



# ESARDA Course BOOKLET

## 20<sup>th</sup> edition of ESARDA Course on Nuclear Safeguards and Non-Proliferation

April 16<sup>th</sup> – 20<sup>th</sup> 2022

via MS TEAMS

Broadcasted from JRC Ispra (Italy)

organised by

**European Commission, Joint Research Centre**

Directorate Nuclear Safety and Security, Department Nuclear Security and Safeguards  
Nuclear Security Unit

In collaboration with

**ESARDA Working Group on Training and Knowledge Management (TKM)**



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## Foreword

The knowledge retention problem in the nuclear field was acknowledged by the OECD in 2000. The United Nations study on disarmament and non-proliferation education (2002) made detailed recommendations for urgently required improvements. ESARDA, the European Safeguards Research and Development Association, reacted to these shortcomings with a strategy to tackle the problem and created a Working Group on Training and Knowledge Management (ESARDA WG TKM). The final objective of the ESARDA WG TKM is the setup of academic course modules to an internationally recognised reference standard. This project is in line with the movement of establishing a European curriculum for Nuclear Engineering. Teaching in the Nuclear Safeguards field is indeed strongly influenced by national history so the objective of the course is to provide homogeneous material in Nuclear Safeguards and Non-Proliferation matters at the European and international level.

## Learning objectives

This compact course is open to master degree students, in particular nuclear engineering students, but also to young professionals and International Relations / law students. It aims at complementing nuclear engineering studies by including nuclear safeguards in the academic curriculum. The basic aim of the course is to stimulate students' interests in safeguards. The course addresses aspects of the efforts to create a global nuclear non-proliferation system and how this system works in practice: the Treaty on Non-proliferation of Nuclear Weapons (NPT), safeguards technology, and export control. Also regional settings, such as Euratom Treaty, are presented and discussed. The course deals in particular with technical aspects and application of safeguards; i.e. how to implement the safeguards principles and methodology within the different nuclear facilities. Therefore the course will create an overview on inspections techniques, ranging from neutron / gamma detectors, to design information verification, to environmental sampling, etc.

## Course content

- Introduction: The evolution of the Non Proliferation Treaty —regime, safeguards, international control regimes in theory and practice, and present trends in the nuclear non-proliferation efforts.
- 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 are inspections performed: Overview on 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.
- What additional information offers: Collection of open source data and demonstration of some case studies (Iraq, 1993).

**Venue**

**Broadcasted from JRC Ispra (Italy)**



# Course Programme



EUROPEAN COMMISSION  
JOINT RESEARCH CENTRE  
Nuclear Safety & Security Directorate  
Nuclear Security & Department Safeguards  
Nuclear Security Unit

## 20<sup>th</sup> edition of ESARDA Course

May 16<sup>th</sup>-20<sup>th</sup>, 2022, Via Video Conference (MS TEAMS)



