Competence-based approaches in radiation protection

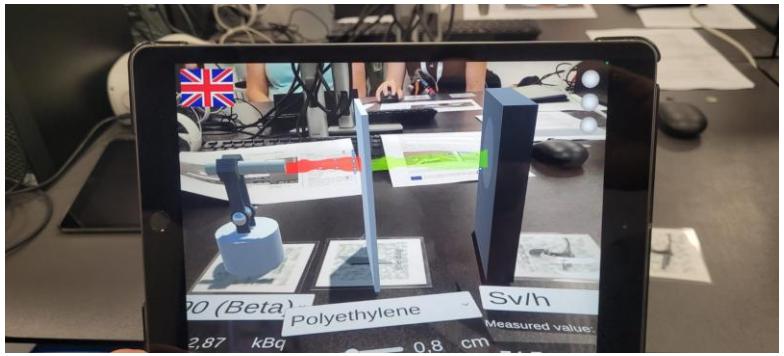
10th EUTERP Workshop, July 7-9 2026, PSI, Villigen, Switzerland

EUTERP Foundation – An introduction

Established in 2010, the objectives of the Foundation are:

- to encourage and support **harmonization of education and training requirements** for RPOs, RPEs and radiation workers, **facilitating the mobility** of these professionals;
- to act as a **central focus for the sharing of information** on training events, standards, developments, and all other related information; and
- to support all stakeholders in **ensuring high-quality E&T in radiation protection**, taking into account and integrating new learning methods such as VR, AR, AI, etc.

Train-the-trainer event in radiation protection
24-27 June 2025, Milan, Italy



EUTERP – European T&E in RP Foundation

- 27 Associates of the EUTERP Foundation

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Why focus on comeptencies?

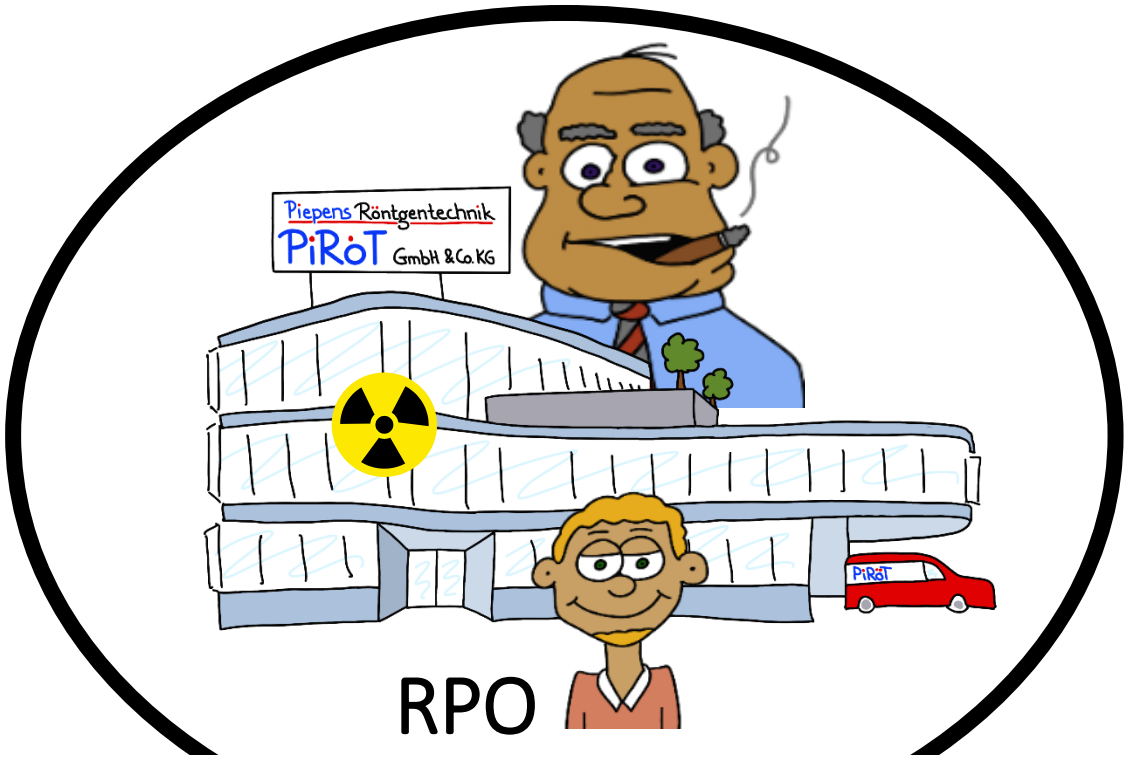
DIRECTIVE 2013/59/EURATOM, Chapter II, article 4

- No 73: **RPE "radiation protection expert**" means an individual or, if provided for in the national legislation, a group of individuals having the knowledge, training and experience needed to give radiation protection advice in order to ensure the effective protection of individuals, and whose **competence** in this respect is recognised by the competent authority;
- No 74: **RPO "radiation protection officer**" means an individual who is technically **competent** in radiation protection matters relevant for a given type of practice to supervise or perform the implementation of the radiation protection arrangements;
- No 49 "**medical physics expert**" means an individual or, if provided for in national legislation, a group of individuals, having the knowledge, training and experience to act or give advice on matters relating to radiation physics applied to medical exposure, whose **competence** in this respect is recognised by the competent authority;

Implementation of RPOs, RPEs and MPEs

- For historical reasons, radiation protection systems in Europe vary considerably, and the tasks and responsibilities are distributed amongst different individuals and roles
- By the way: it was during the 2nd EUTERP workshop in April 2008 in Vilnius that the idea of introducing the RPO was born, because the existing concept – which specified only an RPE ('Qualified Expert') – did not meet the requirements of many Member States.
- The practical implementation of the roles of RPO and RPE can vary considerably from country to country – an RPO in one country does not necessarily correspond to the RPO in another.
- Consequently, the first step is to understand the different implementation of roles, and various projects have been carried out to clarify this

Organisation of radiation protection in Europe



“is technically **competent** in radiation protection matters relevant for a given type of practice to supervise or perform the implementation of the radiation protection arrangements”

