

JRC.G Training Catalogue 2020

*Joint Research Centre
Directorate for Nuclear Safety
and Security*

Cihlář, M.

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Abstract

The JRC.G Training catalogue collects up-to-date information on training courses and programmes that JRCG – the Directorate for Nuclear Safety and Security offers in nuclear safety, nuclear security and safeguards, nuclear science applications, nuclear decommissioning and waste management. The training courses are available to specialized professional groups, academia and public institutions as well as to interested young professionals and students in the relevant fields.

This training catalogue presents the recurrent training activities planned by the JRCG for the year 2020. It also includes the course administration changes that occurred in 2021.

1 Introduction

This JRC.G Training catalogue 2020 collects up-to-date information on training courses and programmes that JRC G. offered in various nuclear domains for 2020. These include nuclear safety, nuclear security and safeguards, nuclear science applications, nuclear decommissioning and waste management. The training courses are available to specialized professional groups, academia, public institutions and individual interested young professionals or students.

The actual course delivery, however, was adversely affected by the Covid-19 pandemic. Due to the related general restrictions, many courses had to be either cancelled or delivered on-line.

The Training catalogue 2020 has also included all modifications in the course administration that occurred during 2021 because of JRC organizational changes.

2 JRC.G training courses per field

2.1 Nuclear Safety

The European Union has currently 106 nuclear reactors in operation distributed over 13 countries. Three types of reactors are in operation in the European Union: Pressurized Water Reactors (PWR and VVER), Boiling Water Reactors (BWR) and Pressurized Heavy Water Reactors (PHWR – CANDU). Nuclear power plants operating those reactors generate approximatively 25% of the EU electricity production.

Nuclear power plants are sophisticated and complex energy systems requiring strict regulations and qualified personnel to operate reliably and safely. The high level of operational and nuclear safety can also be achieved through adequate design configuration, proper operation management and procedural guidance. Improving nuclear safety is of utmost importance for protecting workers, public and the environment from undue radiation hazards. It is therefore essential to develop and improve safety culture including trainings of the current and future work force of nuclear installations.

The nuclear–safety-related training offered by JRC.G mainly focuses on event cause analysis and experience feedback from unusual events at nuclear installations. Another training is committed to European activities in environmental radioactivity monitoring. Special lectures and workshops can also be delivered on thermal hydraulic experimental databases and sub-sized material test techniques.

Unit	JRC.G.9		
Event	Training		
Title of training	Root Cause Analysis and Event Investigation Training Course		
Field	<input checked="" type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	36 hours		
Venue	EC-JRC Petten, The Netherlands		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.9	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input type="checkbox"/> internal	<input type="checkbox"/> external	<input checked="" type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input type="checkbox"/> hands on
JRC Academy Strand ¹⁾	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by Member States representatives at the Clearinghouse Steering Committee	
Targeted audience	Clearinghouse members/ Staff of Nuclear Regulatory bodies		
Training content	Definitions and basic concepts of Operating Experience, Corrective Action Program and Root Cause Analysis, Model Program for Root Cause Analysis, Human Performance, Analytical Techniques: Event & Causal Factors Chart, Analytical Techniques: Barrier Analysis, Change Analysis, Fault Tree Analysis, Task Analysis and Interviewing, Management Oversight and Risk Tree (MORT) Analysis, Evaluating the quality of the corrective actions as to risk assessment, Root Cause Analysis – International Perspective		
Learning outcomes ²⁾	This training will provide complete information on the Root Cause Analysis (RCA) methods and tools frequently used in nuclear event investigation. It shall be comprehensible to participants with various level of knowledge of these processes.		
Contact person	Antonio Ballesteros Avila	Antonio.Ballesteros-Avila@ec.europa.eu	

Unit	JRC.G.9		
Event	Training		
Title of training	Training course for Clearinghouse members		
Field	<input checked="" type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	36 hours		
Venue	JRC Petten, The Netherlands		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.9	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input type="checkbox"/> internal	<input type="checkbox"/> external	<input checked="" type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by Member States representatives at the Clearinghouse Steering Committee	
Targeted audience	Clearinghouse members/ Staff from Nuclear Regulatory bodies		
Training content	To be determined		
Learning outcomes	The training will provide methods and tools frequently used in the practice of operating experience feedback, according to a specific topic. It shall be comprehensible to participants with various level of knowledge of these processes.		
Contact person	Antonio Ballesteros Avila	Antonio.Ballesteros-Avila@ec.europa.eu	

Unit	JRC.G.I.4		
Event	Training		
Title of training	Radioactivity Environmental Monitoring (REM) Data Submission Tool		
Field	<input checked="" type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	15 hours		
Venue	JRC Ispra, Italy		
Language	EN		
Organiser	<input checked="" type="checkbox"/> JRC.G.I.4	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input checked="" type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG ENER	
Targeted audience	Member States Data Providers		
Training content	Radioactivity Environmental Monitoring database Basics New check tool Exercises		
Learning outcomes	The user will learn how to submit and validate data into the REM database		
Contact person	Benjamin Rood	jrc-rembdsupport@ec.europa.eu	

