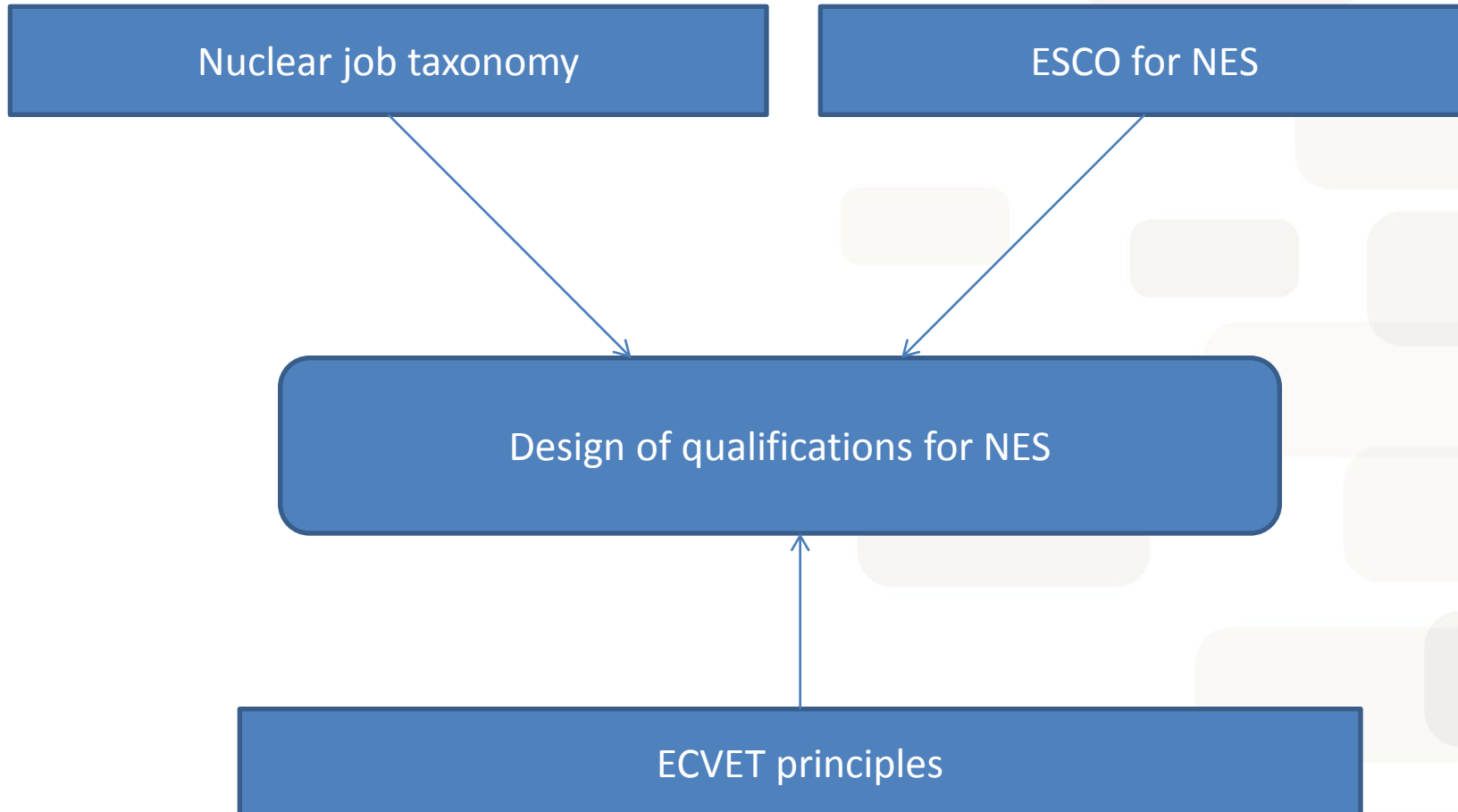


# NES context for qualification design



- Job taxonomy developed for NES
- ESCO job description for NES
- ECVET principles for NES

# NES context for qualification design



# 10 questions before designing a qualification



- Which LO for which qualification?
- How many LO for a unit?
- How many units?
- Units for transversal LO?
- Common units for different qualifications?
- KSC or SCK or CSK?
- To box or not to box LO?
- Same level for all?
- Are actions verbs suitable for every LO?
- Are all LO assessable?

# Which LO for which qualification?



- Occupation standard
  - Job profile,
  - key activities
  - tasks
- Visible LO
  - Easy to pick up from work experience
  - Easy to understand for a trainer and for a trainee
- Assessable LO

# How many LO for a unit?



- Number of LO must give a substantial unit related to the full qualification
- Number of LO must be translated in a sufficient number of learning objectives in a training program
- Number of LO must be translated in a reasonable assessment protocol

# How many units?



## ■ Number

- Coherence with key activities coming from occupation standard
- Support professional mobility
- Reasonable and understandable

## ■ Dimension

- Balance between holistic and atomistic approaches
- Recognition, preparation and accumulation friendly
- Easy to translate in training modules

# Units for transversal LO?



## ■ Arguments

- Grouping permanent elements
- Focusing each unit on its specific contents
- Reducing the number of LO in each unit
- Lightening assessment
- Examples : « Safety and security management » ;  
« Communication with partners »

## ■ But,

- is it possible in decommissioning ?
- is it efficient?

# Common units for different qualification?



## ■ Arguments

- Standardisation of qualification design → more understandable for all users
- Support professional mobility → reduction of steps to complete a new qualification
- Accumulation efficiency

## ■ Limits

- Qualifications must be close
- Design must be done in the same period, or/and in a stable context



# KSC, SCK, CSK?



The place of Knowledge, Skill and Competence in the matrix is a way to underline the key elements of a qualification and the pre-eminence of one or two of the 3 components.