	Mon., May 16 <sup>th</sup>		Tue., May 17 <sup>th</sup>		Wed., May 18 <sup>th</sup>		Thu., May 19 <sup>th</sup>		Fri., May 20 <sup>th</sup>
08:45 09:00	Connection to the course room	08:45 09:00	Quiz on Monday lectures	08:45 09:00	Quiz on Tuesday lectures	08:45 09:00	Quiz on Wednesday lectures	08:45 09:00	Quiz on Thursday lectures
09:00 10:00	<b>Opening</b> Introduction of the participants and Presentation of the course - J. Oddou, President of ESARDA - W. Janssens, HoD, JRC GII - S. Nonneman, HoU, JRC GI17	09:00 09:45	Japan's State System for Accounting for and control of Nuclear Material (SSAC), T. Terasaki, JSGO NRA, JP	09:00 09:40	Nuclear Trade Regulation, Q. Michel (QM), Liege University, BE	09:00 09:30	On-site Inspection, C. Kröger-Negotia, EC ENER, LU	09:00 09:45	Information Collection and Analysis, J. Baute, IAEA, AU
10:00 10:45	History of Non-Proliferation, T. Jonter, Stockholm University, SE	09:45 10:30	French NMAC, L. Roussel, ORANO, FR	09:40 10:15	Overview of the NSG's controls in the EU DU regulation and Model AP, F. Sevini (FS), EC JRC, IT	09:30 10:15	Radionuclide Monitoring in the Environment, M.B. Kalinowski, Consultant, AU	09:45 10:30	Satellite Imagery, P. Struzka, SATGEN, ES
10:45 11:15	Virtual Group Picture and Break	10:30 10:45	Break	10:15 10:30	Break	10:15 10:30	Break	10:30 10:45	Break
11:15 12:00	EURATOM, Historical Facts, M. Gerlini, Roma University, IT	10:45 11:45	Group Exercise 1, L. VdD	10:30 11:15	NDA I: Gamma-Ray Spectrometry, K. Abbas, EC JRC Ispra, IT	10:30 11:15	Monitoring Containment/Surveillance, P. Funk, IRSN, FR	10:45 11:30	State Level Safeguards, J. Dahlberg, IAEA, AU
12:00 12:45	Nuclear Material & Facilities Subject to Safeguards, G. Janssens-Maenhout, EC JRC Ispra, IT	11:45 12:45	- Legal Instruments Implementing NPT, L. Rockwood (LR), ONN, AU - Presentation of the G. Exercise 2	11:15 12:00	NDA II: Neutron Counting, P. Peerani, EC JRC Ispra, IT	11:15 12:00	Statistical Accounting, R. Bencardino, EC JRC, IT	11:30 12:15	Safeguards and Nuclear Export Control Arrangements, M. Tarvainen, MJT, FI
12:45 14:00	Break	12:45 14:00	Break	12:00 13:30	Break	12:00 13:45	Break	12:15 13:45	Break
14:00 14:45 15:00	Small Modular Reactors G. Renda et al., EC JRC, IT	14:00 14:45	Virtual Lab Visit 1 V. Sequeira et al., EC JRC, IT	13:30 14:15	Virtual Lab Visit 2 K. Abbas et al., EC JRC, IT	13:45 14:30	A Fast-Spectrum Pool-Type Research Irradiation Facility, MYRRHA Project, H. Al Abderrahim, SCKCEN, BE	13:45 14:00	Quiz on morning lectures
14:45 15:45	- Nuclear Fuel Cycle, L. Van den Driessche (L. VdD), Nuclear-21, Net, BE - Presentation of the G. Exercise 1	14:45 15:45	G. Exercise 2, LR	14:15 15:00	DA: Destructive Assay in Safeguards, R. Jakopic, EC JRC Geel, BE	14:30 15:00	Case Study: Are IAEA safeguards an effective nuclear non-proliferation means? J. Vidaurre-Henry, Consultant, AU	14:00 15:00	<b>Closing</b> - Course Evaluation - Virtual Distribution of Attendance Certificates, - Closing Addresses
15:45 16:00	Break	15:45 16:00	Break	15:00 15:15	Break	15:00 15:15	Break		
16:00 16:45	Nuclear Material Accounting and Control (NMAC) principles, N. Edmonds, Sellafield, GB	16:00 17:00	Cont.: G. Exercise 2, LR	15:15 16:00	Nuclear Forensics, M. Wallenius, EC JRC Karlsruhe, DE	15:15 16:15	Case Study Continued, J. Vidaurre-Henry		
						16:15 17:00	Physical Protection, C. Crawford, ORNL, US		

## Presentation of the Speakers

Monday 16<sup>th</sup> May



### **Thomas JONTER**

Thomas Jonter is Professor of International Relations and Head of Department at the Department of Economic History and International Relations, Stockholm University.

His research focuses on nuclear disarmament and energy security. He has been a visiting scholar at Stockholm International Peace Research Institute (SIPRI), Stanford University, and Cornell University. Professor Jonter is also chair of Swedish Pugwash and served as advisor to the Swedish delegation to the 2015 Review Conference to the Treaty on the Non-proliferation of Nuclear Weapons, at the United Nations in New York.