Unit	JRC.G.I.4		
Event	International Master of Nuclear Engineering at the Technical University of Catalonia, Barcelona.		
Title of training	Lecture "Databases of Thermal hydraulic Experimental Facilities".		
Field	<input checked="" type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input checked="" type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	4 hours		
Venue	Technical University of Catalonia, Barcelona, Spain		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.I.4	<input type="checkbox"/> Co-organised with Technical University of Catalonia	<input checked="" type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input checked="" type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
JRC Academy Strand	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	Around 20 students of the International Master of Nuclear Engineering.		
Training content	<p>The lecture is about the practical use of databases of experimental facilities. The main focus is the STRESA database, its structure, performance and functions. The database contains thermal-hydraulic and severe accident data mainly produced in JRC experimental facilities as the LOBI in Ispra, Italy. The theoretical part is followed by a practical session where 3 groups of 5 students register in the STRESA DB and ask for data of one LOBI experiment as example. The data are explained in detail (experimental QLR, EDR and videos). The students have to reply to some questions using the LOBI Test Matrix during the class. At the end of the class, they are given homework exercises regarding the selected tests in the LOBI facility.</p>		
Learning outcomes	<p>After the class and homework, the students will understand the importance of experimental work in nuclear safety. They also get familiar with handling experimental data, making graphs, data conversion, etc. The students familiarize with the data stored in STRESA database. They also learn how to use them to validate computer code models for nuclear safety analyses and simulations.</p>		
Contact person	Patricia Pla Frexia	Patricia.PLA-Frexia@ec.europa.eu	

Unit	JRC.G.I.4		
Event	Exploratory Research Workshop 2020		
Title of training	Benefits and limitations of sub-sized, miniature and micro-mechanical test techniques for nuclear safety applications		
Field	<input checked="" type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	12 hours		
Venue	JRC Petten, the Netherlands		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.I.4	<input checked="" type="checkbox"/> Co-organised with EERA JPNM	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	Researchers organized within EERA JPNM and NUGENIA		
Training content	Nuclear industry interest in small specimen testing techniques (SSTT) is driven by (i) low activity of specimens after neutron irradiation, (ii) shallow penetration of ion irradiation, (iii) need to reuse standard tested surveillance samples in Long-term Operation (LTO) programmes, (iv) calibration and validation of multi-scale models. This training will disseminate practicalities of various SSTTs, identify benefits and limitations of SSTTs, develop best practices for nuclear applications, and elaborate on potential standardization needs. The training will look at all small specimen techniques, both the established and new ones, from mainly nuclear safety perspective.		
Learning outcomes	The training will provide participants with a base to decide whether and/or which SSTT they should introduce in their laboratories.		
Contact person	Peter Hähner	Peter.Haehner@ec.europa.eu	

2.2 Nuclear Security and Safeguards

Nuclear security is defined as prevention of, detection of, and response to unauthorized acts involving nuclear or other radioactive material, associated facilities and/or activities. The unauthorized acts include theft of nuclear or other radioactive material, sabotage, illicit trafficking, unauthorized access to or transfer of radioactive material. The response aims at 'reversing' the immediate consequences of unauthorized acts or access (e.g. recovering the stolen material).

To address EU concerns of theft of radioactive materials possibly associated with crime and terrorism, the [European Nuclear Security Training Centre](#) (EUSECTRA) was established at EC JRC. It provides hands-on training in detection, categorization and characterization of nuclear material to front line officers, managers, trainers and other experts in the field. EUSECTRA works with realistic scenarios and samples of real nuclear material like plutonium and uranium of different isotopic compositions.

Nuclear safeguards is defined as a set of measures verifying that states do not use nuclear material to develop nuclear weapons and that nuclear facilities are used for peaceful purposes only. To assist the European and international community in improving safeguards processes, the [European Safeguards Research and Development Association](#) (ESARDA) was established in 1969.

JRC in cooperation with the ESARDA Training and Knowledge Management working group annually organizes training courses. They introduce students into safeguards legislation, nuclear fuel cycle, verification technologies and evolution of safeguards.

In addition, JRC delivers training on using gamma-ray spectrometry for determining isotopic composition of radioactive materials, on neutron detection systems, ultrasonic sealing systems and on tank calibration methods. JRC also offers training on special IEC 63047 standard establishing format of digitally acquired data from radiation measurements or radionuclide detection systems.

Unit	JRC.G.II.8		
Event	EUSECTRA Training		
Title of training	Radiological Crime Scene (RCS) Management		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input type="checkbox"/> yearly <input type="checkbox"/> twice a year <input checked="" type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.8	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG HOME	
Targeted audience	Police Officers from EU Member States		
Training content	Radiation fundamentals and detection equipment Nuclear and radiological threat Establishment of radiological crime scene (RCS) and RCS management The impact of ionising radiation and decontamination techniques on traditional forensic evidence Practical exercise: radiological crime scene scenarios Introduction to nuclear forensics		
Learning outcomes	RCS management should ensure safe, secure, effective and efficient operations at a crime scene associated with radioactive material. The training course combines law enforcement with nuclear measurement techniques to deal with the radiological crime scene. The main topics of this one-week course are: self-protection, evidence collection, evidence management, contamination control, initial identification of the radionuclides and radiological assessment.		
Contact person	Jean Galy	Jean.Galy@ec.europa.eu	

Unit	JRC.G.II.8		
Event	EUSECTRA Training		
Title of training	Additional Protocol Exercise (APEX) Training		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.8	<input checked="" type="checkbox"/> Co-organised with IAEA	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> IAEA	
Targeted audience	IAEA/DG ENER Nuclear Safeguards Inspectors		
Training content	<p>The Additional Protocol Exercise (APEX) allows the participants to practice a Complementary Access (CA) in a fictitious scenario. In accordance with the Additional Protocol agreement, IAEA Member States provide the CA to IAEA inspectors to verify absence of undeclared nuclear material and activities at nuclear sites.</p> <p>The APEX training consists of the following parts:</p> <ul style="list-style-type: none"> • Familiarization with nuclear fuel reprocessing, transmutation and conversion activities and their potential safeguards-related aspects • Practicing the CA in real environment based on scenarios • Preparation of an exercise report • Debriefing on CA, the related scientific equipment and context of the chosen scenarios 		
Learning outcomes	<p>Due to specialized facilities available at the JRC Karlsruhe, the IAEA trainees have the opportunity to be "exposed" to an intricate and advanced nuclear R&D environment. These exercises allow participants to practice their technical, legal, observation and negotiation skills. Using them they will be able to detect indications of potential undeclared nuclear materials and activities in a complex and realistic environment.</p>		
Contact person	Jean Galy	Jean.Galy@ec.europa.eu	