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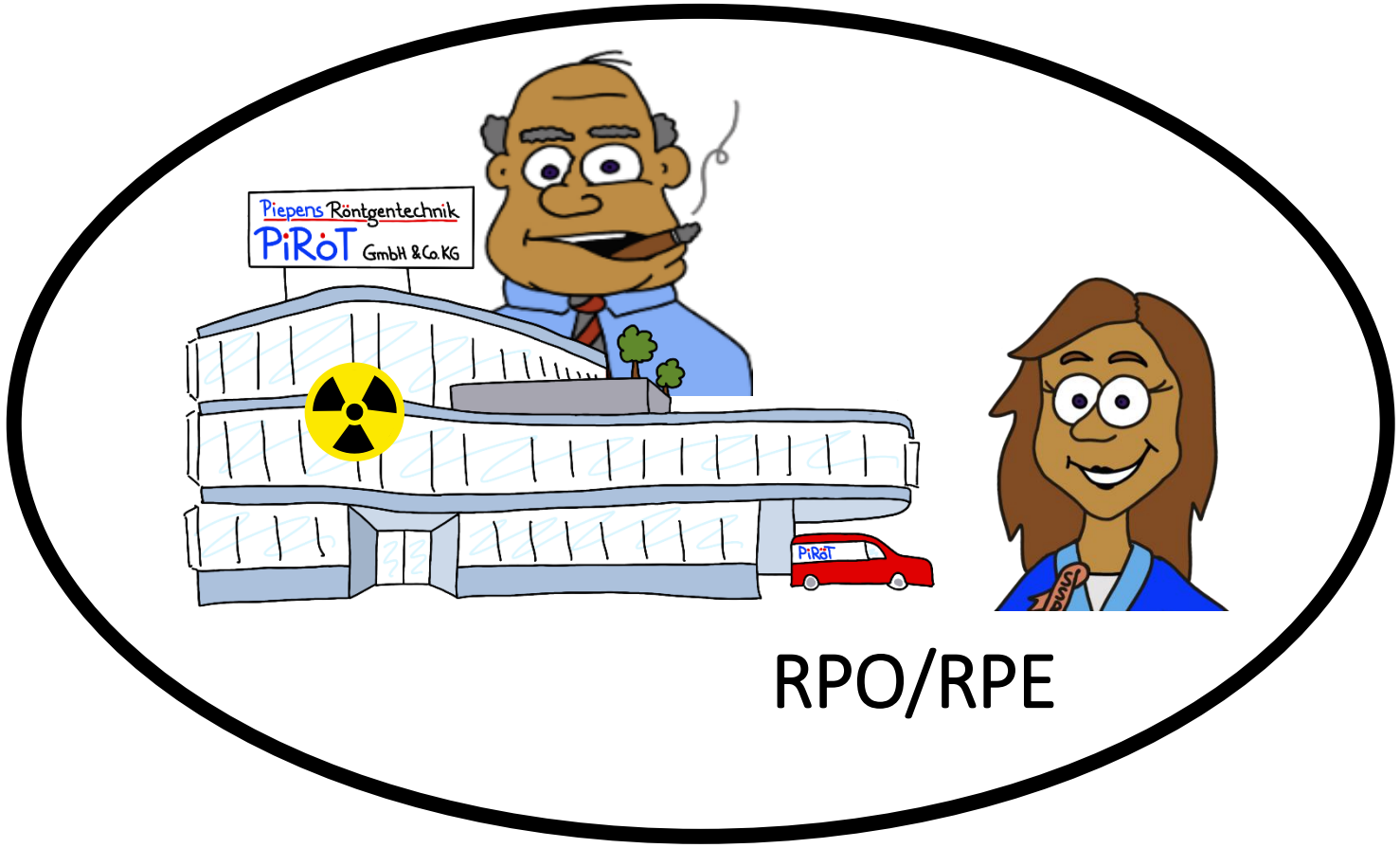
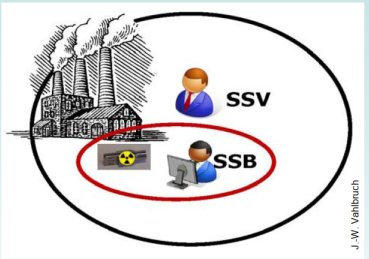
Organisation of radiation protection in Europe



DE system of Responsibilities



Advantages of DE system

- Responsibilities very clearly assigned
- Accountable person available in undertaking
- Person with expertise available „in-house“

Limitations of training (graded approach)

- Level of qualification dependant on risk of practice
- Recognition only valid within limits of qualification
- For low-risk practices only limited training is feasible

No. RPEs

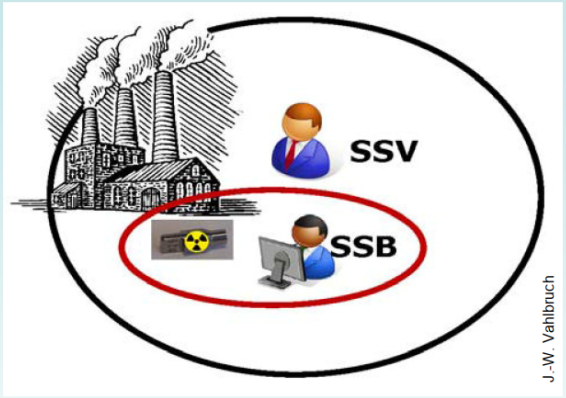
UK: 500

BE: 80

DE: 100.000

Organisation of radiation protection in Europe

DE system of Responsibilities



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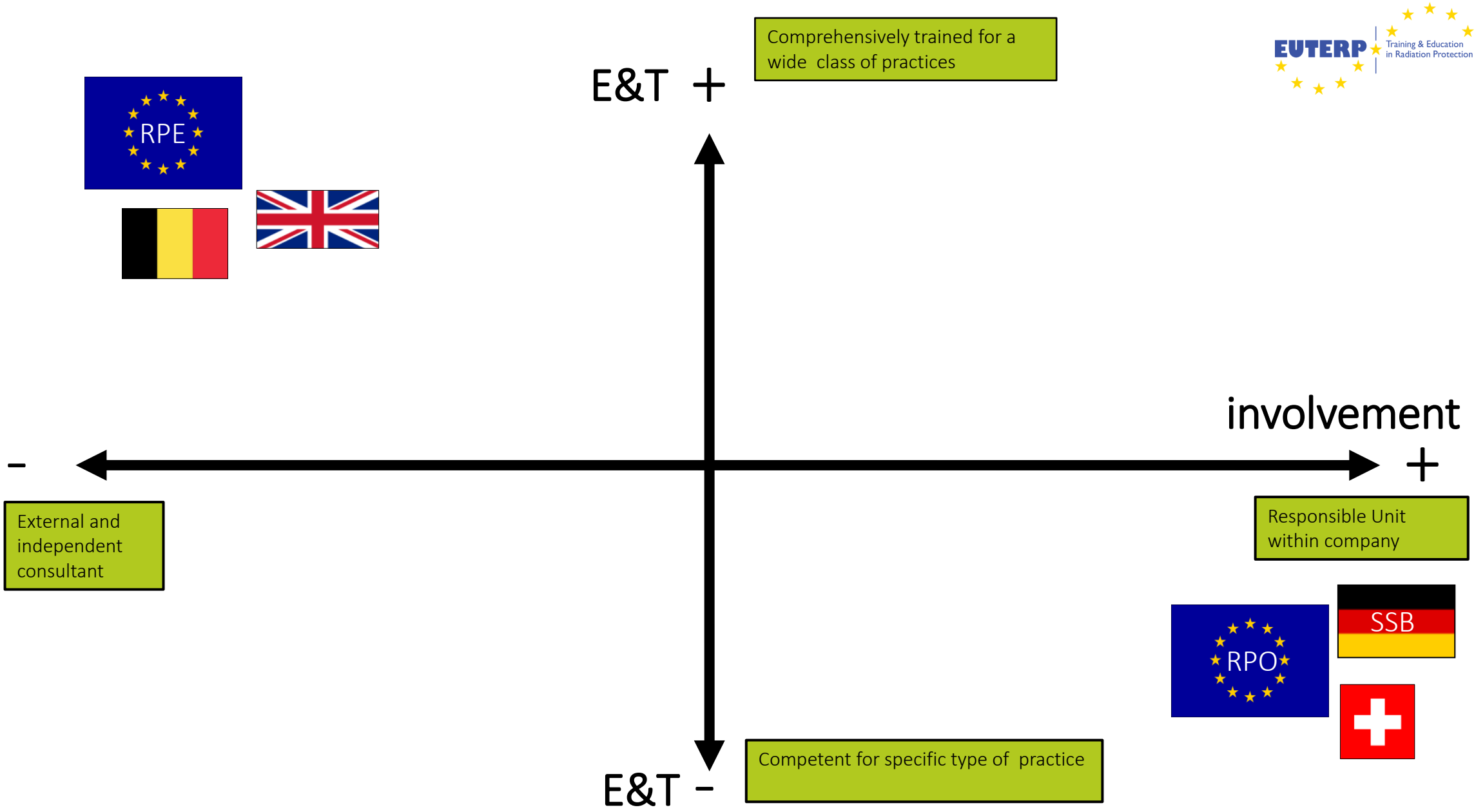
Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Julian Vogel,
Division RS II 3