# KSC, SCK, CSK?

## Team management



<i>Knowledge</i>	<i>Skills</i>	<i>Competence</i>
<b>U7K1</b> - Organisation of human resources <b>U7K2</b> – Social regulations for the transport industry <b>U7K3</b> – Health and safety legislation <b>U7K4</b> – Recruitment of operational teams <b>U7K5</b> – Control and coordination of operational teams <b>U7K6</b> – Monitoring and evaluation of operational teams <b>U7K7</b> – Principles of Project Management <b>U7K8</b> – Oral communications	<b>U7S1 – Identification of personnel requirements</b> <b>U7S1.1</b> – Analyse how the organisation functions <b>U7S1.2</b> – Identify foreseeable future skills needs <b>U7S1.3</b> – Assess training needs	<b>U7S1.C1</b> – Show conviction
	<b>U7S2 - Participation in recruitment processes</b> <b>U7S2.1</b> – Contribute to the candidate selection process. <b>U7S2.2</b> – Develop an induction and integration procedure	<b>U7S2.C1</b> – Comply with anti-discrimination legislation <b>U7S2.C2</b> – Comply with ethical principles
	<b>U7S3 - Participation in the organisation of work</b> <b>U7S3.1</b> – Allocate tasks <b>U7S3.2</b> – Assign personnel <b>U7S3.3</b> – Communicate decisions relating to how work is organised	<b>U7S3.C1</b> – Comply with current legislation, conventions and standards <b>U7S3.C2</b> – Demonstrate equitability <b>U7S3.C3</b> - Demonstrate authority
	<b>U7S4 - Leading a team and managing individual conflicts</b> <b>U7S4.1</b> – Promote and facilitate dialogue between employees <b>U7S4.2</b> – Motivate employees <b>U7S4.3</b> – Develop team working <b>U7S4.4</b> – Anticipate sources of conflict <b>U7S4.5</b> – Conflict resolution <b>U7S4.6</b> – Be supportive of change	<b>U7S4.C1</b> – Anticipate and reduce stress and tension <b>U7S4.C2</b> – Take account of the intercultural dimension <b>U7S4.C3</b> – Display impartiality <b>U7S4.C4</b> – Express oneself confidently
	<b>U7S5 - Managing the activities of team members and evaluating performance</b> <b>U7S5.1</b> – Participate in the development of criteria for monitoring activity and performance <b>U7S5.2</b> – Produce management information <b>U7S5.3</b> – Participate in appraisal interviews <b>U7S5.4</b> – Recommend the award of bonuses and rewards <b>U7S5.5</b> – Apply disciplinary procedures	

# KSC, SCK, CSK?

## Team management



<i>Skills</i>	<i>Competence</i>	<i>Knowledge</i>
<b>U7S1 – Identification of personnel requirements</b> <b>U7S1.1</b> – Analyse how the organisation functions <b>U7S1.2</b> – Identify foreseeable future skills needs <b>U7S1.3</b> – Assess training needs	<b>U7S1.C1</b> – Show conviction	<b>U7K1</b> - Organisation of human resources <b>U7K2</b> – Social regulations for the transport industry <b>U7K3</b> – Health and safety legislation <b>U7K4</b> – Recruitment of operational teams <b>U7K5</b> – Control and coordination of operational teams <b>U7K6</b> – Monitoring and evaluation of operational teams <b>U7K7</b> – Principles of Project Management <b>U7K8</b> – Oral communications
<b>U7S2 - Participation in recruitment processes</b> <b>U7S2.1</b> – Contribute to the candidate selection process. <b>U7S2.2</b> – Develop an induction and integration procedure	<b>U7S2.C1</b> – Comply with anti-discrimination legislation <b>U7S2.C2</b> – Comply with ethical principles	
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# To box or not to box LO?



Skills	Competence	Knowledge
<p><b>U7S1 – Identification of personnel requirements</b>  <b>U7S1.1</b> – Analyse how the organisation functions  <b>U7S1.2</b> – Identify foreseeable future skills needs  <b>U7S1.3</b> – Assess training needs</p>	<p><b>U7S1.C1</b> – Show conviction</p>	<p><b>U7K1</b> - Organisation of human resources  <b>U7K6</b> – Monitoring and evaluation of operational teams</p>
<p><b>U7S2 - Participation in recruitment processes</b>  <b>U7S2.1</b> – Contribute to the candidate selection process.  <b>U7S2.2</b> – Develop an induction and integration procedure</p>	<p><b>U7S2.C1</b> – Comply with anti-discrimination legislation  <b>U7S2.C2</b> – Comply with ethical principles</p>	<p><b>U7K2</b> – Social regulations for the transport industry  <b>U7K3</b> – Health and safety legislation  <b>U7K4</b> – Recruitment of operational teams</p>
<p><b>U7S3 - Participation in the organisation of work</b>  <b>U7S3.1</b> – Allocate tasks  <b>U7S3.2</b> – Assign personnel  <b>U7S3.3</b> – Communicate decisions relating to how work is organised</p>	<p><b>U7S3.C1</b> – Comply with current legislation, conventions and standards  <b>U7S3.C2</b> – Demonstrate equitability  <b>U7S3.C3</b> - Demonstrate authority</p>	<p><b>U7K5</b> – Control and coordination of operational teams</p>
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<p><b>U7S5 - Managing the activities of team members and evaluating performance</b>  <b>U7S5.1</b> – Participate in the development of criteria for monitoring activity and performance  <b>U7S5.2</b> – Produce management information  <b>U7S5.3</b> – Participate in appraisal interviews  <b>U7S5.4</b> – Recommend the award of bonuses and rewards  <b>U7S5.5</b> – Apply disciplinary procedures</p>	<p><b>U7S5.C1</b> – Be conscientious  <b>U7S5.C2</b> – Demonstrate equitability  <b>U7S5.C3</b> – Comply with regulations  <b>U7S5.C4</b> - Respect confidentiality</p>	<p><b>U7K7</b> – Principles of Project Management</p>

# To box or not to box LO?



Skills	Competence	Knowledge
<p><b>U7S1 – Identification of personnel requirements</b>  <b>U7S1.1</b> – Analyse how the organisation functions  <b>U7S1.2</b> – Identify foreseeable future skills needs  <b>U7S1.3</b> – Assess training needs</p>	<p><b>U7S1.C1</b> – Show conviction</p>	<p><b>U7K1</b> - Organisation of human resources  <b>U7K2</b> – Social regulations for the transport industry  <b>U7K3</b> – Health and safety legislation  <b>U7K4</b> – Recruitment of operational teams  <b>U7K5</b> – Control and coordination of operational teams  <b>U7K6</b> – Monitoring and evaluation of operational teams  <b>U7K7</b> – Principles of Project Management  <b>U7K8</b> – Oral communications</p>
<p><b>U7S2 - Participation in recruitment processes</b>  <b>U7S2.1</b> – Contribute to the candidate selection process.  <b>U7S2.2</b> – Develop an induction and integration procedure</p>	<p><b>U7S2.C1</b> – Comply with anti-discrimination legislation  <b>U7S2.C2</b> – Comply with ethical principles  <b>U7S3.C1</b> – Comply with current legislation, conventions and standards  <b>U7S3.C2</b> – Demonstrate equitability  <b>U7S3.C3</b> - Demonstrate authority  <b>U7S4.C1</b> – Anticipate and reduce stress and tension  <b>U7S4.C2</b> – Take account of the intercultural dimension  <b>U7S4.C3</b> – Display impartiality  <b>U7S4.C4</b> – Express oneself confidently  <b>U7S5.C1</b> – Be conscientious  <b>U7S5.C2</b> – Demonstrate equitability  <b>U7S5.C3</b> – Comply with regulations  <b>U7S5.C4</b> - Respect confidentiality</p>	
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# To box or not to box LO?



<i>Skills</i>	<i>Competence</i>	<i>Knowledge</i>
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# Same level for all?



## ■ For a qualification level 6 :

- All units level 6 ?
- Some units level 5 ?

## ■ For a unit level 6 :

- All LO level 6 ?
- Some LO level 5 ?

