Radiation Protection Worker (RPV) Competence Based Qualification Design

Pilot implementation of ECVET

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INTRODUCTION

CORONA I (2011-2014) "Establishment of a Regional Center of Competence for **VVER Technology and Nuclear Applications**" - co-financed by the EC Framework Program 7

CORONA II (2015-2018) "Enhancement of training capabilities in VVER technology through establishment of VVER training academy" – co-financed by the HORIZON 2020/Euratom research and training *programme* 2014-2018

http://corona2.eu/

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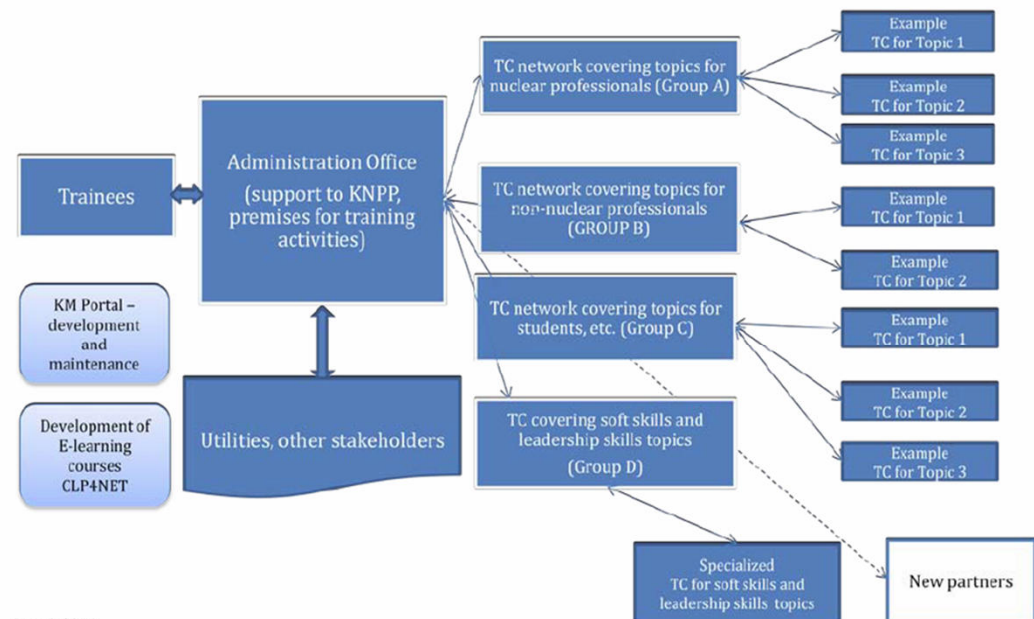
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Partners in CORONA II
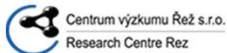
Kozloduy NPP – Bulgaria (coordinator)

Institute for Nuclear Research and Nuclear Energy (INRNE) of the Bulgarian Academy of Sciences

Engineering Support and Intellectual Solutions (ESIS) – Germany

TECNATOM – Spain

Centrum výzkumu Řež (CV REZ) – Czech Republic

Moscow Engineering Physics Institute (MEPhI) - Russia

Risk Engineering (REL) – Bulgaria

**Budapest University of Technology and Economics** (BME) - Hungary

European Nuclear Education Network (ENEN)

Implementation of ECVET process

- ECVET is tested via a qualification, selected on the base of the job profile for this qualification. The selection of Radiation protection worker was already done.

- Competence requirements (ULOs and LOs) were developed;

- KSC (R/A) items for each particular outcome were developed;

- Appropriate training scheme for this qualification, based on the defined units of learning outcomes was selected and elaborated;

- Pilot training was provided in January 2017;