Unit	JRC.G.II.8		
Event	EUSECTRA Training		
Title of training	Nuclear Smuggling Detection and Deterrence - Front-line officers' on-the-job training		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	11–15 May, 2020 15–19 June, 2020 29 June – 03 July, 2020	Recurring: monthly <input type="checkbox"/> yearly <input type="checkbox"/>	
Recurring	<input type="checkbox"/> yearly <input type="checkbox"/> twice a year <input checked="" type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.8	<input checked="" type="checkbox"/> Co-organised with DoE (USA)	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES DoE (USA)	
Targeted audience	Front Line Officers from non-EU Member States		
Training content	Pilot training for the new On The Job training curriculum		
Learning outcomes	Feedback from pilot to validate new On the Job radiological detection training Development and improvement of training curriculum		
Contact person	Jean Galy	Jean.Galy@ec.europa.eu	

Unit	JRC.G.II.8		
Event	EUSECTRA Training		
Title of training	Comprehensive Refresher on Non-Destructive Analysis (NDA) techniques		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.8	<input checked="" type="checkbox"/> Co-organised with IAEA	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> IAEA	
Targeted audience	Mainly IAEA/DG ENER nuclear safeguards inspectors, other applicants with previous knowledge of the topics		
Training content	A <u>refresher</u> course on non-destructive techniques used in Safeguards to verify the type, isotopic composition and mass of <u>fissile material</u> (U, Pu). The training consists of 2-day theoretical part held at the IAEA in Vienna and a practical lab exercise part at JRC-Karlsruhe. The practical lab-exercises includes a "Physical Inventory Verification" exercise using gamma and neutron analytical techniques. During this exercise the course participants analyse a number of "unknown" samples to determine their composition and mass. The material used in the exercises has the form usually found in commercial nuclear installations: powder, pellets, rods, fuel element, oxide or metal.		
Learning outcomes	In the hands-on lab exercise, <u>the participants learn/repeat how to determine/verify the isotopic composition/enrichment and the mass using the NDA techniques at several samples.</u>		
Contact person	Ludwig Holzleitner	Ludwig.Holzleitner@ec.europa.eu	

Unit	JRC.G.II.8		
Event	EUSECTRA Training		
Title of training	Member State Support		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input type="checkbox"/> yearly <input type="checkbox"/> twice a year <input checked="" type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.8	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by requesting MS	
Targeted audience	Officers from EU Member States (on their own request)		
Training content	Radiological detection knowledge for front-line officers Customized training based on national procedure and expressed needs		
Learning outcomes	The purpose of the course is to provide basic knowledge of radiation detection principles and theory. Participants will familiarize themselves with the correct use of all available detectors. They will be able to apply procedures for systematic investigation without compromising personal safety. The course is divided into morning lectures and afternoon practical sessions. The morning lectures provide basic foundations of radiation detection principals, instrumentation and operational response. In the afternoon, after some demonstrations and explanations by the trainers, participants are expected to apply the theoretical knowledge in the field. They will handle the detectors, interpret measurement outputs and perform inspections. The course uses realistic scenarios with real nuclear and radioactive material.		
Contact person	Jean Galy	Jean.Galy@ec.europa.eu	

Unit	JRC.G.II.8		
Event	EUSECTRA Training		
Title of training	Non-destructive Analysis for Bundesamt für Strahlenschutz, Germany		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input type="checkbox"/> yearly <input checked="" type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Karlsruhe, Germany		
Language	English-German		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.8	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by Bundesamt für Strahlenschutz, Germany	
Targeted audience	Radiological experts of the Bundesamt für Strahlenschutz, Germany		
Training content	Non-destructive measurement techniques for detection, identification and characterisation of nuclear materials Practical exercises/Challenging nuclear incident scenarios for national mobile expert support teams (MEST)		
Learning outcomes	Strengthen skills in application of Non-destructive Analysis methods for characterisation of nuclear materials		
Contact person	Janos Bagi	Janos.Bagi@ec.europa.eu	

Unit	JRC.G.II.8		
Event	EUSECTRA Training		
Title of training	Active Well Coincidence Counter (AWCC) Training		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.8	<input checked="" type="checkbox"/> Co-organised with DG ENER	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG ENER	
Targeted audience	DG ENER Inspectors		
Training content	Passive and active neutron measurement for determination of uranium and plutonium content		
Learning outcomes	Deep knowledge of specific knowledge in active and passive neutron measurements in the frame of nuclear safeguards control and accountancy		
Contact person	Ludwig Holzleitner	Ludwig.Holzleitner@ec.europa.eu	

Unit	JRC.G.II.8		
Event	EUSECTRA Training		
Title of training	Radiological training for EOD Technicians		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input type="checkbox"/> yearly <input checked="" type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.8	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG HOME	
Targeted audience	Police Officers from EU Member States		
Training content	The Explosive Ordnance Disposal (EOD) technicians serve the EU member states in detecting, disarming and disposing explosive threats in the most extreme environments. This radiological training aims at strengthening their skills when radiological hazard is added to some of their missions		
Learning outcomes	Assessment and specific procedure expertise of the radiological additional danger in a bomb technician's operation		
Contact person	Jean Galy	Jean.Galy@ec.europa.eu	