Comprehensively trained for a wide class of practices
E&T +
RPE
involvement
-
+
External and independent consultant
Responsible Unit within company
RPO
SSB
E&T -
Competent for specific type of practice

Implementation of RPOs and RPEs in different MS

- ENETRAP I, II and III: report March 2016 „European Guidance on the Implementation of the Requirements of the Euratom BSS with respect to the Radiation Protection Expert and the Radiation Protection Officer"

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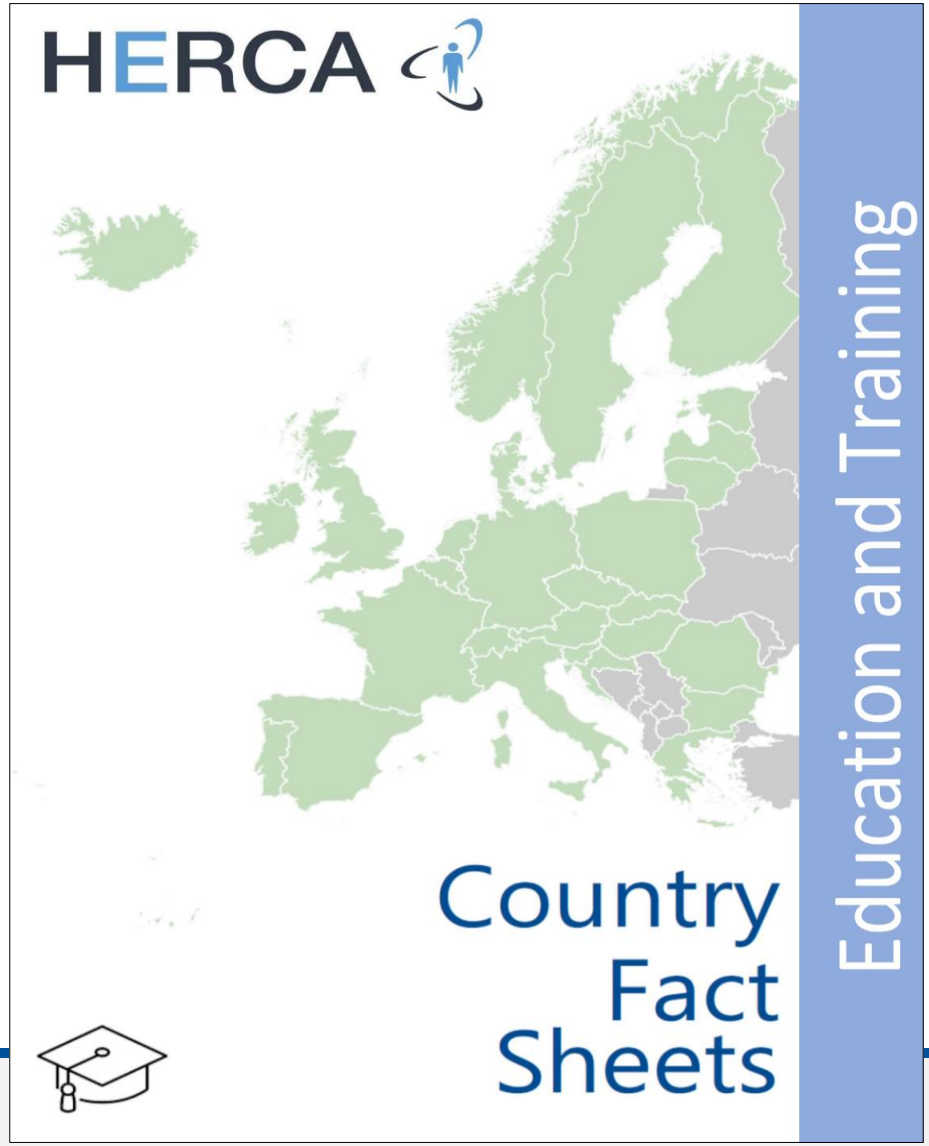
- HERCA fact sheets: https://www.herca.org/download/11486/?tmstv=1782118619