# Are actions verbs suitable for every LO?



<i>Skills</i>	<i>Competence</i>	<i>Knowledge</i>
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# Starting point

## Bloom taxonomy



According to Benjamin Bloom (1956) there are six levels of cognition ( from the simplest to the more complex)

- **Knowledge:** rote memorization, recognition, or recall of facts
- **Comprehension:** understanding what the facts mean
- **Application:** correct use of the facts, rules, or ideas
- **Analysis:** breaking down information into component parts
- **Synthesis:** combination of facts, ideas, or information to make a new whole
- **Evaluation:** judging or forming an opinion about the information or situation

# Bloom revised taxonomy 2001



## Original Domain

## New Domain

- Evaluation

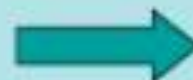
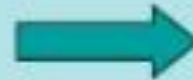
- Synthesis

- Analysis

- Application

- Comprehension

- Knowledge



- Creating

- Evaluating

- Analyzing

- Applying

- Understanding

- Remembering

# Bloom revised taxonomy 2001



- Before we can **understand** a concept we have to **remember** it
- Before we can **apply** the concept we must **understand** it
- Before we **analyse** it we must be able to **apply** it
- Before we can **evaluate** its impact we must have **analysed** it
- Before we can **create** we must have **remembered, analysed, understood, and applied, evaluated.**

# Bloom revised taxonomy 2001



- Effective learning objectives need to be observable and/or measureable, and using action verbs is a way to achieve this.
- Verbs such as “define”, “classify,” or “combine” are more measureable than vague or passive verbs such as “understand” or “be aware of”.

# REVISED Bloom's Taxonomy Action Verbs



**ecvet**  
European Credit system for

I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
<ul style="list-style-type: none"> <li>• Choose</li> <li>• Define</li> <li>• Find</li> <li>• How</li> <li>• Label</li> <li>• List</li> <li>• Match</li> <li>• Name</li> <li>• Omit</li> <li>• Recall</li> <li>• Relate</li> <li>• Select</li> <li>• Show</li> <li>• Spell</li> <li>• Tell</li> <li>• What</li> <li>• When</li> <li>• Where</li> <li>• Which</li> <li>• Who</li> <li>• Why</li> </ul>	<ul style="list-style-type: none"> <li>• Classify</li> <li>• Compare</li> <li>• Contrast</li> <li>• Demonstrate</li> <li>• Explain</li> <li>• Extend</li> <li>• Illustrate</li> <li>• Infer</li> <li>• Interpret</li> <li>• Outline</li> <li>• Relate</li> <li>• Rephrase</li> <li>• Show</li> <li>• Summarize</li> <li>• Translate</li> </ul>	<ul style="list-style-type: none"> <li>• Apply</li> <li>• Build</li> <li>• Choose</li> <li>• Construct</li> <li>• Develop</li> <li>• Experiment with</li> <li>• Identify</li> <li>• Interview</li> <li>• Make use of</li> <li>• Model</li> <li>• Organize</li> <li>• Plan</li> <li>• Select</li> <li>• Solve</li> <li>• Utilize</li> </ul>	<ul style="list-style-type: none"> <li>• Analyze</li> <li>• Assume</li> <li>• Categorize</li> <li>• Classify</li> <li>• Compare</li> <li>• Conclusion</li> <li>• Contrast</li> <li>• Discover</li> <li>• Dissect</li> <li>• Distinguish</li> <li>• Divide</li> <li>• Examine</li> <li>• Function</li> <li>• Inference</li> <li>• Inspect</li> <li>• List</li> <li>• Motive</li> <li>• Relationships</li> <li>• Simplify</li> <li>• Survey</li> <li>• Take part in</li> <li>• Test for</li> </ul>	<ul style="list-style-type: none"> <li>• Agree</li> <li>• Appraise</li> <li>• Assess</li> <li>• Award</li> <li>• Choose</li> <li>• Compare</li> <li>• Conclude</li> <li>• Criteria</li> <li>• Criticize</li> <li>• Decide</li> <li>• Deduct</li> <li>• Defend</li> <li>• Determine</li> <li>• Disprove</li> <li>• Estimate</li> <li>• Evaluate</li> <li>• Explain</li> <li>• Importance</li> <li>• Influence</li> <li>• Interpret</li> <li>• Judge</li> <li>• Justify</li> </ul>	<ul style="list-style-type: none"> <li>• Adapt</li> <li>• Build</li> <li>• Change</li> <li>• Choose</li> <li>• Combine</li> <li>• Compile</li> <li>• Compose</li> <li>• Construct</li> <li>• Create</li> <li>• Delete</li> <li>• Design</li> <li>• Develop</li> <li>• Discuss</li> <li>• Elaborate</li> <li>• Estimate</li> <li>• Formulate</li> <li>• Happen</li> <li>• Imagine</li> <li>• Improve</li> <li>• Invent</li> <li>• Make up</li> <li>• Maximize</li> </ul>

# Are all LO assessable?



<i>Skills</i>	<i>Competence</i>	<i>Knowledge</i>
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# Assignment



Prepare the description of qualifications accessible from various pathways:

- ✓ professional context,
- ✓ job profile,
- ✓ level,
- ✓ key activities,
  - units,
  - for one unit some LO
  - assessment criteria