Unit	JRC.G.II.7		
Event	ESARDA Course		
Title of training	International Course on Nuclear Safeguards and Non-Proliferation		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	5 days		
Venue	JRC Ispra, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.7	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG ENER	
Targeted audience	Master's degree students, in particular nuclear engineering students, but also to young professionals and International Relations/ law students. The maximum number of participants is 60.		
Training content	<p>The course features a full five-day program. It includes 1h lectures given by experts in nuclear safeguards, visits to five safeguards laboratories and some classroom exercises. The course material, consisting of a syllabus, a complete set of presentations and literature, will be provided to the participants. It is also posted in the website for consultation prior to the course. The course aims at complementing nuclear engineering studies by including nuclear safeguards in the academic curriculum. The content of the course includes all aspect of nuclear safeguards and non-proliferation. It covers regional and international treaties, nuclear material verification technics such as NDA, DA, verification and surveillance techniques, such as seals, video, laser and satellite imagery.</p>		
Learning outcomes	<p>The participant will have an overview of the various aspects of safeguards and non-proliferation including:</p> <ul style="list-style-type: none"> - Introduction: The evolution of the Non Proliferation Treaty -regime, safeguards, international control regimes in theory and practice; present trends in the nuclear non-proliferation efforts 		

	<ul style="list-style-type: none"> - What is safeguarded: Definition of nuclear material that is subject to nuclear safeguards and related safeguards goals (significant quantity, timeliness and detection probabilities) - Where is it found: Description of the nuclear fuel cycle from mining to final repository, focussing on enrichment in the front-end and reprocessing in the back-end - Which legal protection means exist: Overview on international and regional Non-Proliferation Treaties and established Institutions and Organisations - What is the methodology to verify: Nuclear material accountancy principles and statistics of auditing - How inspections are performed: Overview of inspector tools and their use to verify the nuclear activities as declared under the safeguards agreements (Non Destructive Assay, Monitoring, Containment/ Surveillance); additional safeguards measures under the Additional Protocol (complementary access, satellite imagery, environmental sampling) and how they are applied in field (storage facility, process facility, enrichment facility, research institute, spent fuel transfer) - How to control Import/ Export: Guidelines of the Nuclear Suppliers Group, trigger list and dual-use list; means to combat illicit trafficking, inclusive nuclear forensics - Where to find additional information: Collection of open source data and demonstration of some case studies (Iraq, 1993) 	
Contact person	Kamel Abbas	Kamel.Abbas@ec.europa.eu

Unit	JRC.G.2		
Event	A lecture within the ESARDA course on nuclear safeguards and non-proliferation		
Title of training	Destructive Analysis for Nuclear Safeguards		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	1 hour		
Venue	JRC Ispra, Italy		
Language	English		
Organiser	<input type="checkbox"/> JRC.G.2	<input type="checkbox"/> Co-organised with	<input checked="" type="checkbox"/> Organised by ESARDA working group on training, knowledge management
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by ESARDA	
Targeted audience	Master's degree students, in particular nuclear engineering students, but also young professionals and International Relations / law students.		
Training content	Information on how a global nuclear non-proliferation system is created and works in practice: the Treaty on Non-proliferation of Nuclear Weapons (NPT), safeguards technology, and export control. Regional settings like EURATOM Treaty are also included. The course explains how to implement the safeguards principles and methodology within the different nuclear facilities. It gives an overview of inspections techniques, like neutron/gamma detectors, environmental sampling, etc.		
Learning outcomes	Students will know the basic principles of destructive analysis and when to apply these methodologies in nuclear safeguards.		
Contact person	Rozle Jakopic	Rozle.Jakopic@ec.europa.eu	

Unit	JRC.G.II.7		
Event	Training for EURATOM Inspectors		
Title of training	Verification of uranium enrichment		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	5 days		
Venue	JRC Ispra, PERLA laboratory, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.7	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG ENER	
Targeted audience	EURATOM inspectors		
Training content	Verification of uranium enrichment using gamma-ray spectrometry. The training includes introduction to radiation physics, radiation detection techniques and instrumentation. It also involves a hands-on gamma spectrometry experiment using various gamma detectors and various uranium enrichment samples.		
Learning outcomes	At the end of the training, the trainee is able to set a gamma spectrometry electronic chain and carry out a safeguards verification of uranium enrichment on non-irradiated sample.		
Contact person	Kamel Abbas	Kamel.Abbas@ec.europa.eu	

Unit	JRC.G.II.7		
Event	Training for EURATOM Inspectors		
Title of training	Plutonium isotopic composition determination		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	5 days		
Venue	JRC Ispra, PERLA laboratory, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.7	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG ENER	
Targeted audience	EURATOM inspectors		
Training content	Determination of plutonium isotopic composition using high-energy resolution gamma-ray spectrometry. The training includes introduction to radiation physics, radiation detection techniques, instrumentation and the calculation code used (MGA). The training also involves a hands-on experiment with gamma spectrometry using liquid nitrogen and electrically cooled planar HPGe gamma detectors. Standard Pu samples of various isotopic composition are used in the training.		
Learning outcomes	At the end of the 5 days training the trainee is able to set a gamma spectrometry electronic chain and carry out a plutonium isotopic composition determination.		
Contact person	Kamel Abbas	Kamel.Abbas@ec.europa.eu	