He is also member of the Swedish International Law and Disarmament Delegation headed by Minister of Foreign Affairs Margot Wallström.

His latest book, *The Key to Nuclear Restraint: The Swedish Plans to Acquire Nuclear Weapons during the Cold War*, is published with Palgrave Macmillan 2016.

He was also chairman of the TKM WG of ESARDA.



### **Matteo GERLINI**

Matteo Gerlini teaches History and Policy of the scientific research in the University of Florence.

A diplomatic historian by education, he wrote many articles and essays on the history of nuclear energy.

He participates as Italian expert in the IAEA and NEA working and consultation meetings.

### **Greet JANSSENS-MAENHOUT**



Greet is deputy head of unit for the Knowledge Management unit for the Sustainable Resources directorate in Joint Research Centre (JRC). Working on the energy dossier, she touched upon different fields. She started with nuclear safety (for her PhD), then moved to nuclear safeguards and non-proliferation.

Now she's involved in the investigation of the climate and emission aspects of different energy sources and how these can be monitored from space.

She is also professor at the University Ghent, Faculty of Engineering & Architecture (department on energy), where she teaches nuclear reactor physics.



**Luc VAN DEN DURPEL**



Luc Van den Durpel graduated as Nuclear Engineer in Belgium late 1980's and assumed nuclear R&D positions in Belgium, France and USA. He was staff member at OECD's Nuclear Energy Agency early 2000s before working at Argonne National Laboratory for US-DOE programmes as Generation-IV and Advanced Fuel Cycle.

He became Scientific Director Nuclear Fuel Cycle and finally Vice President of Technology Strategy at AREVA's headquarters since 2009 and left AREVA early 2015.

He launched the international operating expert cabinet "Nuclear-21" currently with 9 experts supporting decisions within nuclear domain by government, utilities, industry and R&D-laboratories.

**Nick EDMONDS**



Nick Edmonds is the Operations Support Manager working in the Nuclear Material Accountancy and Safeguards Department at Sellafield, UK where he has been employed since 1991. Prior to his current position he was the Senior Nuclear Material Accountant for Magnox and Waste facilities on the Sellafield site providing information to meet Site License, Customer and Regulatory requirements.

His current role provides advice across all Sellafield site facilities involving contributions and leadership in a variety of technical areas including international safeguards, audits and inspections, training and education and nuclear material control and accountancy. Nick has many years of experience of producing nuclear material accounts, safeguards reporting, safeguards inspection, physical inventory takes and follow-up investigations. He has first-hand knowledge of the practicalities and a difficulty associated with reprocessing facilities and provides expert advice to Regulators, such as IAEA workgroups.

**Tuesday 17<sup>th</sup> May**

**Loic ROUSSEL**



Loic Roussel is currently in charge of Nuclear Material Accounting and Control Coordination for the Orano group facilities in France.

His office brings a technical support to Orano local teams in terms of information system solutions, skills management and projects driving.

Formerly he was working at the French national institute for Nuclear Safety and Protection, in a team dedicated to international safeguards follow up.



### **Tomohiro TERASAKI**

Tomohiro TERASAKI is currently the Director of Japan Safeguards Office, Nuclear Regulation Authority. In this capacity, Mr. TERASAKI is responsible for safeguards implementation in Japan.

Prior to this position, Mr. Terasaki served as a SSAC training officer at the Division of Concepts and Planning, Department of Safeguards, the International Atomic Energy Agency from 2017 to 2020.



### **Laura ROCKWOOD**

Laura Rockwood is the Director of Open Nuclear Network (ONN), a programme of One Earth Future. Laura has over 30 years of experience in non-proliferation and international safeguards. She has published extensively on safeguards and non-proliferation. In July 2012, the Institute of Nuclear Materials Management (INMM) for long-term noteworthy accomplishments in, and service to, the nuclear materials management profession honoured her with the Distinguished Service Award.