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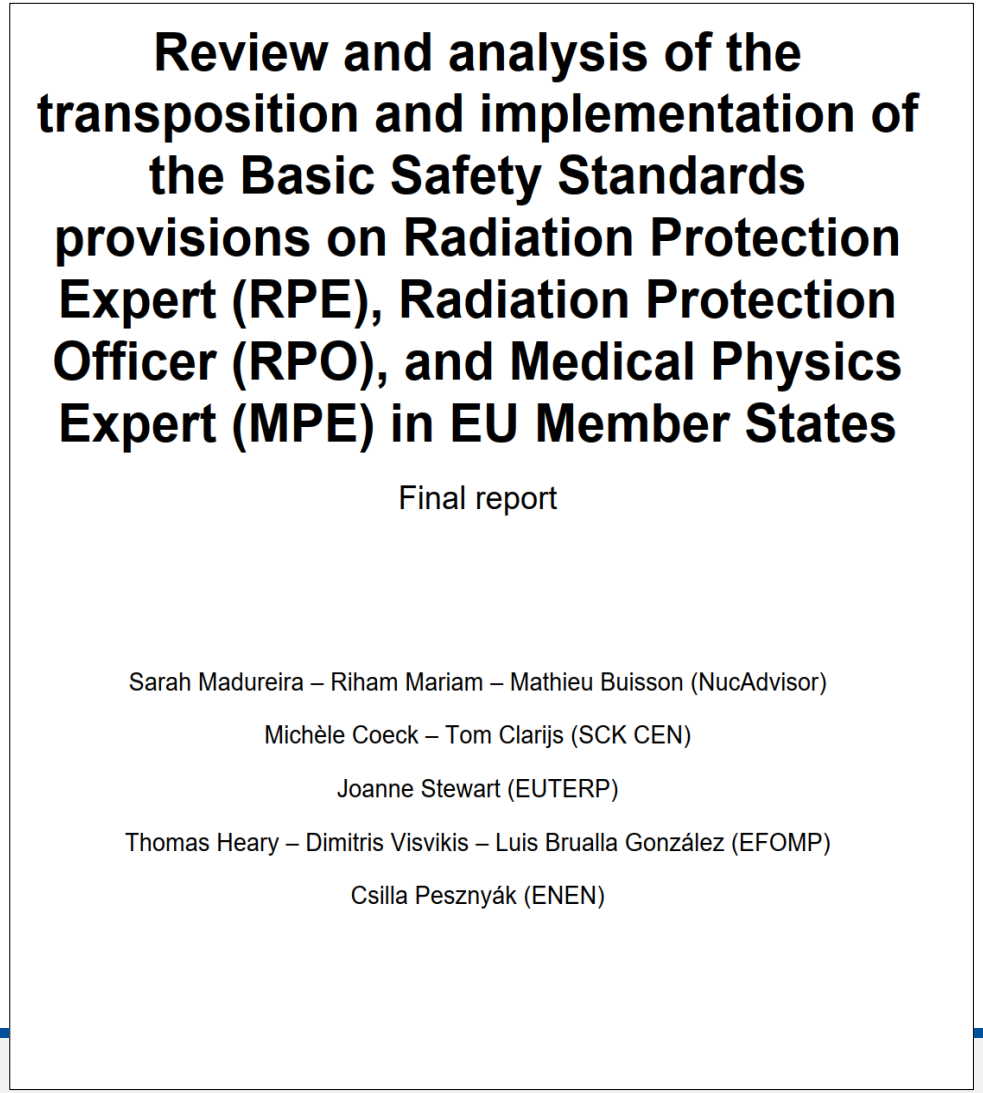
- HERCA fact sheets: https://www.herca.org/download/11486/?tmstv=1782118619
- Review and analysis of the transposition and implementation of the basic safety standards provisions RPE, RPO, and MPE in EU MS https://op.europa.eu/en/publication-detail/-/publication/6477fb76-6472-11f1-9b18-01aa75ed71a1



Review and analysis of the transposition and implementation of the Basic Safety Standards provisions on Radiation Protection Expert (RPE), Radiation Protection Officer (RPO), and Medical Physics Expert (MPE) in EU Member States

Final report

Sarah Madureira – Riham Mariam – Mathieu Buisson (NucAdvisor)

Michèle Coeck – Tom Clarijs (SCK CEN)

Joanne Stewart (EUTERP)

Thomas Heary – Dimitris Visvikis – Luis Brualla González (EFOMP)

Csilla Pesznyák (ENEN)

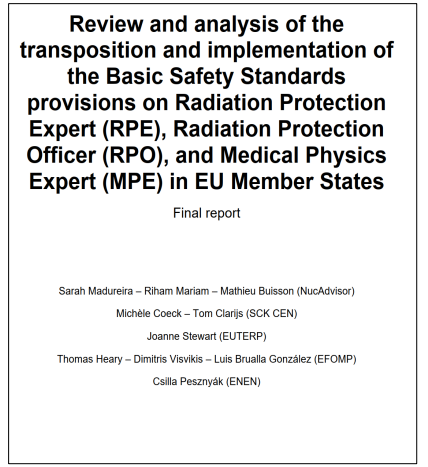
Review and analysis of the transposition and implementation of the basic safety standards provisions RPE, RPO, and MPE in EU MS

Recommendation 1: interpretation of roles and functions

Action for improvement

The **European Commission** should (with stakeholder involvement) establish an initiative to update and publish the guidance developed under ENETRAP III, covering:

1. expectations regarding (and the limits of) roles and functions, setting benchmarks for RPE and RPO status and focusing on a competence-based approach;
2. clarification of the objective of recognition (for the RPE role) and what is expected in terms of how that is achieved by competent authorities;
3. the relation of the BSSD requirements to the Council recommendation on qualification frameworks.