Unit	JRC.G.II.7		
Event	Follow-up NDA training for selected trainees of the Japanese State System for Accounting and Control of nuclear material participants		
Title of training	Uranium and Plutonium isotopic composition verification		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	2 days		
Venue	JRC Ispra, PERLA laboratory, Italy		
Language	English		
Organiser	<input type="checkbox"/> JRC.G.II.7	<input checked="" type="checkbox"/> Co-organised with JAEA	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> Collaboration JRC-JAEA	
Targeted audience	EURATOM inspectors		
Training content	Determination of plutonium isotopic composition and uranium enrichment using high-energy resolution gamma-ray spectrometry. The training includes introduction to radiation physics, radiation detection techniques, instrumentation and the calculation code used (MGA). The training also involves a hands-on experiment with gamma spectrometry using different gamma detectors. Standard Pu and U samples of various isotopic composition and enrichment are used in the training. Training on neutron counting for safeguards application is also included.		
Learning outcomes	The trainee should have a solid experimental knowledge of gamma-ray spectrometry and should be able to use it to verify plutonium isotopic composition or uranium enrichment for safeguards purposes.		
Contact person	Kamel Abbas		Kamel.Abbas@ec.europa.eu

Unit	JRC.G.II.7		
Event	Training course for nuclear inspectors		
Title of training	Passive Neutron Assay		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input type="checkbox"/> yearly <input checked="" type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	36 hours		
Venue	PERLA laboratory, JRC, Ispra site, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.7	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG ENER	
Targeted audience	Nuclear inspectors		
Training content	The physics principles of neutron sources and neutron counting composition/design of detectors and analysers The analytical method using neutron coincidence counting Hands-on exercises with standard neutron detectors and analysers The standard safeguards neutron software package INCC Calibration of a standard neutron well counter using INCC and nuclear samples INCC verification procedure of standard bulk samples Troubleshooting in instrumentation and data analysis		
Learning outcomes	The course prepares the inspector for performing verification measurements of fissile materials in field conditions. The inspector will learn the entire procedure of verification measurements. He will also understand basics of the underlying theory, the detection systems, and the analysers used for the task.		
Contact person	Bent Pedersen	Bent.Pedersen@ec.europa.eu	

Unit	JRC.G.II.7		
Event	Periodic nuclear safeguards inspector training		
Title of training	Training on the JRC ultrasonic sealing systems		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input type="checkbox"/> yearly <input checked="" type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	16 hours		
Venue	JRC Ispra – AS3ML Laboratory, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.7	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by IAEA	
Targeted audience	Nuclear Inspectors (EURATOM / IAEA)		
Training content	Presentation of the JRC Ultrasonic Sealing System Basics of Ultrasonic sensors technology Training on the use of the equipment and the seal verification software. Hands-on training on installation, verification and removal of underwater seal in spent fuel pond Hands-on training on installation, verification and removal of Ultrasonic Optical Sealing Bolts for dry storage casks		
Learning outcomes	Train the inspector on the use of JRC ultrasonic seals in their inspections.		
Contact person	François Littmann	Francois.Littmann@ec.europa.eu	

Unit	JRC.G.II.7		
Event	Training		
Title of training	Tank Calibration Course		
Field	<input type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	30 hours		
Venue	JRC Ispra, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.7	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG ENER /IAEA	
Targeted audience	Nuclear Safeguards Inspectors and Supporting Staff		
Training content	Presentation of different tanks and their calibration methods; acquisition and evaluation of data		
Learning outcomes	Inspectors acquire skills necessary for inspection of nuclear facilities		
Contact person	Claudio Bergonzi	Claudio.Bergonzi@ec.europa.eu	

Unit	JRC.G.2		
Event	On-line course, continuously available		
Title of training	Online training on the use of the list-mode data format standard IEC 63047.		
Field	<input checked="" type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input checked="" type="checkbox"/> Nuclear Science Applications <input checked="" type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> permanent		
Venue	online		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.2	<input type="checkbox"/> Co-organised	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input checked="" type="checkbox"/> online	<input type="checkbox"/> class	<input type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	Users of digital data acquisition instruments for nuclear measurements		
Training content	A set of online modules, continuously available online, developed e.g. in moodle Discusses the use of the data format standard IEC 63047, developed under the lead of JRC		
Learning outcomes	Know how to implement IEC 63047		
Contact person	Jan Paepen	Jan.Paepen@ec.europa.eu	

2.3 Strategic Trade Control

Strategic Trade Controls (or Export Controls) aim at administering and facilitating the international trade of dual-use goods. Dual-use goods are highly sensitive products and technologies that can be used for both civilian and military applications.

JRC has established STRIKE project to support harmonised implementation of dual-use strategic trade controls (STC) in the EU and with respect to third countries. Within the STRIKE project, training courses have been delivered on technical aspects of export controls and on guidelines for export controls of dual-use goods.

Unit	JRC.G.II.7		
Event	STRIKE-1 Training		
Title of training	EUP2P Programme - Commodity Identification Training		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management <input checked="" type="checkbox"/> Strategic Trade Control		
Recurring	<input type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	16 hours		
Venue	JRC Ispra, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.7	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG TRADE	
Targeted audience	Export licensing authorities of third countries		
Training content	Lectures describing dual-use control lists and related goods; export control legal framework; internal compliance; case studies, lab tours and tests.		
Learning outcomes	The participants will become more familiar with the export control legal framework, dual-use commodities, the reasons why they are considered sensitive, how to recognise and classify them. They also will be able to see these goods in operation in research labs.		
Contact person	Filippo Sevinì	Filippo.Sevini@ec.europa.eu	