# Joint Research Centre

the European Commission's in-house science service

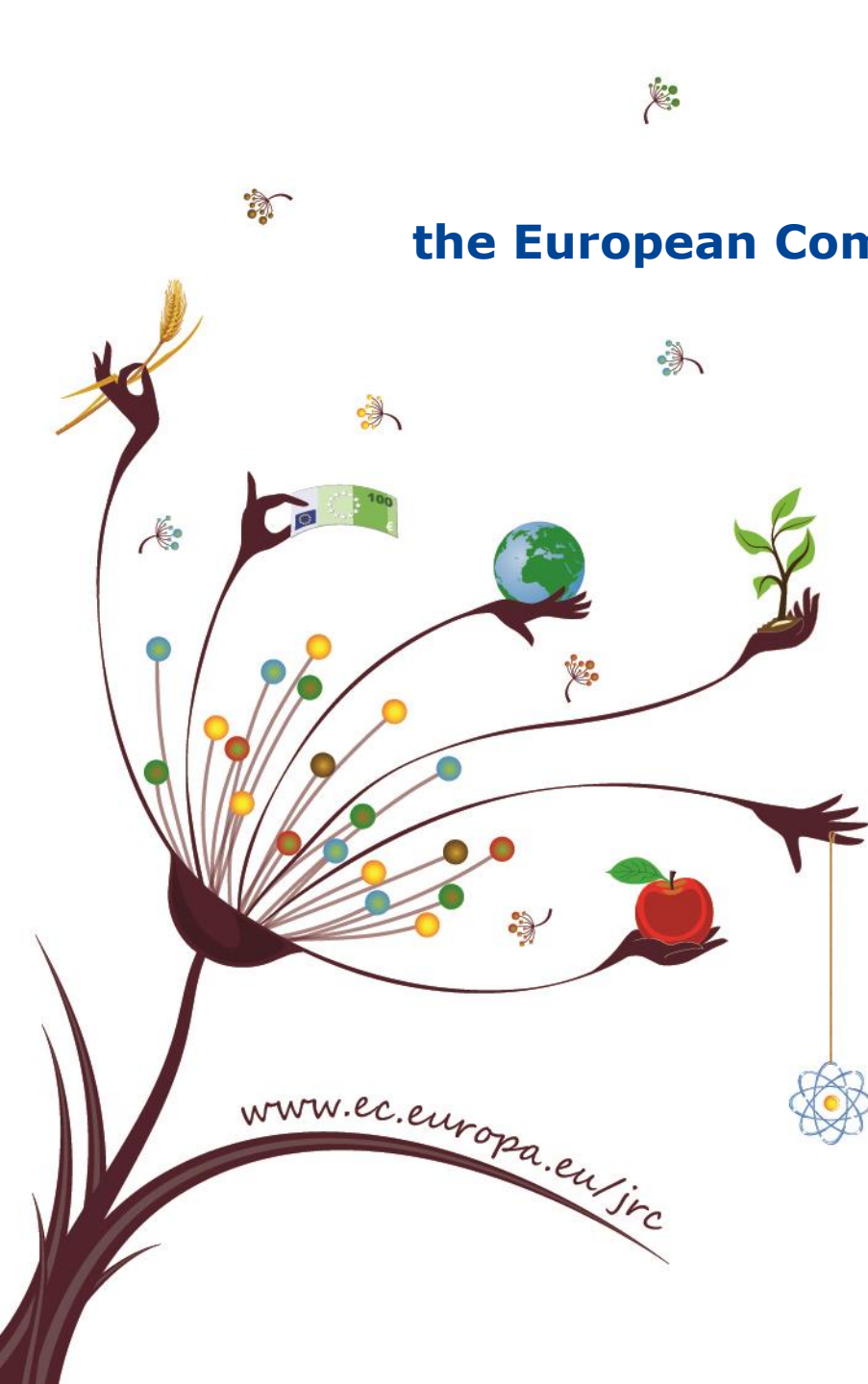
*Serving society  
Stimulating innovation  
Supporting legislation*

## Workshop on- Qualifications for Nuclear Decommissioning

### Tools for achieving the EU single market

**Mihail CECLAN,**  
Project Officer-EU Policies

**Lisbon, 7.10.2015**





# Agenda

- 1. Tools for achieving the EU single market**
- 2. Tools for developing the CB-QS in nuclear sector**
  - 2.a ESCO– tool for management of the supply & demand of jobs**
  - 2.b EQF–tool for comparing qualifications**
  - 2.c ECVET –tool that facilitates the free movement of workers**

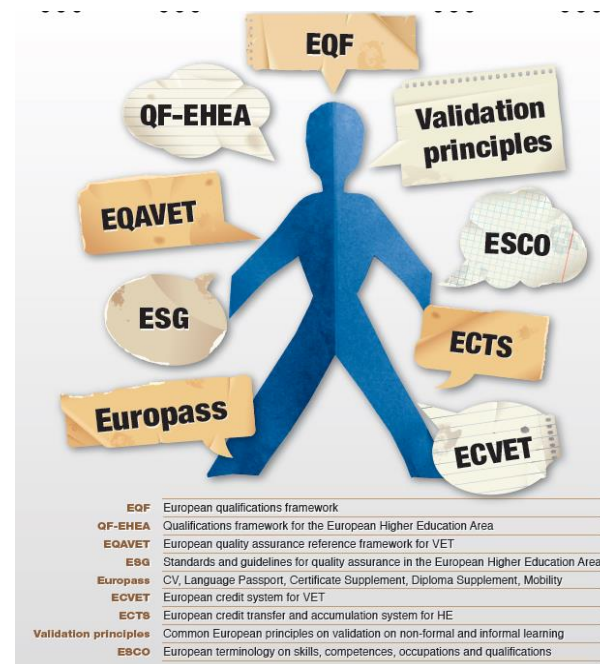
# 1. Tools for achieving the EU single market

- **EU single market:**
  - **EU - one territory without any internal borders or other regulatory obstacles**
  - **accounts 510 million consumers & 21 million SMEs**
  - **4 freedoms of a free market:** free movement of goods, services, capitals and workers
  - **Developing CB-QS- WS contributes - free movement of workers in the nuclear market**
- **ECVET – facilitates the free movement of workers in the EU single market**



# 1. Tools for achieving the EU single market

- Since the functional EU Single Market is concerned:
  - it primarily involves the modernization of the E&T system
  - European common tools and principles for modernization E&T; 9 tools (**key concept-LO**)-**ESCO;EQF&ECVET**



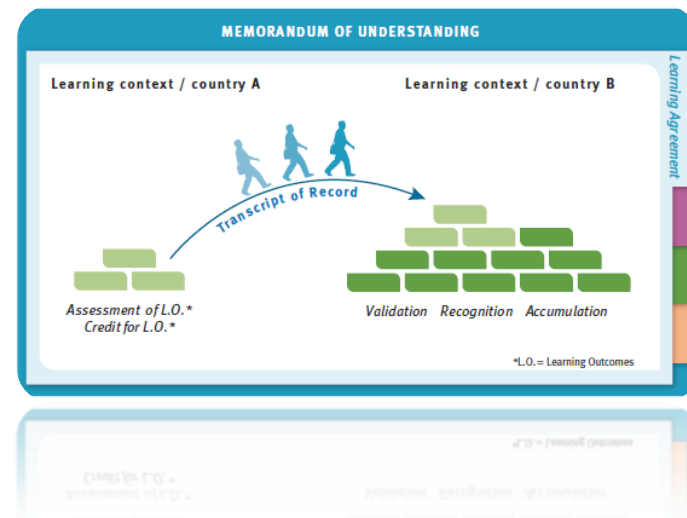
## 2. Tools for developing the CB-QS in nuclear sector

E&T modernization		
Tools	Innovations	Remarks
<b>ESCO</b> = data base that bridges the communication gap between education and work	ESCO- tool for management of the supply & demand of jobs	<b>Nuclear Energy Sector is not visible in ESCO</b>
<b>EQF</b> = tool that helps comparison between qualifications systems in Europe.	<b>Common framework for EU qualifications</b> ; Eight reference levels - described in terms of LO (KSC/A).	Learners, graduates, training providers, employers and national qualifications frameworks (NQFs) can <b>use EQF levels to compare qualifications awarded in different countries</b>
<b>ECVET</b> = facilitates the free movement of workers in the EU nuclear market	<ul style="list-style-type: none"> <li>• <b>Qualifications structured in ULOs &amp; LOs -allow flexible career pathways</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Qualifications : more transparent&amp; flexible; facilitating the mobility</b></li> </ul>
	<ul style="list-style-type: none"> <li>• <b>Transfer &amp; recognition of the competences acquired abroad- no matter learning proc. ( formal, non- formal, informal)</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Increasing the worker's capacity to adapt to the market needs</b></li> </ul>