- The criteria and procedure for mutual recognition will be developed

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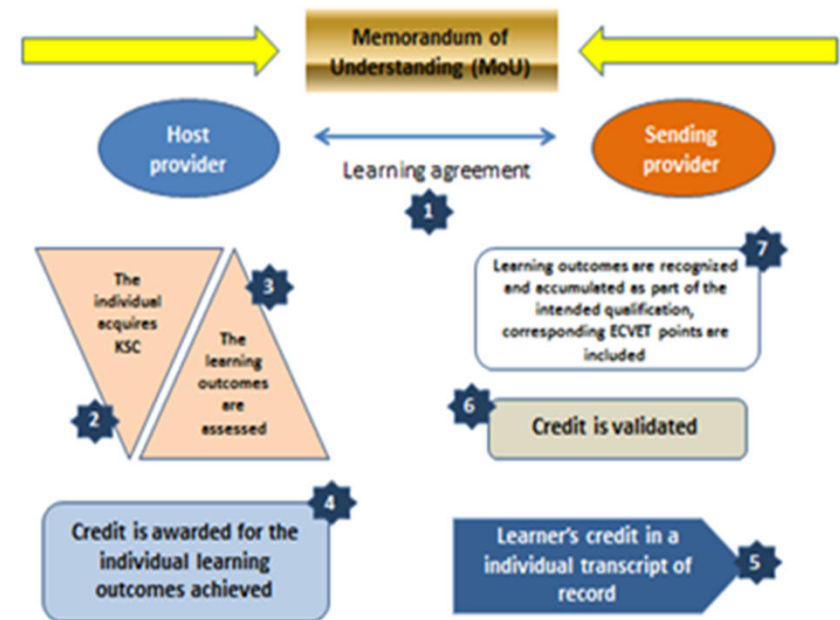
RPW qualification selection
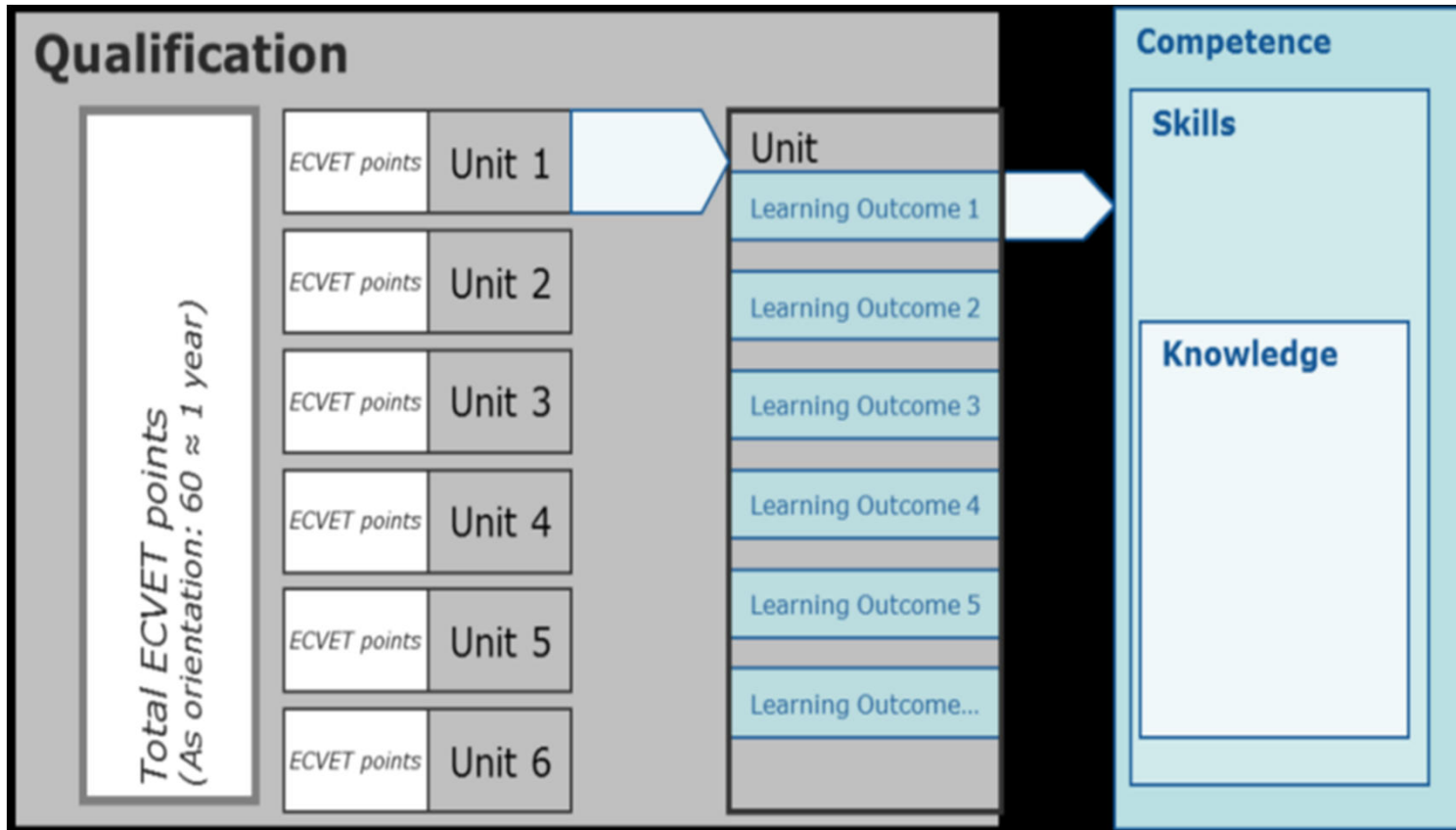
The methodology was developed based on the methodology proposed by JRC-IET for the Workshop for Qualifications in Nuclear Decommissioning held in October 2015 in Lisbon

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RPW qualification selection (cont.)