Laura retired from the International Atomic Energy Agency (IAEA) in November 2013 as the Section Head for Non-Proliferation and Policy in the Office of Legal Affairs after 28 years of service. During her employment with the IAEA, she was the senior legal advisor on all aspects of the negotiation, interpretation and implementation of IAEA safeguards, and was the principal author of the document that became the Model Additional Protocol.

She participated in high-level negotiations on Iran, Iraq and North Korea, and in the IAEA/US/Russian Federation negotiations on the Trilateral Initiative and the Plutonium Management and Disposition Agreement. Laura came to ONN from her position as Executive Director of the Vienna Center for Disarmament and Non-Proliferation (VCDNP) between 2015 and 2019. Prior to joining the VCDNP, she served as a resident Senior Research Fellow at Harvard University's Kennedy School Belfer Center Managing the Atom Project. She received her BA degree from the University of California, Berkeley, and her Juris Doctor from the University of California's Hastings College of Law in San Francisco.



Wednesday 18<sup>th</sup> May

### **Jaime VIDAURRE-HENRY**



Jaime Vidaurre-Henry is a graduated Chemical Engineer (Summa cum Laude) from a major university in La Paz – Bolivia. He completed post-graduate courses in nuclear technology, management and instructional technologies. Mr. Vidaurre-Henry started his career as an adjunct professor and subsequently as a professor in a major university in Bolivia. He joined the IAEA's Secretariat in 1981 as a safeguards inspector. In 1989 he was assigned to the Section for Safeguards Training.

In 1998 he was appointed Head of the Section for Safeguards Training. In 2005 he was appointed Head of the Coordination and Support Section of the Division of Operations "C" of the Department of Safeguards of the IAEA.

Mr. Vidaurre-Henry retired from the IAEA in March 2009, became an Independent Scholar and worked as an international consultant. He worked from August 2014 to April 2018 at the Japan Atomic Energy Agency as an Invited Senior Researcher. He also lectured at the Faculty of Nuclear Engineering of the Tokyo University in Japan. Currently Mr. Vidaurre works as an international Consultant.

Mr. Vidaurre-Henry has published a number of papers and articles in scientific symposia and meetings. He is a fellow of the Institute of Nuclear Materials Management.

### **Kamel ABBAS**



Kamel Abbas defended his PhD in nuclear physics in 1992 at Pierre & Marie Curie University (Paris) on nuclear physics. After the PhD, he has worked at the French Nuclear Energy Commission (CEA, Commissariat à l'Énergie Atomique) in the nuclear fuel cycle division. Then he joined the European Commission, Joint Research Center, in 1995 first as a temporary agent in the Institute for Transuranium Elements (ITU, Karlsruhe, Germany). He dealt with research on three main topics; production of alpha emitters for nuclear medicine applications (Ac225/Bi213 generator), development of instruments and calculation methods for fuel

characterisation. In 1998 he was hired in a permanent position in the Institute for Health and Consumer Protection (IHCP, Ispra, Italy).

In the IHCP, he has worked in research and development on production of medical radioisotopes using the JRC Cyclotron and he developed and built a facility for commercial production of radiopharmaceuticals for Cancer Diagnosis via Positron Emission Tomography (PET). He has also developed new methods for production of radioactive nanoparticles for nano-bioscience studies. In parallel, he has been produced significant amount of experimental nuclear data on evaporation and fission reactions that he often validated using calculation models.

In 2012, Kamel joined back the ITU in the Nuclear Security Unit (Ispra, Italy). He was first fully involved in the security field of export control of dual use commodities then extended his duties to international cooperation in the nuclear security through the JRC support to other EC customer Directorates Generals. He is implementing EU projects in several countries and regions worldwide.

Kamel is author of more than 120 peer reviewed scientific papers (publications and presentations in international journals) and few patents.



### **Paolo PEERANI**

Paolo Peerani got his MSc and a PhD in Nuclear Engineering at the University of Bologna. He spent twelve years at ENEA working in the field of nuclear reactor design.

Then he joined the European Commission Joint Research Centre where he worked 6 years at the Institute of Transuranium Elements in Karlsruhe (Germany) on Non-Destructive Analysis applied to nuclear safeguards.