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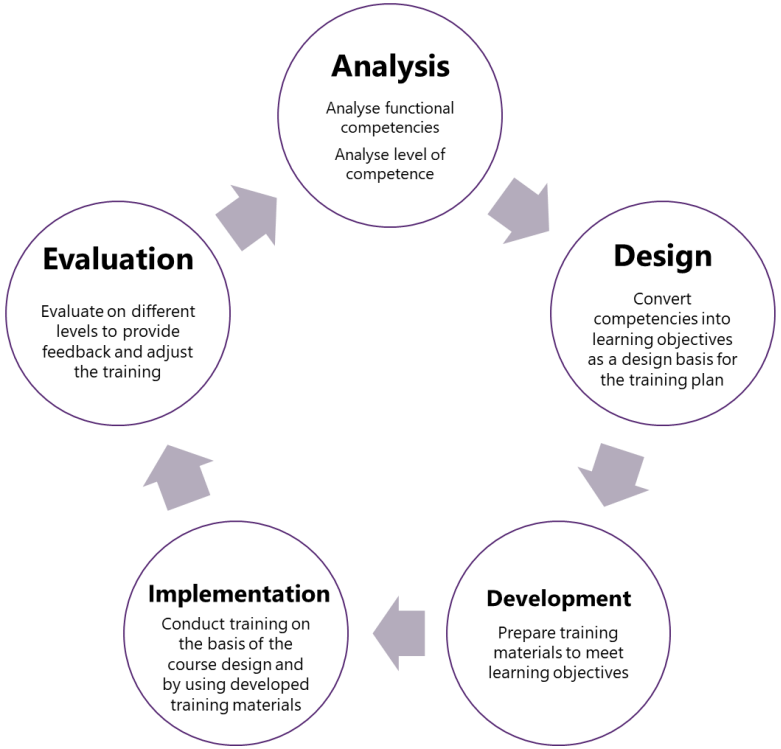
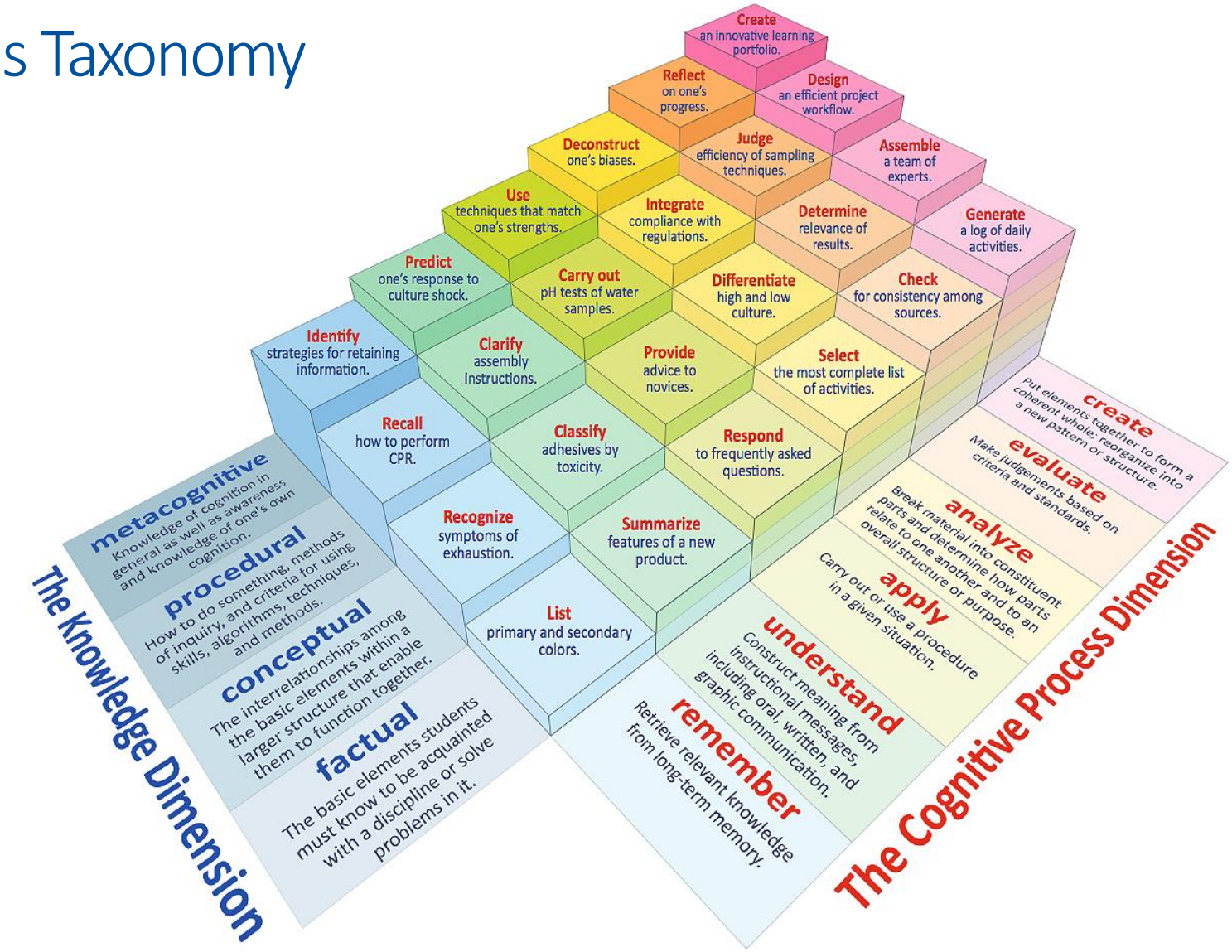
What is competence?

- Last Train-the-Trainer event: SAT was presented by Tom Clarijs
- 1. step: Analysis of the needs
- Result:
  - Knowledge
  - Skills
  - Attitude

  } K+S+A = Competence
- EC-approach:
  - Knowledge
  - Skills
  - Competences (autonomy & responsibility)



Bloom´s Taxonomy



A Model of Learning Objectives–based on *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* by Rex Heer, Center for Excellence in Learning and Teaching, Iowa State University

10th EUTERP workshop :

Proposed topics include:

- **Working session 1 | Design, implementation and evaluation of competencies**
  - **Designing** competences in radiation protection, including soft skills
  - **Evaluation** of competences: methods, tools, and best practices.
- **Working session 2 | Establishment of qualification pathways and competence frameworks**
  - European **competence frameworks**: **comparisons**, references, and country-specific developments. **Including the IAEA Competence framework for QE and RPO, IAEA**
- **Working session 3 | New methods in radiation protection E&T**
  - Use of AI in radiation protection training,
  - How to build reliable AI-generated solutions to problems in radiation protection?
  - Can AI driven tools fill the gap in the missing knowledge of national regulations?

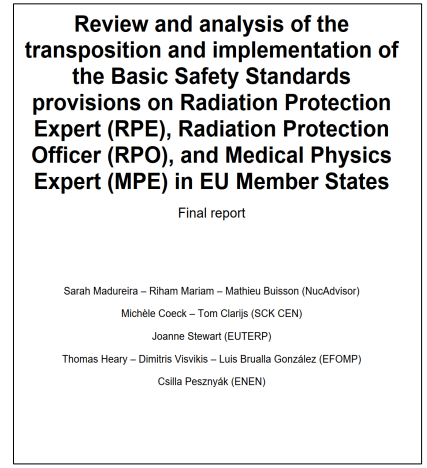
Review and analysis of the transposition and implementation of the basic safety standards provisions RPE, RPO, and MPE in EU MS

Recommendation 2: consideration of competence

Action for improvement

International organisations (such as HERCA, EUTERP and IRPA) should:

1. set up a relevant taskforce / working group;
2. promote the (updated) European Commission guidance model / standard (see recommendation 1);
3. support and progress the development of common training standards to support competence development.



Although 'competence' (for the RPE) and 'technical competence' (for the RPO) are inherent to the definitions of these roles, there is no uniform application or definition of these concepts in Member States and, consequently, in associated development pathways. In many countries, the focus of training appears to be on radiation science and the fundamentals of radiation protection, which, while clearly an essential component in the process of competence development, do not cover all the requirements. For example, to provide expert advice (in the case of the RPE), achieving operational competences and having the ability to formulate appropriate advice – which requires judgement, situational understanding, good communication skills, etc. – are required. It is difficult to see (on the basis of the information currently available) how, or if, opportunities to develop these skills are addressed.