Unit	JRC.G.II.7		
Event	STRIKE-2 Training		
Title of training	JRC-NNSA licensing seminar		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management <input checked="" type="checkbox"/> Strategic Trade Control		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	16 hours		
Venue	JRC Ispra, Italy		
Language	English		
Organiser	<input type="checkbox"/> JRC.G.II.7	<input checked="" type="checkbox"/> Co-organised with US DOE	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external: national authorities; US DOE	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG TRADE	
Targeted audience	Export licensing authorities of EU member states		
Training content	Lectures describing dual-use control lists and related goods Case studies, Commodity identification exercises, Lab tours, Tests. The course provides an annual update combined with very specific in-depth lectures.		
Learning outcomes	The participants will become more familiar with dual-use commodities, the reasons why they are considered sensitive, how to recognise and classify them. They also will be able to see these goods in operation in research labs.		
Contact person	Filippo Sevini	Filippo.Sevini@ec.europa.eu	

Unit	JRC.G.II.7		
Event	STRIKE-3 Training		
Title of training	EU export control in-reach programme: Licensing for beginners		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management <input checked="" type="checkbox"/> Strategic Trade Control		
Recurring	<input type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input checked="" type="checkbox"/> biannual		
Duration	16 hours		
Venue	JRC Ispra, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.II.7	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by DG TRADE	
Targeted audience	Export licensing authorities of EU member states		
Training content	Lectures describing dual-use control lists and related goods; export control legal framework; internal compliance; case studies, lab tours and tests.		
Learning outcomes	The participants will become more familiar with the export control legal framework, dual-use commodities, the reasons why they are considered sensitive, how to recognise and classify them. They also will be able to see these goods in operation in research labs.		
Contact person	Filippo Sevini	Filippo.Sevini@ec.europa.eu	

2.4 Nuclear Science Applications

Nuclear phenomena are processes involving changes in the physical state of atomic nucleus. The majority of nuclei are unstable and can spontaneously convert into an energetically more stable nucleus through a process called radioactive decay.

This radioactive decay is accompanied by emission of gamma-ray photons and other particles like electrons, positrons, and alpha (helium nuclei). Bombarding atomic nuclei with other particles, like protons or neutrons, can also induce radioactivity of the atoms or release energy.

Over last decades, nuclear phenomena have found many applications in medicine, environmental science, non-destructive material analyses and energy generation.

JRC offers training in the [Karlsruhe nuclide chart](#), which is a [2D scheme](#) of nuclear and radioactive characteristics of all known atoms. JRC experts also provide lectures on using neutrons for study of material properties within broader schooling programmes.

Additionally, JRC provides lectures and practical training in application of the TRANSURANUS fuel performance simulation tool and in applications of radionuclides in targeted alpha therapy of cancer.

Unit	JRC.G.I.5		
Event	Online and printed brochure		
Title of training	Karlsruhe Nuclide Chart		
Field	<input checked="" type="checkbox"/> Nuclear Safety <input checked="" type="checkbox"/> Nuclear Security and Safeguards <input checked="" type="checkbox"/> Nuclear Science Applications <input checked="" type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> permanent		
Venue	online		
Language	English, French, Spanish, Portuguese, Russian, Chinese		
Organiser	<input checked="" type="checkbox"/> JRC.G.I.5	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by:
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input checked="" type="checkbox"/> online www.nucleonica.com	<input type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	Students and professionals		
Training content	The Karlsruhe Nuclide Chart (KNC) provides scientists and students with structured, accurate information on the half-lives and decay modes of radionuclides, as well as the energies of emitted radiation. Beyond the more traditional physical sciences such as health physics and radiation protection, nuclear and radiochemistry, and astrophysics. The Chart is now in wide and common usage in the life and earth sciences. An important characteristic of the Chart is its great didactic value for education and training in the nuclear sciences.		
Learning outcomes	Participants will be introduced to nuclear data on 4,040 experimentally observed ground states and isomers; most recent values of the atomic weights, isotopic abundances and cross sections.		
Contact person	Zsolt Soti	Zsolt.Soti@ec.europa.eu	

Unit	JRC.G.I.5		
Event	School on the Physics and Chemistry of the Actinides		
Title of training	Neutron spectroscopy techniques		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input checked="" type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	27 hours		
Venue	Journées des Actinides – a conference series		
Language	English		
Organiser	<input type="checkbox"/> JRC.G.I.5	<input type="checkbox"/> Co-organised with	<input checked="" type="checkbox"/> Organised by: Journées des Actinides
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	PhD students and young researchers at postdoctoral level		
Training content	General introduction to the physics and chemistry of actinide elements and compounds. The JRC contribution focusses on the use of neutron spectroscopy techniques applied to the study of actinide materials, in particular of their structural, magnetic, and electronic properties.		
Learning outcomes	Participants are introduced to: Neutron physics and instrumentation; Basic principles of the techniques; Applications of neutrons to the study of actinide materials		
Contact person	Eric Colineau	Eric.COLINEAU@ec.europa.eu	