In 2000 he moved to JRC-ISPRA as responsible of the PERLA laboratory and the activities focussed mainly in the domain of NDA techniques, neutron counting, Monte Carlo simulation applied to nuclear safeguards and homeland security.

Since 2015 he is Head of Unit Nuclear Decommissioning at JRC.



### **Rozle JAKOPIC**

Rozle Jakopic studied at the University of Ljubljana, Slovenia (Ph.D. in Chemistry 2008)

Employed by the EC-Joint Research Centre in Geel, Belgium since 2006

Responsible for Nuclear Chemistry Laboratory in Geel.

Scientific activities include: preparation and certification of nuclear reference materials, organisation of proficiency testing/inter-laboratory comparisons, reference measurements for nuclear and environmental samples



### **Maria WALLENIIUS**

Maria Wallenius started her radiochemist career in Finland in the University of Helsinki in a nuclear safeguards project.

Over 20 years ago she moved to European Commission's Joint Research Centre in Karlsruhe to do research in nuclear forensics on characteristic parameters for the origin determination of plutonium by mass spectrometric techniques and she obtained a Ph.D. in 2001.

Since then she has been involved in various research and training activities related to nuclear forensics and nuclear security.

She is the coordinator of the nuclear forensics analysis at JRC Karlsruhe, and is co-chairing one of the ITWG's (International Group on Nuclear Forensics) task groups.



### **Cary E. CRAWFORD**

Cary E. Crawford began his career at the Pantex Plant in Amarillo, Texas as a Safeguards Statistician and later at the US DOE National Training Center as a Nuclear Materials Control and Accountability instructor.

Cary joined the Pacific Northwest National Laboratory in 2001, taking on multiple roles in the U.S./Russian Material Protection Control and Accounting Program as well as various other domestic and international MC&A roles.

While focusing on nuclear security over the past ten years, one of his primary interests relates to measuring the effectiveness of an integrated Safeguards and Security System against adversarial attacks from modern, technically proficient, adaptive adversaries, to include the intersection of cyber and physical security.

For the past 10 years, Cary served as a Technical Group Manager, stewarding Safeguards and Security capabilities at PNNL.

Cary joined the Oak Ridge National Laboratory in January of 2016 as a Program Manager leading safeguards and security research and development efforts for various nuclear and critical infrastructure agencies.

He is currently the Vice President of the Institute for Nuclear Materials Management.

**Thursday 19<sup>th</sup> May**



### **Cezar KRÖGER-NEGOIȚĂ**

Kröger-Negoita is the Deputy Head of the Unit "Inspections: reactors, geological repositories and other installations" in Directorate-General for Energy.

Before joining the European Commission in 2010, Dr. Kröger-Negoita worked as Nuclear Safety Advisor with GDF SUEZ (currently ENGIE). He has a doctoral degree in nuclear physics from Technische Universität Dresden.



### **Martin KALINOWSKI**

Martin B. Kalinowski is Head, Scientific Methods Section, of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) in Vienna, Austria.

Before re-joining the CTBTO in 2012, he served as Professor for Science and Peace Research at the University of Hamburg, Germany. Dr. Kalinowski holds a PhD in nuclear physics and his main expertise is on effective strategies and analysis methodologies for environmental sample analysis, specifically for nuclear explosion monitoring.



### **Pierre FUNK**

Pierre Funk has more than 20 years of experience in the field of nuclear security and safeguards. He has a background in physics with a specialization in nuclear instrumentation.

He started his career at IRSN doing technical studies and inspections of French facilities regarding physical protection, containment/surveillance, and accountancy of nuclear material. He has then held several positions (section manager, deputy head). Since 2016, his position within IRSN is to coordinate international activities and training whenever it concerns nuclear security and safeguards topics.



### **Hamid AÏT ABDERRAHIM**

Hamid Aït Abderrahim is the Deputy Director General of SCK•CEN, the Belgian nuclear research centre. He is also professor of reactor physics and nuclear engineering at the "Université Catholique de Louvain" (UCL) at the mechanical engineering department of the "Ecole Polytechnique de Louvain (EPL)".