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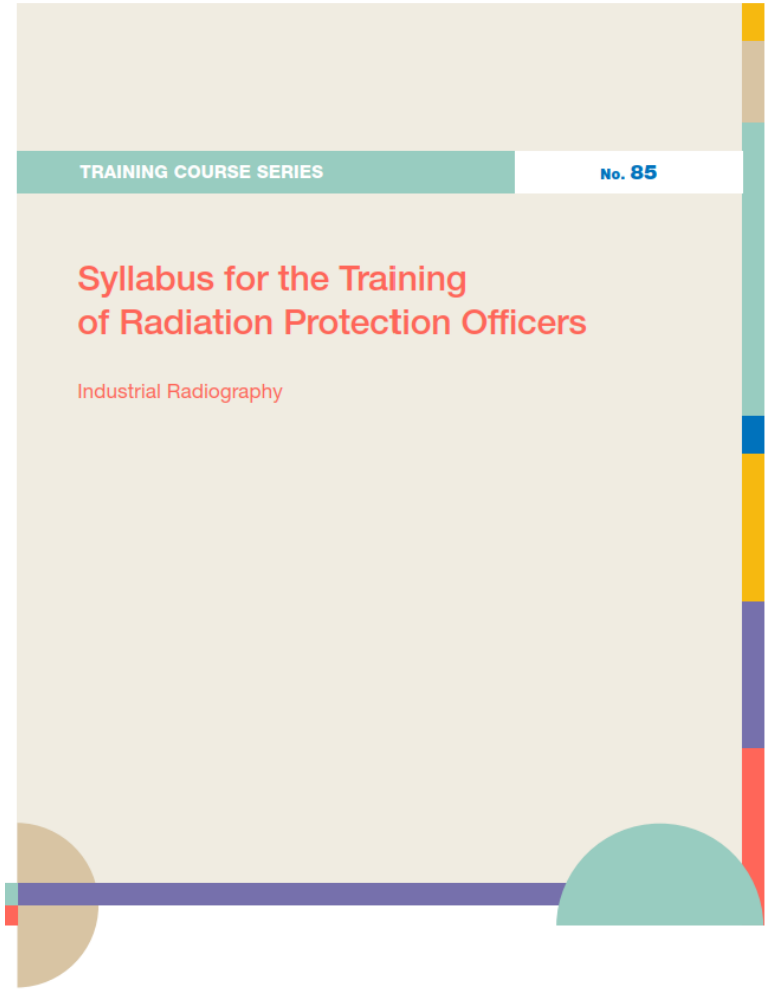
IAEA Training Course Series No 85

Published Summer 2025:

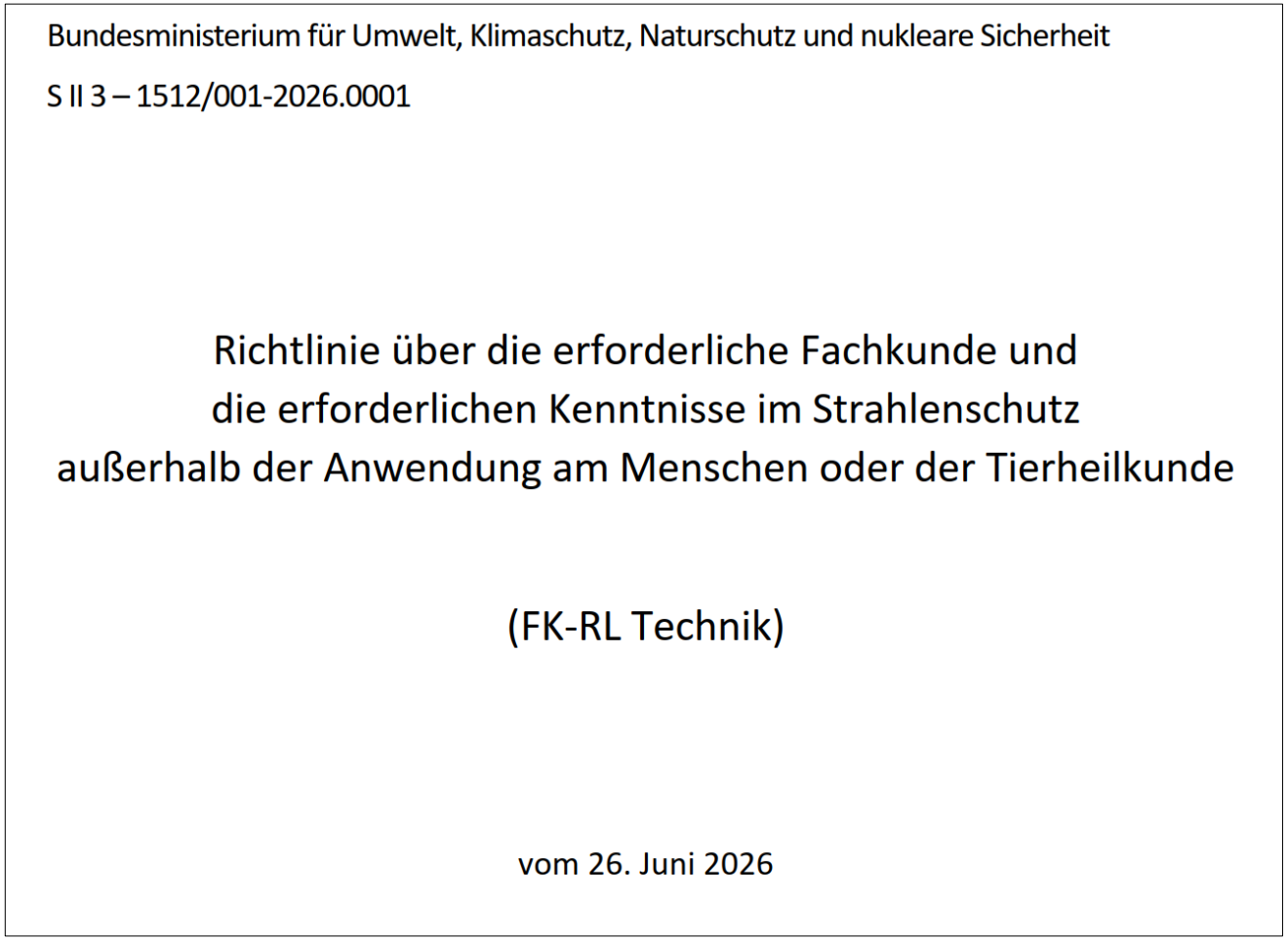
IAEA Training Course Series No 85 Syllabus for the Training of Radiation Protection Officers

Industrial Radiographers



German Guideline on the E&T of RPOs and RPEs for technical applications

- Published 26 June 2026
- Including learning content and learning outcomes (**competences)**



Bundesministerium für Umwelt, Klimaschutz, Naturschutz und nukleare Sicherheit

S II 3 – 1512/001-2026.0001

Richtlinie über die erforderliche Fachkunde und
die erforderlichen Kenntnisse im Strahlenschutz
außerhalb der Anwendung am Menschen oder der Tierheilkunde

(FK-RL Technik)

vom 26. Juni 2026

Comparison of learning outcomes

IAEA

Learning objectives

To be able to:

- Describe the difference between ionizing and non-ionizing radiation
- Explain the terms ‘ionizing radiation’ ‘sealed source’ and ‘radioactive contamination’
- Explain, in practical terms, the difference between radioactive sources and radiation generators
- Describe the important features of gamma sources and X ray generators used in industrial radiography
- Explain how the accelerating voltage, current and beam filtration affects the quality of the X ray beam generated
- Explain for an X ray generator, in general terms, the relationship between applied voltage and radiation energy
- Compare the penetrating powers of different types of radiation and of radiations of the same type but of different energies
- Explain the categories of the radioactive sources used in industrial radiography
- Explain the difference between the primary beam and scattered radiation