Unit	JRC.G.I.5		
Event			
Title of training	TRANSURANUS training course		
Field	<input checked="" type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input checked="" type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	5 consecutive days		
Venue	Hotel in Karlsruhe and/or at JRC Karlsruhe premises (visit of laboratories)		
Language	English		
Organiser	<input checked="" type="checkbox"/> G.I.5	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES by different TRANSURANUS licensees, who sign a confirmation letter for each individual prior to the course.	
Targeted audience	New TRANSURANUS users at technical safety organisations, industry, research organisations and universities who have to simulate nuclear fuel behaviour.		
Training content	<p>The course provides an overview of how nuclear fuel rods behave in the nuclear reactor during normal operating conditions, during an accident and during storage after irradiation. For each topic, the main phenomena are described along with the corresponding equations and underlying assumptions. The associated requirements for the input file of the TRANSURANUS fuel rod performance code are explained. In a separate exercise, sensitivity of outputs to some of these input parameters is highlighted.</p> <p>The course participants will also visit JRC laboratories in Karlsruhe, where nuclear fuel is examined after irradiation. The visit includes both the large hot cells, where the entire full rods can be examined, and the laboratories where detailed examination of the fuel microstructure can be performed.</p> <p>In final exercises, participants use the TRANSURANUS code to solve problems based on selected cases from IAEA international benchmarking.</p> <p>At the end of the exercises, the successful participants obtain a certificate.</p>		
Learning outcomes	At the end of the training course, the participants should be able to: <ul style="list-style-type: none"> • Understand the basics of nuclear fuel behaviour in a reactor, the corresponding equations and associated simplifications and limitations; 		

	<ul style="list-style-type: none"> • Install the TRANSURANUS software on a computer • Create a correct input file based on the information from the nuclear fuel rod fabrication and irradiation report; • Implement new model parameters in the source code and create a new executable version of the code • Extract and present the main outputs of the fuel performance calculations using a graphic user interface; • Verify the compliance with safety and design criteria provided by the IAEA. 	
Contact person	Paul van Uffelen	Paul.Van-Uffelen@ec.europa.eu

Unit	JRC.G.I.5		
Event			
Title of training	Targeted Alpha Therapy		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input checked="" type="checkbox"/> Nuclear Science Applications <input type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual <input checked="" type="checkbox"/> upon request		
Duration	1-2 days		
Venue	JRC Karlsruhe or in hospitals on site		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.I.5	<input checked="" type="checkbox"/> Co-organised with IAEA	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	Hospital personnel in nuclear medicine		
Training content	Lectures and hands-on training on safe handling, detection, quantification and disposal of alpha emitting radionuclides in clinical settings. Synthesis and quality control of radiopharmaceuticals for application in targeted alpha therapy of cancer.		
Learning outcomes	Upon completion of the course, trainees will be able to safely handle, detect and quantify alpha emitting radionuclides and to synthesize alpha emitter labelled radiopharmaceuticals for clinical application.		
Contact person	Alfred Morgenstern	Alfred.Morgenstern@ec.europa.eu	

2.5 Nuclear Decommissioning and Waste Management

Nuclear decommissioning is a process of dismantling a nuclear installation (e.g. a nuclear power plant or a nuclear research facility) at the end of its operational lifetime. After full decommissioning of a nuclear installation, no radiological danger should exist and no radiation protection measures should be necessary anymore. The regulatory control of the installation is therefore terminated and the site can be reused.

The decommissioning process includes:

- final shutdown of the installation
- removal of radioactive sources from the site
- decontamination of equipment and buildings of the installation
- dismantling of the equipment and buildings
- management of all waste, including nuclear, resulting from the operation and decommissioning of the installation

An effective waste management includes waste characterization, treatment, storage, and disposal, as well as radiation protection and environmental monitoring.

The safe and efficient implementation of nuclear decommissioning and waste management (ND&WM) constitutes a key factor in public perception and acceptance of a nuclear activity.

JRC regularly organises summer schools in ND&WM, delivers a metrology course within the European Learning Initiative for Nuclear Decommissioning and Environmental Remediation (ELINDER) and offers a special course on treatment of spent nuclear fuel.

Unit	JRC.J.1		
Event	Summer School		
Title of training	Summer School on Nuclear Decommissioning & Waste Management		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input checked="" type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	36 hours (1 week)		
Venue	JRC Ispra, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.J.1	<input checked="" type="checkbox"/> Co-organised with JRC.A.7	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	MSc and PhD students in technical disciplines		
Training content	General introduction to ND&WM Radiation Protection Operational decommissioning Radioactive waste management Social aspects of ND&WM		
Learning outcomes	The students will have a global overview of all aspects of nuclear decommissioning and waste management.		
Contact person	Paolo Peerani	Paolo.Peerani@ec.europa.eu	

Unit	JRC. J.1		
Event	ELINDER course S7		
Title of training	Metrology for Waste Characterisation and Clearance		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input checked="" type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	36 hours (1 week)		
Venue	JRC Ispra, Italy		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC. J.1	<input checked="" type="checkbox"/> Co-organised with JRC.A.7	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input checked="" type="checkbox"/> Science and Technical Capacity Building	<input type="checkbox"/> On the job training
Commissioned by customer	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	Young professionals in ND&WM		
Training content	Fundamentals of metrology for ND&WM Methods in metrology for ND&WM Measurements techniques with practical training in: Gamma spectrometry for waste Gamma measurement for clearance Passive neutron counting Destructive analysis for plant and waste characterisation Method validation, inter-comparison, standards, international networks		
Learning outcomes	The trainee will deepen their skills in analytical techniques for ND&WM		
Contact persons	Paolo Peerani	Paolo.Peerani@ec.europa.eu	

Unit	JRC.G.I.6		
Event	Hands-on-training on SNF corrosion in the frame of the EC DisCo project		
Title of training	Spent nuclear fuel corrosion methodology		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input checked="" type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	160 hours (max. 4 weeks)		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input checked="" type="checkbox"/> JRC.G.I.6	<input type="checkbox"/> Co-organised with	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input type="checkbox"/> class	<input checked="" type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	Young scientists from Less Advanced RWM Programmes (LAP) and Associated Group (AG) to DisCo project (max. 2 persons/year).		
Training content	Workshop for young professionals <ul style="list-style-type: none"> • Individual training • Laboratory work 		
Learning outcomes	Practical knowledge on how to perform spent fuel leaching experiments, (autoclave construction, handling of autoclave in hot cell, measurements techniques (ICP-MS, ICP-OES, gamma spectrometry), SEM/TEM, IRF calculations)		
Contact person	Paul Carbol	Paul.Carbol@ec.europa.eu	