He graduated as Nuclear Engineer in 1983 from the 'Institut Supérieur Industriel' in Brussels (Belgium). Afterwards he moved to Paris at the University of Paris XI in Orsay (France), where he acquired a Master degree in reactor physics in 1984 and in 1990, he received his degree of PhD in Sciences in Energetics & Reactor Physics.

His fields of specialisation are Reactor Physics, Reactor Dosimetry, Nuclear Fuel Cycle, Partitioning and transmutation of high level nuclear waste and Nuclear Reactor Technology.

Since 1998 he is the director of the MYRRHA project: an accelerator driven system coupling a sub-critical Pb-Bi cooled reactor and a high power proton accelerator through a spallation target.

He is partner and/or coordinator of various projects of the European Commission framework programme related to advanced nuclear systems or to partitioning and transmutation of high level nuclear waste management since the FP5 programme. He chaired the Strategic Research Agenda (SRA) working group of the European Sustainable Nuclear Energy Technology Platform (SNETP, <http://www.snetp.eu>) from September 2007 to December 2011. Since 2015 he is the chairman of the Governing Board of SNETP.

He is the representative of Belgium in the Governing Board of the project JHR (Jules Horowitz Reactor, a MTR under construction in Cadarache, France).



### **Raffaele BENCARDINO**

Raffaele is a Team Leader in the Accountancy Services of Euratom Safeguards: the unit ENER.E5–Accountancy and International Obligations.

Physicist by education, Raffaele worked as a research scientist across Italy, Russia, Australia, Belgium and Luxembourg, on the development of radiation detectors, dedicated to space borne experiments as well as homeland security and standard cross section measurements.



### **Quentin MICHEL**

Main research fields:

Decision making process of the EU Institutions, in particular, the role of informal governance;

Sensitive items export control regimes: ongoing research is mainly dedicated to the increasing responsibility of industries and exporters with respect to the proliferation risk analysis;

EU sustainable development policies as concerns the links with other policies (impact assessment studies); Nuclear regulation policies. Projects in education and research

Teaching in European Studies (Institutions, Governance, Policies in particular Common Agricultural Policy and Trade Control Regimes)

Seminars and consultancies on Trade Control issues in the context of Global Stability (JRC) and Collaboration agreement with the European Commission for 2011/12 (ICP, and non-proliferation studies)

Project Leader of the Chaudfontaine Group (a discussion forum of young European researchers and experts as regards the rules and practices of controls of sensitive goods and technologies).

Since 2009 Professor in European Studies (Department of Political Science - ULg).

From 2007 to 2011 President of Political Science Department (ULg)

Since 2010 Regional Project Adviser, EU Cooperation in Export Control of Dual-Use Goods.

Sept 2004 - Dec 2007 Expert national détaché to the European Commission (Trade Directorate General E4) responsible for the revision of the Regulation (EC) No 1334/2000.

He also spent some years in Ispra In DU group.



### **Filippo SEVINI**

Filippo Sevini leads the Strategic Trade Control Implementation and Knowledge management (STRIKE) project at the European Commission Joint Research Centre's Nuclear Safety and Security Directorate, based in the Ispra site, Italy.

He earned his PhD in nuclear engineering from Milan Polytechnic, Italy and has been working for the European Commission for over 20 years, doing research on nuclear technology, nuclear safeguards and strategic export control.

The activities for which Filippo has been responsible in the last ten years and executed with a team of JRC experts include technical analyses supporting the harmonised implementation of export controls in the EU; capacity building for licensing and customs officers; internal compliance; international export control framework; monitoring and evaluation of the EU cooperative programme on export controls, EU P2P. In the period 2009- 2019 he also acted as ESARDA secretary and founded the ESARDA Export control Working Group.