The first task in the application of the methodology is the development of **general criteria** for selection of a qualification. The general selection criteria are listed below:

- Safety related;

- Low level in respect to the EQF;

- Not very wide job profile;

- Clear and easy to define competences;

- Mutual recognition is possible;

- Requires only internal approval by

  the competent authority.

EQF LEVEL 8	ACADEMIC LEVEL	DOCTORATE	
EQF LEVEL 7		MASTER	MAINTENANCE MANAGERS AND SUPERVISORS, VOCATIONAL TEACHERS
EQF LEVEL 6	POST UPPER SECONDARY LEVEL	BACHELOR	
EQF LEVEL 5		HIGHER NATIONAL DIPLOMA	MAINTENANCE TECHNICIANS
EQF LEVEL 4	UPPER SECONDARY LEVEL	HIGHER NATIONAL CERTIFICATE, UPPER SECONDARY DIPLOMA	MAINTENANCE MECHANICS
EQF LEVEL 3	SECONDARY LEVEL	SECONDARY DIPLOMA OR VOCATIONAL DIPLOMA	
EQF LEVEL 2	PRIMARY LEVEL	SECONDARY SCHOOL WITH NO DIPLOMA	
EQF LEVEL I		PRIMARY SCHOOL	

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RPW qualification selection (cont.)

After initial proposal and discussion of several qualifications the following specific criteria were defined in order to facilitate the selection of the qualification and the design of the training scheme at a later phase:

- Availability of training programs and training materials amongst the partners;

- Language of the developed training materials (English);

- Complexity of the job profile and the training programs for the selected qualification (should be not very complex);

- Availability of training provider;

- Availability of trainees.

RPW Job profile

The RPW job profile is taken from Nuclear Job Taxonomy document, developed by IET- JRC, v. 08.05.2015

<table>
<tr><td colspan="2">Ref</td><td colspan="2">Job Title</td><td colspan="2">Occupational Category</td></tr>
<tr><td colspan="2">2.4.03</td><td colspan="2">Radio Protection Worker</td><td colspan="2">Craft</td></tr>
<tr><td colspan="2">Phase / Area</td><td colspan="2">Alternate job title(s) – specialisations</td><td colspan="2">Functional Category</td></tr>
<tr><td colspan="2">NPP O
WM & RP</td><td colspan="2">-----</td><td colspan="2">Executive</td></tr>
</table>

Role / Functions

Accomplish Radiation Protection tasks in all operation modes and for keeping a safe environment in all work places, under the supervision of a Radiation Protection Officer

- Implement the RP measures at work places and in potential contaminated area in both production and outage
- Collect and analyse the readings of personal monitoring equipment (dosimeters) used by plant personnel and measure individual exposure to radiation
- Implement the initial response to any abnormal events and to any alarms generated by radiation monitoring equipment
- Decontamination of materials, premises and persons by the appropriate methods

JOB REQUIREMENTS

KNOWLEDGE (Cognitive competence)	EQF level (1-8)
Radiological decontamination	4
Dosimetry: natural & artificial sources, quantities and units, dose limits for professional exposure and for population, RP external doses; protection against internal exposures and external exposure	4
Dose Monitoring-regulatory Framework	3
Fuel Cycle, Radioactive Waste handling, Interactions of radiation with matter and Plant systems and components	3
....	

SKILLS (Technical and functional competence)	EQF level (1-8)
Report changes in radiological conditions	3
Identify and quantify radiation hazards and implements radiation protection monitoring activities	3
Deliver a radiation protection monitoring service to defined standards	3
Make radiological measurements and maps at the site	3
....	

COMPETENCE (Attitude; behavioural and personal competence)	EQF level (1-8)
Eye for detail / accuracy	3
Team working	3
Conscientiousness	3
....	