Unit	JRC.G.I.6		
Event	Training workshop on SNF corrosion in the frame of the EC DisCo project		
Title of training	Workshop on spent nuclear fuel corrosion methodology		
Field	<input type="checkbox"/> Nuclear Safety <input type="checkbox"/> Nuclear Security and Safeguards <input type="checkbox"/> Nuclear Science Applications <input checked="" type="checkbox"/> Nuclear Decommissioning and Waste Management		
Recurring	<input checked="" type="checkbox"/> yearly <input type="checkbox"/> twice a year <input type="checkbox"/> several times a year <input type="checkbox"/> biannual		
Duration	20 hours (max. 2.5 days)		
Venue	JRC Karlsruhe, Germany		
Language	English		
Organiser	<input type="checkbox"/> JRC.G.I.6	<input checked="" type="checkbox"/> Co-organised with JRC G. and Disco (Amphos21)	<input type="checkbox"/> Organised by
Trainer	<input checked="" type="checkbox"/> internal	<input checked="" type="checkbox"/> external	<input type="checkbox"/> subcontracted to
Means of training	<input type="checkbox"/> online	<input checked="" type="checkbox"/> class	<input type="checkbox"/> hands on
JRC Academy Strand	<input type="checkbox"/> Science for Policy	<input type="checkbox"/> Science and Technical Capacity Building	<input checked="" type="checkbox"/> On the job training
Commissioned by customer	<input type="checkbox"/> NO	<input type="checkbox"/> YES by	
Targeted audience	Young scientists from Less Advanced RWM Programmes (LAP) and Associated Group (AG) to DisCo project (max. 10 persons).		
Training content	Workshop for young professionals <ul style="list-style-type: none"> • Presentations • Laboratory visits 		
Learning outcomes	Training on performing spent fuel leaching experiments, simulating deep repository conditions (autoclave, hot cell, measurements techniques, calculation)		
Contact person	Paul Carbol	Paul.Carbol@ec.europa.eu	

3 Conclusions

JRC provides variety of training courses in nuclear safety, nuclear science applications, nuclear security and safeguard, nuclear decommissioning and nuclear waste management. The courses convey either expertise of JRC experts or results of research projects carried out by JRC scientists.

In the courses, the students develop their scientific knowledge, practical skills or learn how to apply science in policymaking process.

Depending on the course nature, they are available either to specialized professionals, university students or interested public. The courses are organized either by JRC only or in cooperation with other national or international organization and educational institutions. They can be delivered on the JRC sites and in JRC laboratories or in the premises of collaborating institutions.

More detailed information on the courses, learning outcomes and application process can be found at <https://ec.europa.eu/jrc/en/training-programmes>.

References

- 1) **Science to policy courses** develop skills and competences to uptake science and science-based evidence into policy. These courses are particularly relevant for researchers and/or policy makers (EU and government officials, politicians, MPs) working in policy anticipation, conception, formulation or evaluation.

Scientific and technical capacity building courses are based on JRC hard science research. They aim at developing scientific and technical competence in policy-relevant fields. These courses are relevant for persons active in policy implementation and monitoring (e.g. staff of governmental bodies, regulating authorities, academia, or training professionals).

On-the-job-Training should support educational or professional development of course participants through performing specific practical tasks. It may also be applicable to non-permanent staff, such as the EC Trainees, PhD students or Post-graduate students.
- 2) The learning outcomes describe what the participant will know and be able to do after completing the course.

List of abbreviations and definitions

APEX	Additional Protocol Exercise
AWCC	Active Well Coincidence Counter
CA	Complementary Access
DA	Destructive Analysis
DG ENER	European Commission, Directorate General for Energy
DG HOME	European Commission, Directorate General for Migration and Home Affairs
ELINDER	European Learning Initiative for Nuclear Decommissioning and Environmental Remediation
EOD	Explosive Ordnance Disposal
ESARDA	European Safeguards Research & Development Association
EUP2P	European Union Peer-to-Peer
EURATOM	European Atomic Energy Community
EUSECTRA	European Nuclear Security Training Centre
FLO	Front-line officer (police, customs, border guard, intelligence)
HPGe	High Purity Germanium
IAEA	International Atomic Energy Agency
JAEA	Japanese Atomic Energy Agency
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ICP-OES	Inductively Coupled Plasma Optical Emission Spectroscopy
IEC	International Electrotechnical Commission
INCC	International Neutron Coincidence Counting
IRF	Impulse Response Function
JRC	European Commission, Joint Research Centre
LTO	Long-term operation
MGA code	Multiple Group Analysis code (for gamma-ray spectrum analysis)
ND&WM	Nuclear Decommissioning and Waste Management
NDA	Non-Destructive Analysis
NNSA	National Nuclear Security Association (USA)
NSDD	Nuclear Smuggling Detection and Deterrence
OT	On-the-job Training
PWR	Pressurized Water Reactor
R&D	Research and Development
RCS	Radiological crime scene
REM	Radioactivity environmental monitoring
RWM	Radioactive waste management
SEM	Scanning Electron Microscopy
SNF	Spent nuclear fuel
SSTT	Small specimen testing techniques
STC	Strategic Trade Controls

STRESA	Storage of Thermal Reactor Safety Analysis
TEM	Transmission Electron Microscopy
US DoE	United States Department of Energy

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