**Friday 20<sup>th</sup> May**



### **Jacques BAUTE**

Jacques Baute has been Director of the Division of Information Management, Department of Safeguards, of the International Atomic Energy Agency since 1st August 2005. This division has the responsibility to collect, analyse and securely disseminate information from State Declaration, Open Sources, incl. Satellite Imagery, voluntary contributions, etc., and provide expert technical preparation and evaluation of field results (e.g. statistical studies, sample analysis). It is also a key contributor to the department-wide State Evaluation process leading to Safeguards conclusions.

Between 1999 and 2005, Dr. Baute was the Director of the Iraq Nuclear Verification Office (also known as the IAEA Iraq Action Team), office responsible for the implementation of the Director General's United Nations Security Council mandate in Iraq. He joined the IAEA in 1994 to direct the assessment of weapons development in Iraq's clandestine nuclear weapons programme.

He had previously various level of responsibility in the research and development area at the Commissariat à l'Énergie Atomique (CEA, French Atomic Energy Commission), which he joined in 1981. He graduated from the École Centrale des Arts et Manufactures, Paris, in 1981 and obtained a Doctorate in high-pressure physics in 1984. Between 1981 and 1994, in addition to his work at CEA, he taught Statistical Physics, Thermodynamics and Fluid Mechanics at the École Centrale des Arts et Manufactures at various university levels.





### **Petr STRUZKA**

Petr Struzka is from the Czech Republic, working in EU SatCen since 2013 as imagery analyst:

2013 – 2016 as seconded national expert (SNE)

2016 – 2022 as SatCen staff

Working in the field of defence and security all his career (Czech Ministry of defence, NATO, international military mission)



### **Joakim DAHLBERG**

Joakim Dahlberg works as a safeguards analyst at the International Atomic Energy Agency.

His work is focused on safeguards concepts and approaches which is also the name of the section where he works since little over a year.

Before his appointment to the IAEA he worked at the Swedish Radiation Safety Authority (SSM) where he was as a national inspector in the line of non-proliferation.

Joakim was the Swedish coordinator of the Swedish support program to IAEA safeguards, making national resources available to the IAEA.

He served as part of the Swedish delegation to the NPT review conference in 2015, the delegation to several IAEA general conferences and Board of Governors, as well as to the International Partnership for Nuclear Disarmament Verification (IPNDV).

Before his appointment to the IAEA, he participated in the ESARDA working group on Implementation of Safeguards.

Joakim holds a Master in engineering physics from the Royal institute of technology in Stockholm and also took this very ESARDA course in 2007.



### **Matti TAIRVANEN**

Matti Tairvanen is an Independent Non-proliferation Professional with 37 years of nuclear non-proliferation related experience – both implementation and R&D – at national level (STUK/Finland), international level (IAEA/ Safeguards), and in nuclear newcomer organization (ENEC/UAE).

He has an advanced degree (Licentiate of Philosophy) in applied nuclear physics and radiochemistry.

## Laboratory Visits

### Advanced Safeguards Measurement, Monitoring and Modelling Laboratory (AS3ML)



Laboratory to test and develop innovative integrated solutions for the implementation of safeguards in the different types of nuclear installations. The three main pillars are Measurement of nuclear material, monitoring the operation of facilities through an extensive collection of data from multiple types of sensors, modelling the plant operations to derive conclusion on the appropriate operation of the plant according to declarations. Laser based verification technologies and self-localisation techniques are being developed to support modernised inspection capabilities.