## 2.a ESCO– tool for management of the supply & demand of jobs

### ESCO's primary objective : Boost online and skills-based job matching

- Help describe qualifications in terms of KSC/A
- Getting more people into jobs throughout Europe
- Facilitate the dialogue between the labour market and E&T sector
- Enable the development of innovative career guidance services
- Allow employment services to exchange relevant labour market information across borders



## 2.a ESCO-tool for management of the supply & demand of jobs



### ESCO content development:

- ESCO Secretariat - responsible for the management of content development
- 27 Sectorial Reference Groups develop the content of ESCO: defining occupational profiles, sector specific skills and competences and qualifications
- The Sectorial Reference Groups - organised on the basis of the European classification of economic activities -NACE
- The Sectorial Reference Group -**Energy and water supply, sewerage and waste management** (D35, E) -(includes the nuclear energy sector)
- **No nuclear Sectorial Reference sub-group** to develop the content for nuclear energy sub-sector (decommissioning)
- By consequence the **NES including decommissioning sub-sector is not visible in ESCO**

## 2.a ESCO–tool for management of the supply & demand of jobs

### How to increase the NES (decommissioning) visibility in ESCO?

- Initiating the Decommissioning sub-group for developing the ESCO content→ **Deliverable 1**
- Registering the jobs from decommissioning sub-sector-identified by NJT-in ESCO
- Classification of occupations, qualifications and jobs in nuclear decommissioning→ **Deliverable 2**
- **Table 2:** From jobs to occupations in nuclear decommissioning
- **Table 3:** The selection criteria for the qualifications to be designed
- **Table 4:** Input data for ESCO



## 2.a ESCO–tool for management of the supply & demand of jobs

**Table 3: The criteria for qualifications selection to be designed**

Criteria					Qualifications assigned for design
NPP life cycle phases	Type and category of qualification	Awarding body	EQF level	No of jobs	
NB, O & D	International qualifications and certificates linked to occupations and sectors (directly in ESCO)	awarded at national level but regulated at European level DIRECTIVE 2013/59/ EURATOM /Int. level- ISCO-08: Unit Group 2263	5 to 7, depending on the country and RPE's roles and duties [ENETRAP II-WD 4.2]	1	<b>Radiation Protection Expert</b>
O & D	-	awarded at national level	5 to 6, depending on the country	3	<b>Radioactive Waste Manager</b>



# 2.a ESCO–tool for management of the supply & demand of jobs

**Table 2: From jobs to occupations in nuclear decommissioning**

Occupations		Qualification	Jobs
1	2	3	6
Broader-Occupation groups	Occupation PT	Occupation Definition	7
<b>Decommissioning activities</b>	3.7. Radioactive waste	Ensure safe processing, handling (on-site), storage of all types of solid and liquid radioactive waste generated during decommissioning	Radioactive Waste Manager Radioactive Waste Worker 3.7.01.Radioactive Waste Manager 3.7.02.Radioactive Waste Manager- characterisation 3.7.03.Radioactive Waste Manager- processing 3.7.04.Radioactive Waste Worker-characterisation 3.7.05.Radioactive Waste Worker-processing 3.7.07.Transport responsible
	3.9. Health, safety and environmental professionals/	Ensure compliance of decommissioning with the RP, Health Physics and environmental principles, issues in order to ensure effective protection of individuals, general public and the environment during the decomm. of NPP	Radiation Protection Expert Radiation Protection Officer Radiation Protection Worker Industrial Safety and Environment 3.9.01.Radiation Protection Manager 3.9.02.Radiation Protection Officer 3.9.03.Radiation Protection Worker 3.9.04.Industrial Safety Engineer 3.9.05.Safety Case Expert 3.9.06. Environmental Expert 3.9.07.Radioprotection Technician/Officer
1	10		16
			45

## 2.b EQF–tool for comparing qualifications

### Descriptors defining levels in the European Qualifications Framework (EQF)

	<b>KNOWLEDGE</b>	<b>SKILLS</b>	<b>COMPETENCE</b>
	<i>In the context of EQF, knowledge is described as theoretical and/or factual.</i>	<i>In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments).</i>	<i>In the context of EQF, competence is described in terms of responsibility and autonomy.</i>
<b>Relevant learning outcomes</b>			
<b>LEVEL 1</b>	• basic general knowledge	• basic skills required to carry out simple tasks	• work or study <b>under direct supervision</b> in a structured context
<b>LEVEL 2</b>	• basic factual knowledge of a field of work or study	• basic cognitive and practical skills required to use relevant information in order to carry out tasks and to <b>solve routine problems</b> using simple rules and tools	• work or study under supervision with <b>some autonomy</b>
<b>LEVEL 3</b>	• knowledge of facts, principles, processes and general concepts, in a field of work or study	• a range of cognitive and practical skills required to accomplish tasks and <b>solve problems</b> by selecting and <b>applying basic methods</b> , tools, materials and information	• take <b>responsibility</b> for completion of tasks in work or study • <b>adapt own behavior</b> to circumstances in solving problems
<b>LEVEL 4</b>	• factual and theoretical knowledge in <b>broad contexts</b> within a field of work or study	• a range of cognitive and practical skills required to <b>generate solutions</b> to specific problems in a field of work or study	• exercise <b>self-management</b> within the guidelines of work or study contexts that are usually predictable, but are subject to change • <b>supervise the routine work</b> of others, taking some responsibility for the evaluation and improvement of work or study activities
<b>LEVEL 5</b>	• <b>comprehensive, specialized, factual and theoretical knowledge</b> within a field of work or study and an awareness of the boundaries of that knowledge	• a comprehensive range of cognitive and practical skills required to develop <b>creative solutions</b> to <b>abstract problems</b>	• exercise <b>management and supervision</b> in contexts of work or study activities where there is <b>unpredictable change</b> • <b>review and develop performance</b> of self and others