Germany

To be able to:

- Explain the structure of the atom. Explain the physical properties of the components of the atom (protons, electrons, neutrons)
- Explain the concept of ionising radiation, its various types and its basic physical properties
- Explain how X-rays are produced and describe the basic structure of an X-ray machine
- calculate the dose rate as a function of source parameters (e.g. type of radiation, activity, current, geometry, distance)
- calculate shielding (e.g. based on attenuation factors, half-value layer thickness, one-tenth value layer thickness, range, bremsstrahlung)

Comparing competences

- Comparing learning outcomes to identify commonalities in the E&T of RPEs and RPOs in different countries
- Comparing national learning outcomes to benchmark-documents like IAEA guidelines (Syllabus RPOs industrial radiographer, IAEA-Document ‘Competence building for RPEs/RPOs’,
- How to integrate AI?
  - Promising first trials with different LLM to identify commonalities and gaps in competencies
  - Doublecheck by EUTERP-experts -> Compiling a collection of quality-assured national comparisons of competences to support mutual recognition

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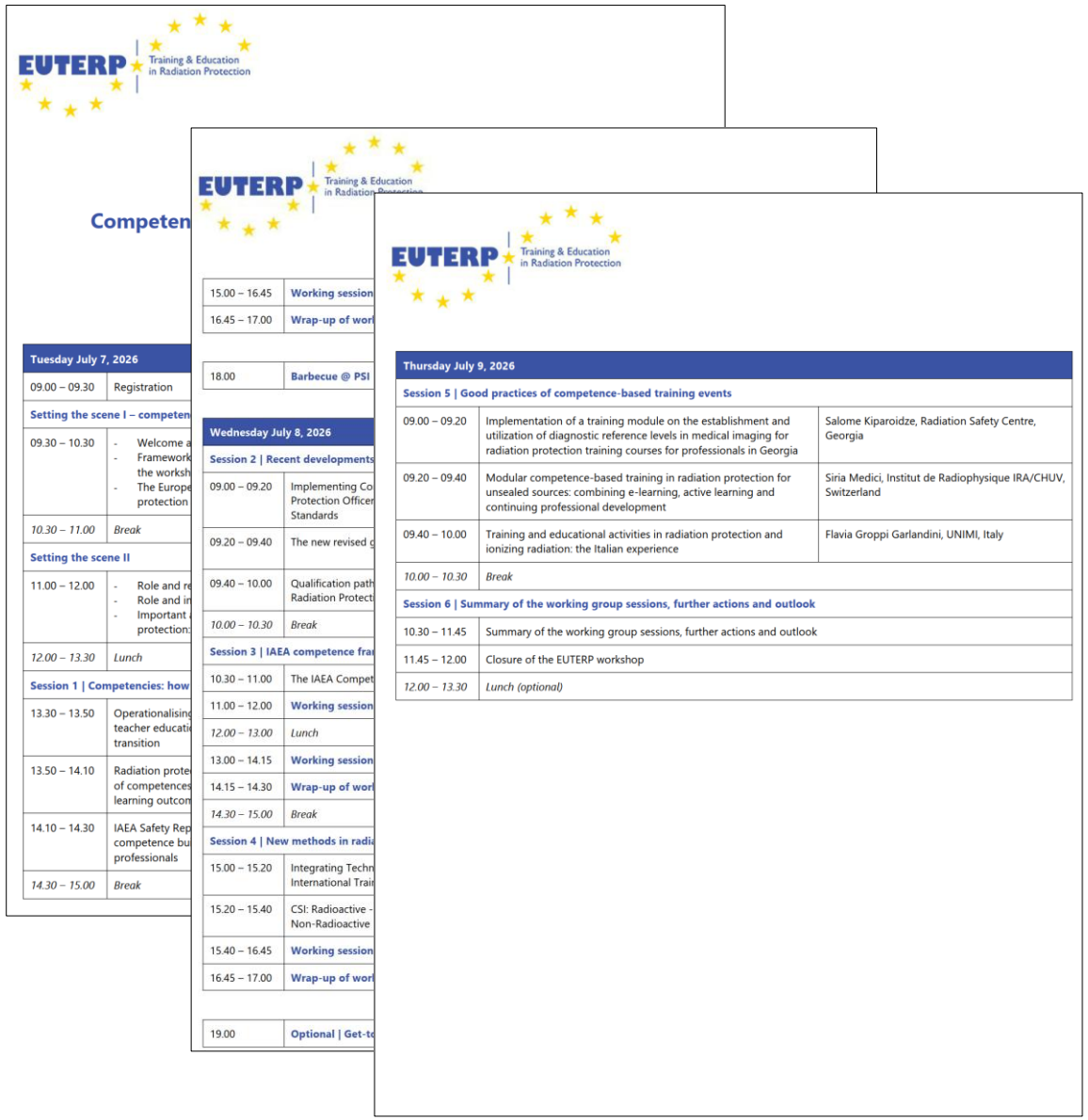


Thursday July 9, 2026		
Session 5 | Good practices of competence-based training events		
09.00 – 09.20	Implementation of a training module on the establishment and utilization of diagnostic reference levels in medical imaging for radiation protection training courses for professionals in Georgia	Salome Kiparoidze, Radiation Safety Centre, Georgia
09.20 – 09.40	Modular competence-based training in radiation protection for unsealed sources: combining e-learning, active learning and continuing professional development	Siria Medici, Institut de Radiophysique IRA/CHUV, Switzerland
09.40 – 10.00	Training and educational activities in radiation protection and ionizing radiation: the Italian experience	Flavia Groppi Garlandini, UNIMI, Italy
10.00 – 10.30	*Break*	
Session 6 | Summary of the working group sessions, further actions and outlook		
10.30 – 11.45	Summary of the working group sessions, further actions and outlook	
11.45 – 12.00	Closure of the EUTERP workshop	
12.00 – 13.30	*Lunch (optional)*	

PROGRAMME

10th EUTERP WORKSHOP
Competence-based approaches in radiation protection

July 7-9, 2026
PSI, Villigen, Switzerland

- 31 participants
- 3 working sessions
- 17 talks
- BBQ
- Get-together

Thank you for your attention!