NOTES

Proposal to move RP profiles to Safety and Security area

DRAFTED BY:	1ST REVIEW:	2ND REVIEW:
1ST ECVET WORKSHOP	M CECLAN	5TH ECVET WORKSHOP
14.10.2012	13.05.2013	14.11.2014

Nuclear Job Taxonomy
2.4.03 v. 04.05.2017   1/1

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RPW competence based qualification structure 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	

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ULOs for RPW qualification

ULO 1 Introduction to nuclear power technology

ULO 2 Radiation protection

ULO 3 Radiation monitoring

ULO 4 Nuclear fuel and Radioactive waste

ULO 5 Accident and emergency issues

ULO 6 Decontamination

ULO 7 Safety and security

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QUALIFICATION STRUCTURE			
1. UNITS OF LEARNING OUTCOMES			
ULO 1			
ULO .... N			
2. LEARNING OUTCOMES			**EQF level (1-8)**
ULO 1	LO 1.1		
	LO 1.2		
	LO 1.3		
	LO 1.4		
	LO 1.5		
	LO 1.6		
3. SPLITTING LOs IN K,S,C/A			
K no.	**KNOWLEDGE (Cognitive competence)**		**EQF level (1-8)**
K 1.1.1			
.....			
K 1.1.n			
K 1.2.1			
....			
K 1.2.n			
S no.	**SKILLS (Technical and functional competence)**		**EQF level (1-8)**
S 1.1.1			
S 1.1.2			
S 1.2.1			
....			
S 1.2.n			
C/A no.	**COMPETENCE (Attitude; behavioural and personal competence)**		**EQF level (1-8)**
C/A 1.1.1			
....			
C/A 1.1.3			
C/A 1.2.1			
....			
C/A 1.2.3			

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ECVET oriented competence based training program for Radiation Protection Worker

The development of ECVET based training course was essential part of the preparation of ECVET oriented qualification and its pilot testing. The target was to transfer ECVET oriented competence based qualification to an ECVET oriented competence based training course for Radiation Protection Worker.

The Training program was organised in Training courses (units), which correspond to the Units of LO.

Each training course was organised in modules, which aim to cover all Knowledge, Skill and Competence items belonging to the corresponding unit.

Presenter logo
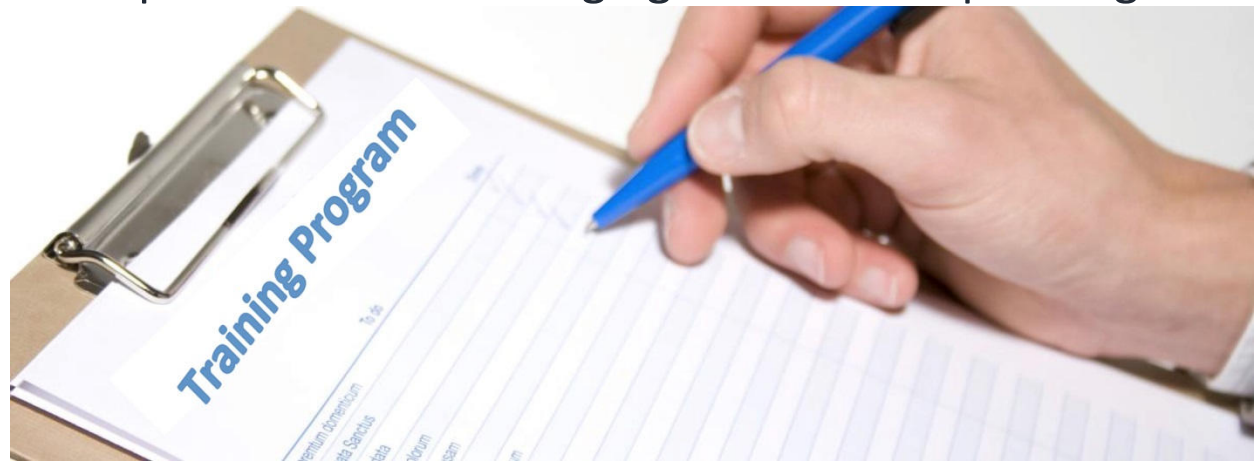
Requirements to the training courses

For each training course within the training programme the following information is provided:

- Objectives of the training course;

- Requirements to the target audience;

- Content of the training course (topics);

- Suggested duration of the course (in working days and in academic hours);

- Type of training – theoretical, practical, simulator / initial, refreshing;

- Methods for evaluation.