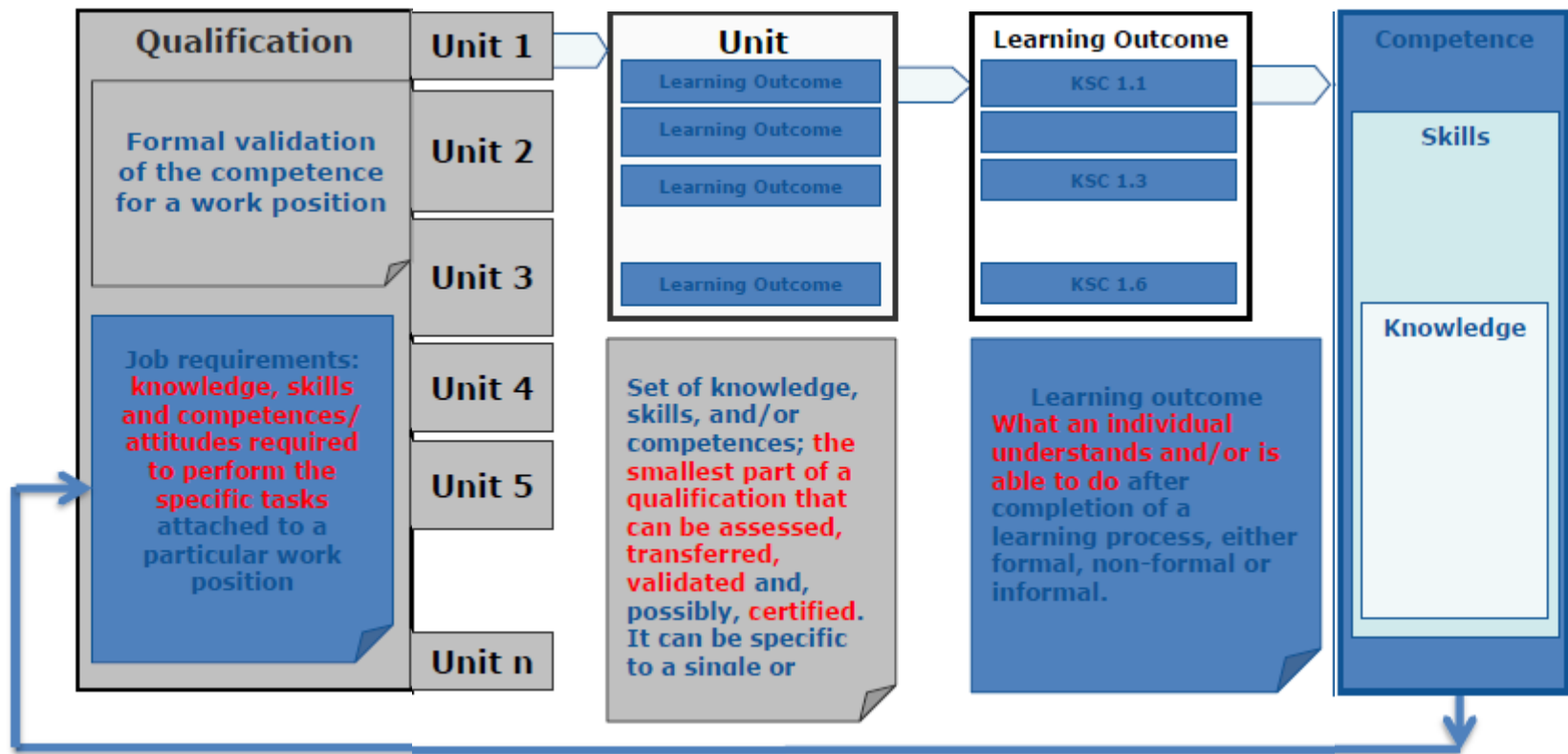
## 2.b EQF–tool for comparing qualifications

### Descriptors defining levels in the European Qualifications Framework (EQF)

	KNOWLEDGE	SKILLS	COMPETENCE
<b>LEVEL 6</b>	<ul style="list-style-type: none"> <li>advanced knowledge of a field of work or study, involving a <b>critical understanding</b> of theories and principles</li> </ul>	<ul style="list-style-type: none"> <li>advanced skills, demonstrating mastery and <b>innovation</b>, required to <b>solve complex and unpredictable problems</b> in a specialized field of work or study</li> </ul>	<ul style="list-style-type: none"> <li><b>manage complex technical or professional activities</b> or projects, taking responsibility for decision-making in unpredictable work or study contexts</li> <li>take responsibility for managing professional development of individuals and groups</li> </ul>
<b>LEVEL 7</b>	<ul style="list-style-type: none"> <li>highly <b>specialized</b> knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for <b>original thinking</b> and/or research</li> </ul>	<ul style="list-style-type: none"> <li>specialized problem-solving skills required in research and/or innovation in order to <b>develop new knowledge</b> and procedures and to <b>integrate</b> knowledge from different fields</li> </ul>	<ul style="list-style-type: none"> <li>manage and transform work or study contexts that are complex, unpredictable and require <b>new strategic approaches</b></li> <li>take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of</li> </ul>
<b>LEVEL 8</b>	<ul style="list-style-type: none"> <li>knowledge at the <b>most advanced</b> frontier of a field of work or study and at the <b>interface between fields</b></li> </ul>	<ul style="list-style-type: none"> <li>the <b>most advanced</b> and specialized skills and techniques, including synthesis and evaluation, required to solve <b>critical problems in research</b> and/or innovation and to extend and redefine existing knowledge or professional practice</li> </ul>	<ul style="list-style-type: none"> <li>demonstrate substantial <b>authority, innovation</b>, autonomy, <b>scholarly</b> and professional integrity and sustained commitment to the development of <b>new ideas</b> or processes</li> <li>at the forefront of work or study contexts including research</li> </ul>

## 2.c ECVET –tool that facilitates the free movement

### ECVET dimensions & structure of a qualification



**Now is time for the debate on: Classification of occupations, qualifications and jobs in nuclear decommissioning!**





# Joint Research Centre

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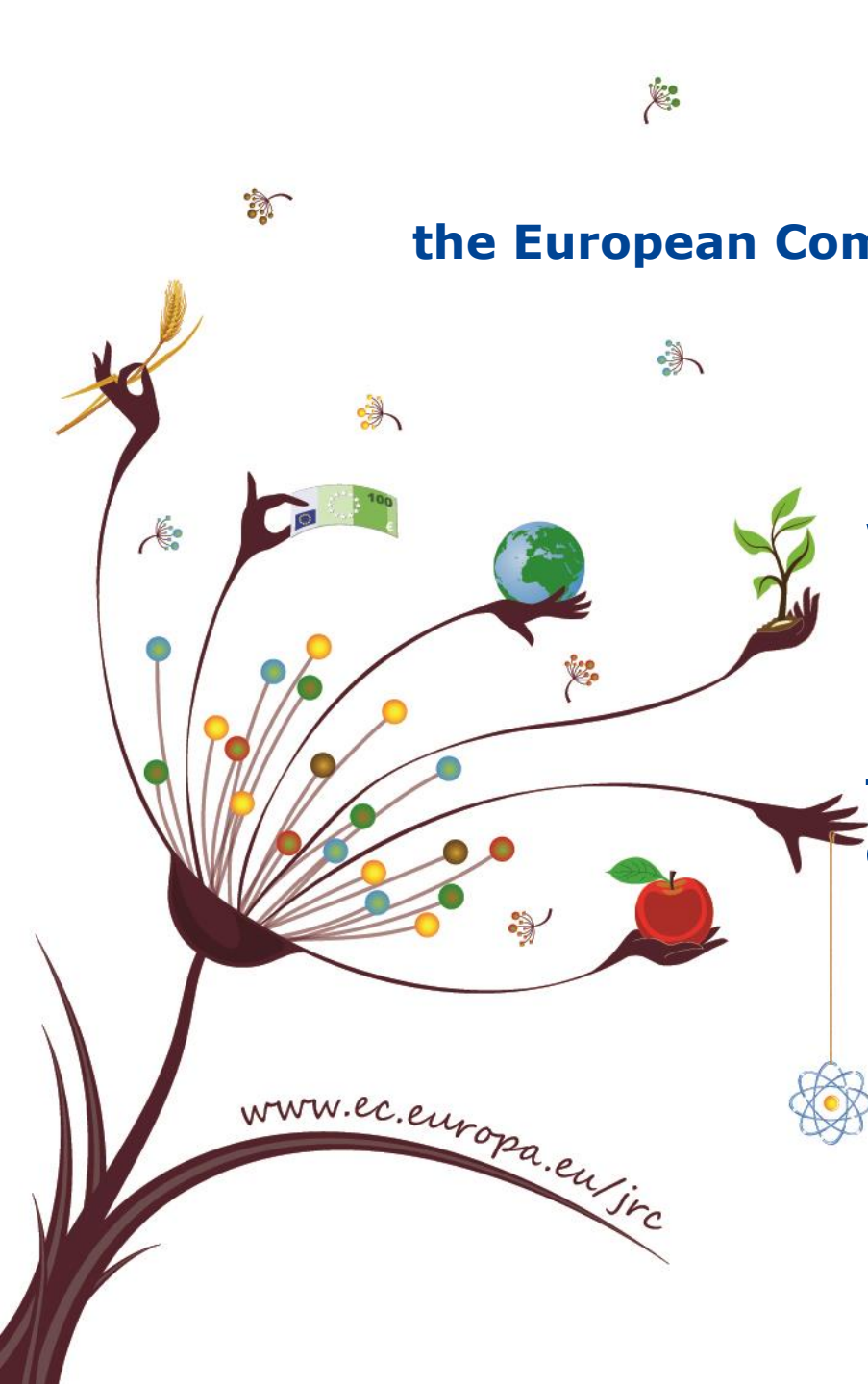
*Serving society  
Stimulating innovation  
Supporting legislation*