Dr. Jan-Willem Vahlbruch

Institute of Radioecology and Radiation Protection (IRS) at Leibniz University Hannover (LUH)
Herrenhäuser Str. 2
30419 Hannover - Germany

vahlbruch@irs.uni-hannover.de

Next EUTERP-workshop: Focusing on competences

Register here:

https://www.sckcen.be/en/euterp2026

Comparing learning outcomes – an example

COMPARISON BETWEEN IAEA SYLLABUS AND GERMAN REQUIREMENTS FOR RPOS IN INDUSTRIAL RADIOGRAPHY

IAEA Training Course Series No 85

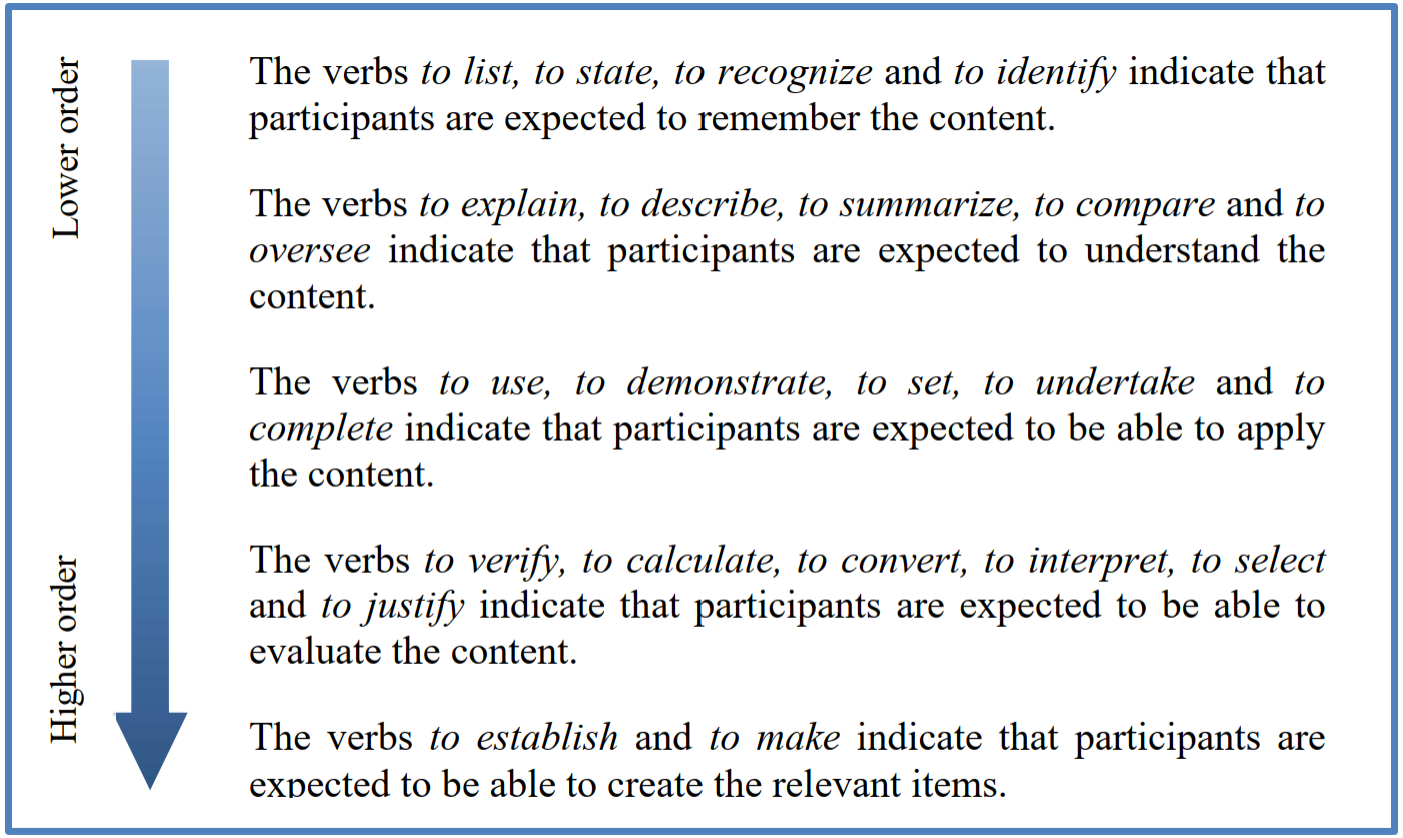
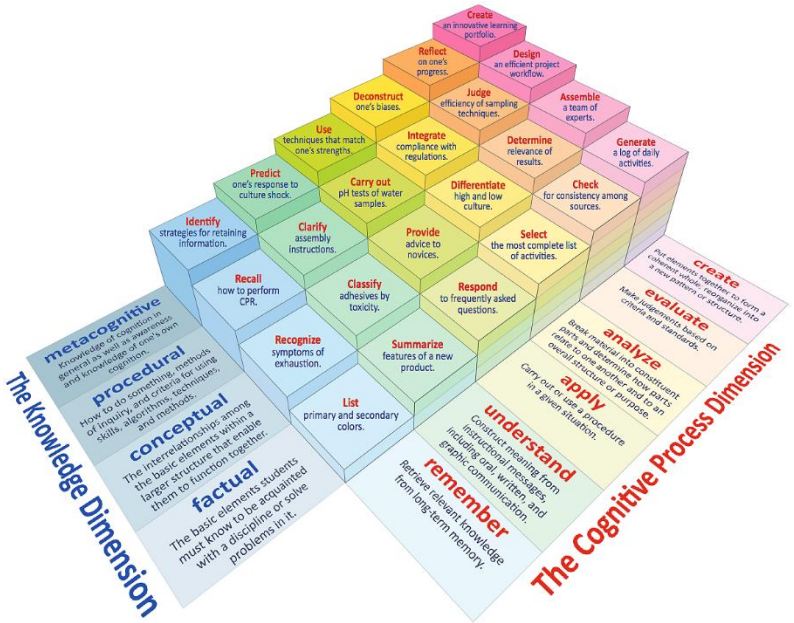


FIG. 1. Relationship between the verbs used in the learning objectives and the expected level of achievement.

TABLE 2. CONTENT AND LEARNING OBJECTIVES OF TOPIC 2: BASIC CONCEPTS OF IONIZING RADIATION

Content	Learning objectives
	To be able to: - Describe the difference between ionizing and non-ionizing radiation - Explain the terms 'ionizing radiation' 'sealed source' and 'radioactive contamination' - Explain, in practical terms, the difference between radioactive sources and radiation generators - Describe the important features of gamma sources and X ray generators used in industrial radiography - Explain how the accelerating voltage, current and beam filtration affects the quality of the X ray beam generated - Explain for an X ray generator, in general terms, the relationship between applied voltage and radiation energy - Compare the penetrating powers of different types of radiation and of radiations of the same type but of different energies - Explain the categories of the radioactive sources used in industrial radiography - Explain the difference between the primary beam and scattered radiation

Suggested exercise

Demonstration of the types and properties of spontaneous radiations including their penetrating power

Comparing competences

- Comparing learning outcomes to identify commonalities in the E&T of RPEs and RPOs in different countries
- Identifying professional roles and countries for which a comparison might be useful
- Looking forward to commenting on the IAEA Document ‘Competence building for RPEs/RPOs’, in collaboration with IRPA
- How to integrate AI?
  - Promising first trials!
  - Doublecheck by EUTERP-expert -> stamp EUTERP-proofen
  - Compare also to benchmark-documents like the IAEA Document ‘Competence building for RPEs/RPOs’

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