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Training course No 2 Radiation Protection Activities (example)

Autonomy/Responsibility	
MODULE 2.1 Ionizing radiation	
Skills	**Knowledge**
S.2.1. Explain the nuclei composition (p, n and e) S.2.2. Use the chart of nuclides and nuclear data and find important constants. S.2.3. Perform different dosimetry calculations.	K.2.1. General characteristics of atoms (electrical charge, nuclei, mass and dimension) K.2.2. Interaction of ionising radiation with matter K.2.3. Biological effects of ionising radiation ….
MODULE 2.2 Radiation protection activities	
S.2.4. Choose the appropriate protective equipment according to the working environment. S.2.5. Propose a suitable active or passive dosimeter for different radiation protection situations. ……	K.2.6. Dosimetry and dose types (absorbed dose, equivalent dose and effective dose) K.2.7. Methods and tools for radiation protection for internal and external radiation exposure ………
Assessment criteria (used by the trainer to assess the trainees): Capability in application of the ALARA implementation strategy Proper behaviour in emergency situations ……	Precision of dose measurements evaluation Precision of calibration of the equipment ………
Recommended assessment methods (used by the Competent institution to recognize the training): Written test - case study, problem solving Practical test - simulation exercises ……..	Face to face examination, etc.

Assignment of the roles of the participants

Two universities were selected to play the role of host provider.

- BME – Hungary

- MEPhI – Russia

The rest of the Consortium's partners played
the role of sending provider.
The mutual recognition of the curricula,
training programs and learning outcomes is still
Under development.
The pilot training was organised from 30.01. till
03.02.2017 at Budapest University of Technology
and Economics premises in Budapest, Hungary.

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Development of the ECVET oriented pilot training course

The Training Units correspond totally to the Units of Learning Outcomes, but divided into Modules. The Modules are the smallest convertible (interchangeable) units. Assessment criteria and assessment methods are developed for each Training Unit.

The **target audience** was identified as non-nuclear professionals or students, which are graduated at least to the level of bachelors or are currently bachelors' students, with negligible prior knowledge or without knowledge and experience in nuclear could be trained.

This covers the general target of **nuclearization**.

The training program aimed to give competencies at **EQF Level 3 and 4**.

The training program for the pilot course contains 3 modules:

• **Introduction to nuclear power** - developed and provided by BME

• **Radiation protection** - developed and provided by BME

• **Nuclear fuel and radioactive wastes** - developed and provided by MEPhI in the form of video conference

The duration of the training was **40 hours**.

The working language was **English.**

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Conductance of the pilot training

The pilot training was organised from **30.01. to 03.02.2017** at Budapest University of Technology and Economics premises in Budapest, Hungary.

Participants:

• 8 trainees from 3 countries (4 organisations)

• 2 observers from 2 countries

Trainees	
Institution, Country	**Number**
Research Centre Rez (CVRez), Czech Republic	3
National Center of Radiobiology and Radiation Protection (NCRRP), Bulgaria	2
Kozloduy NPP, Bulgaria	1
Moscow Engineering Physics Institute (MEPhI), Russia	2
Total	**8**
Observers	
Research Centre Rez (CVRez), Czech Republic	1
Risk Engineering Ltd., Bulgaria	1
Total	**2**

Conductance of the pilot training (cont.)

The level of experience and knowledge of the trainees were assessed by entrance tests. The tests were as follows:

- Jump-in Test questions in the topic of Introduction to Nuclear Technology
- Radiation Protection Worker Entrance test

Evaluation of the obtained knowledge and skills and the training programme effectiveness were organized at the end of the training by the use of two questionnaires:

- Final Test questions about the content of the whole pilot training
- Participants Satisfaction Survey for the Radiation Protection Worker Pilot Training

The observer's evaluation was based on the preliminary prepared and agreed instructions. The key aspects that were observed are:

- Organisation and management of the pilot training
- Training materials – content, quality, use of laboratory equipment
- Fulfilment of requirements for ECVET oriented training
- Assessment of trainee's achievements- types, criteria, alignment with LO
- Overall course evaluation

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Evaluation of the pilot training

Observer's evaluations

Improvements are possible with regard to:

- Revision of the training material on the topic "Nuclear fuel and radioactive waste" to correspond to the EQF 3/4
- Increase of the duration of laboratory exercises in order to put more attention on training of skills
- Use of more interactive way of learning, instead of presenting the slides during video conference. The training materials prepared for topic "Nuclear fuel and radioactive waste" could be used for self-training, video conference could be used for Trainee -Lecturer communication and/or collaboration

Thank you

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