## Workshop on-Qualifications for Nuclear Decommissioning

**Methodology-ECVET oriented- for  
the design of decommissioning  
qualifications**

**Mihail CECLAN,**  
Project Officer-EU Policies

**Lisbon, 7.10.2015**

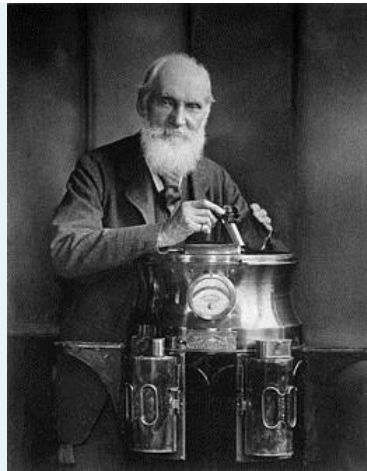


# Agenda

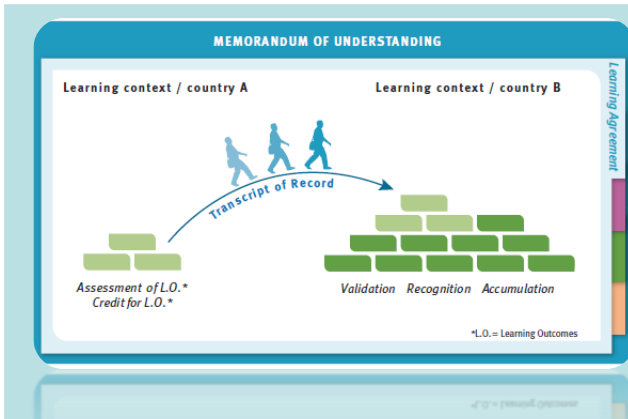
- 1. Prerequisites for nuclear qualifications design**
- 2. Modelling the European nuclear energy labour market**
- 3. Customized methodology for nuclear qualifications design & TP design**
- 4. Customized methodology for decommissioning qualifications design**



**LORD KELVIN-** Sir  
William Thomson



**When we can express  
our knowledge in  
numbers, then our  
knowledge will be  
strong.**



**When we can express our competences or LOs in KSA, then our competences will be strong.**

# 1. Prerequisites for nuclear qualifications design

- **The prerequisites for the process of qualifications design:**
  - **Preparation of the toolbox: ESCO; EQF & ECVET (key concept-LO)**
  - **Getting a deep understanding and mastering of ECVET manifold innovations**
  - **To consider the NES particularities:**
    - **most required qualifications - upper level of EQF 5-7**



## 2. Modelling the European nuclear energy labour market

- **Main features of ENELM model:**

- **The European nuclear energy labour market (ENELM)** -5 components: nuclear industry (employers); workers and learners; competent authorities for O&Q; E&T providers and NRB; (**interact each other**)

- **ENELM-Dynamic system:** it means that the **system's behavior changes over time**, often in response to external stimulation or forcing

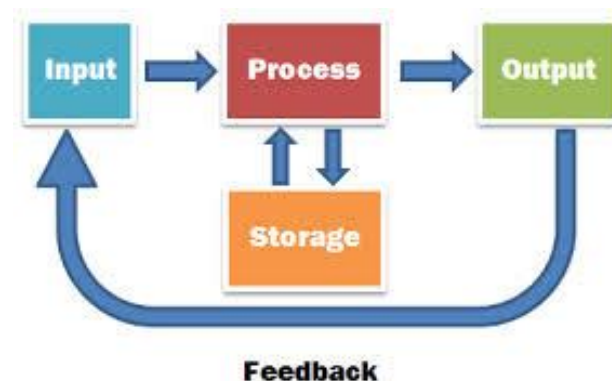
- **Modeled - Feedback System** : the ENELM is seen as a whole (a black box) - interacting with the environment through an **Input, Output and Feedback**

- **The Feedback-** is facilitated by specific tools:

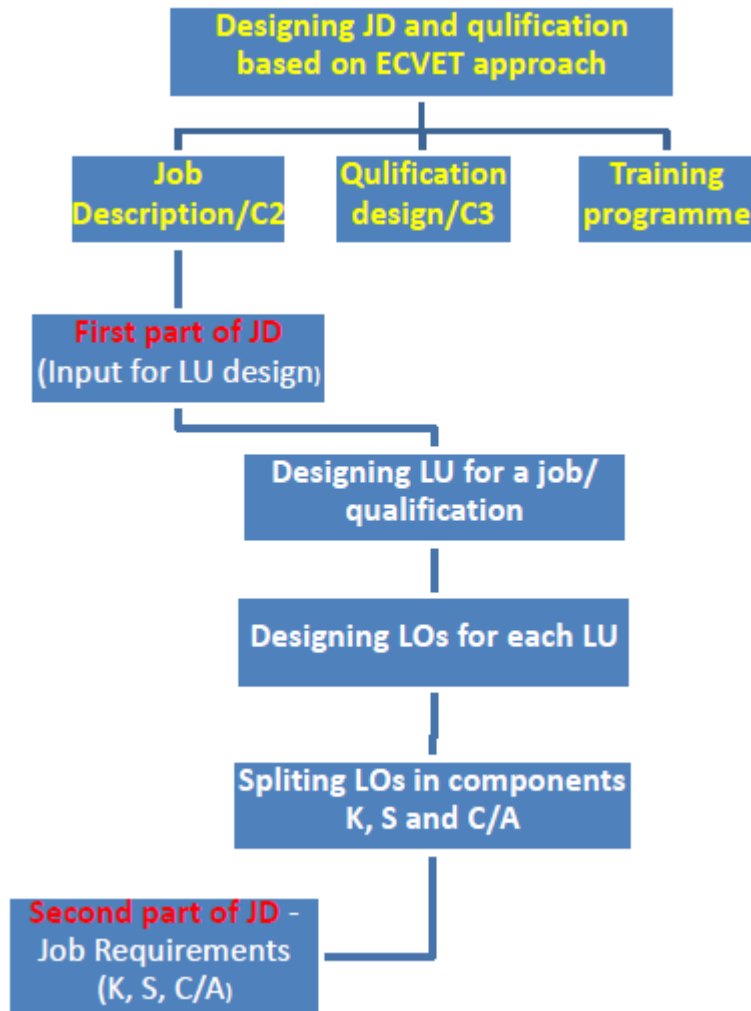
- ESCO** for online and skill-based job matching

- EQF** for comparing qualifications awarded in different MS

- ECVET** – facilitates the free movement of workers



### 3. Customized methodology for nuclear qualifications design & TP



- ECVET training programme/TP-is not a standard TP
- first step- **identification of prior learning**
- second step – TP designed -**deliver only competences/LOs that are missing from the targeted qualif.**  
→ ECVET TP- is a **customized training** → **allow a flexible career pathway**



# 3. Customized methodology for nuclear qualifications design & TP

## Designing a TP for CRO qualification

<p>Senior Reactor Operator/CRO</p> <p>Formal validation of the competence for Senior Reactor Operator/CRO position</p>	<p>Unit 6= Management of abnormal/emergency situation</p> <p>6.1 Nuclear incidents assessment /5</p> <p>6.2 Emergency response management /5</p>	<p>CRO/ EQF 5-6</p> <p>Licensing flow</p> <p>≈ 1 year &amp; 4 month</p>
<p>Job requirements: the KSC required to perform the CRO's functions/roles (K,S, C/A defined in the JD 2.02.02)</p>	<p>Unit 5=Support training programmes for control room crew</p> <p>5.1 Input for licensing flow for CRO /6</p> <p>5.2 Input for CRO refreshments-at each 6 month /6</p>	<p>Working under supervision =6 month</p> <p>LU5, LU6 recognition&amp;validation</p> <p>CRO licensing by NPP management</p>
	<p>Unit 4= Team and technical supervision</p> <p>4.1 Technical supervision /6</p> <p>4.2 Team supervision /5</p>	<p>Practical training on simulator =6 month</p> <p>LU3, LU4 recognition&amp;validation</p> <p>Review by regulatory body</p>
	<p>Unit 3= Interfacing with other departments</p> <p>3.1 Interfacing with maintenance department /4</p> <p>3.2 Interfacing with instrumentation and control /4</p> <p>3.3 Interfacing with other departments/4</p> <p>Unit 2=Maintenance and testing activities</p> <p>2.1 Nuclear equipment maintenance /5</p> <p>2.2 NPP systems and components /5</p>	<p>Nuclearization = 4 month</p> <p>LU1, LU2</p>
	<p>Unit 1= Operation of reactor facility</p> <p>1.1 Nuclear operation and national laws /6</p> <p>1.2 Radiation protection and emergency response /5</p> <p>1.3 Chemical regimes of fluids /4</p>	

# 4. Customized methodology for decommissioning qualifications design

- 4.1 Input for designing process:

- **Deliverable 2:** Classification of occupations, qualifications and jobs in nuclear decommissioning; selected qualification for design
- **Deliverable 3:** Methodology- ECVET oriented- for decommissioning qualifications design
- WG 1: **RPE qualification**; JD\_3.9.01; ENETRAP II-WD 4.2
- WG 2: **RWManager qualification**; JD\_3.7.01-3.7.03;

# 4. Customized methodology for decommissioning qualifications design

- 4.2 The process of decommissioning qualifications design- four steps:  
Template for decommissioning qualifications design (**Annex 1**)

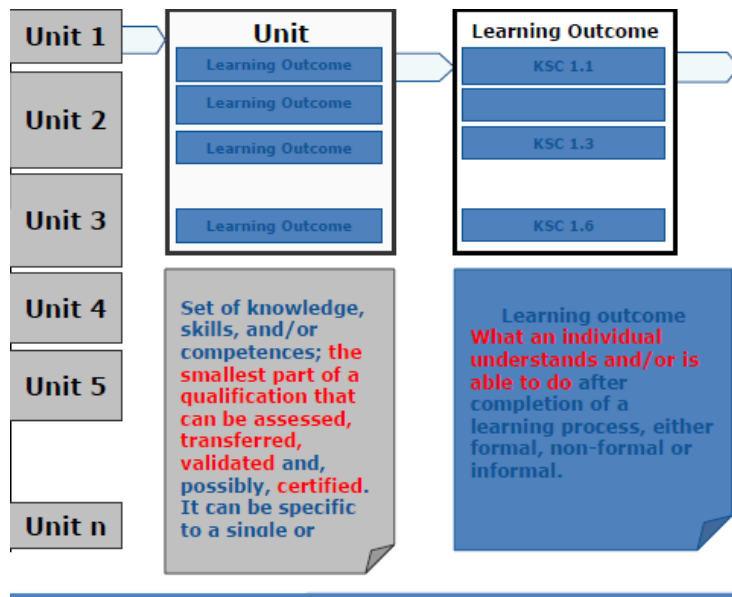
- **Step 1/Section 1. DESIGN BASIS CONCEPTS**: concerns the design basis concepts, the source for qualification features and references;
- **Step 2/Section 2. METADATA OF THE QUALIFICATION IN ESCO**: the key features of the concerned qualification to be published in ESCO;
- **Step 3/Section 3. CLASSIFICATION OF THE QUALIFICATION IN NJT**: cod of the representative jobs corresponding to the qualification (**Deliverable 2**);
- **Step 4/Section 4. ECVET QUALIFICATION**: according to ECVET approach, a qualification is structured in ULOs and LOs : (**Deliverable 3**);



# 4. Customized methodology for decommissioning qualifications design

## • 4.2 The process of decommissioning qualifications design- four steps: Template for decommissioning qualifications design (**Annex 1**)

- **Step 4/Section 4. ECVET QUALIFICATION STRUCTURE:** according to ECVET approach, a qualification is structured in: (**Deliverable 3**);
  - 4.1 Designing Units of Learning Outcomes/ ULOs**
  - 4.2 Designing Learning Outcomes/LO**
  - 4.3 Splitting LOs in KSC/A**
- **Deliverable 4a: Design of RPE qualification**
- **Deliverable 4b: Design of RWManager qualification**



**The floor is yours for the debate on:  
Methodology for decommissioning qualifications design !**