### Sealing and Identification Laboratory (SILab)

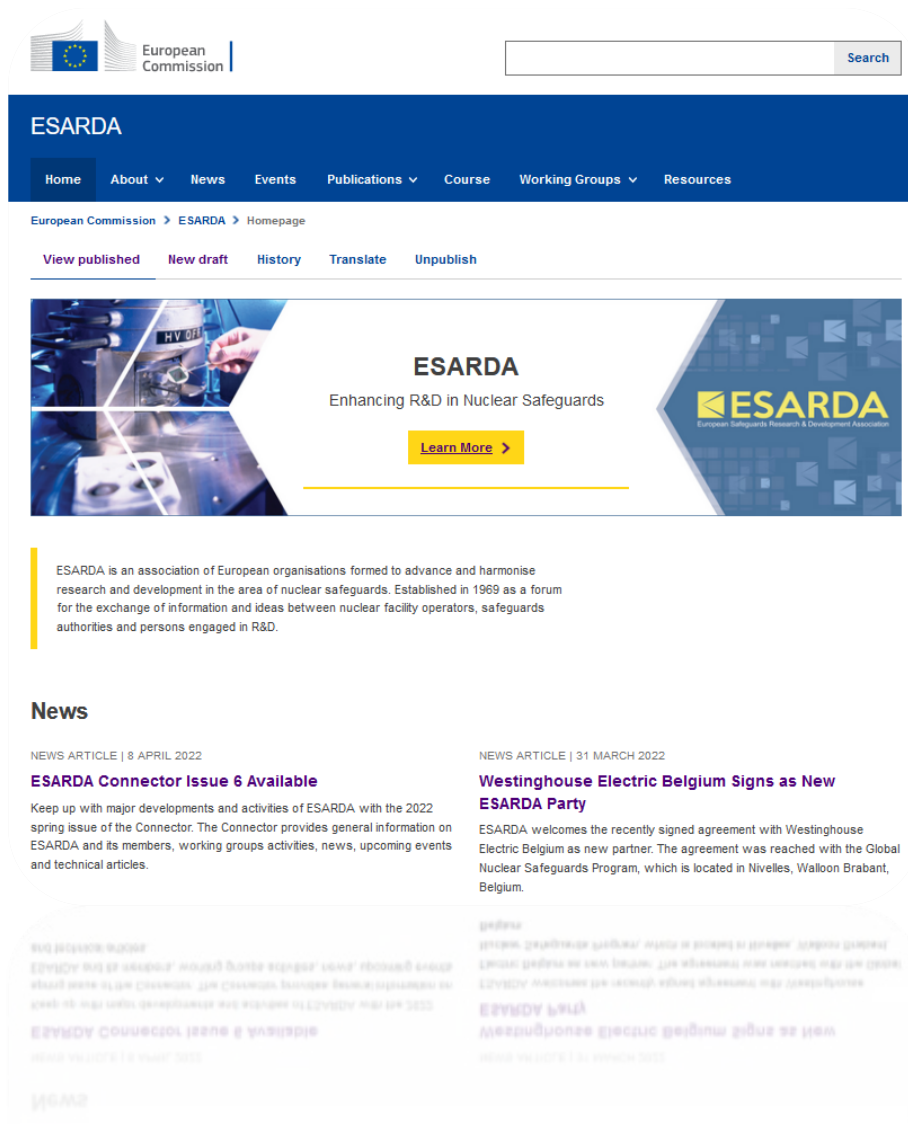
SILab is a laboratory for the development, testing and commissioning of security systems used for nuclear and commercial applications and devoted to increase the security of the citizen. The laboratory serves institutional clients like the International Atomic Energy Agency (IAEA), the Directorate General for Energy (DG ENER). Latest developments include ultrasonic bolt seals, US seals combined with fiber optics and low cost electronic seals. Training on application of seals is also provided in the laboratory.

### 3D-Laboratory

The laboratory performs R&D on laser based identification and verification systems for containment and surveillance. Applications cover the design information verification of nuclear facilities, identification of nuclear containers by unique surface maps, verification of containment and closure welds as well as 3D surveillance. Activities include the support and training to IAEA and DG-ENER on JRC-developed laser based systems.



# ESARDA Online



The ESARDA website can be reached at the following URL: <https://esarda.irc.ec.europa.eu>

The website features publications and events of the association. Furthermore, through the website you can reach the ESARDA Document's repository (CIRCABC), where you can also find the Library with all the historical publications of ESARDA.

ESARDA also expanded its dissemination through social media such as LinkedIn and Twitter. Should you wish to join, visit the links below:

<https://www.linkedin.com/in/esarda-association-2b7140158/>

<https://twitter.com/ESARDAAssociat1>

## **GETTING IN TOUCH WITH THE EU**

### **In person**

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: [https://europa.eu/european-union/contact\\_en](https://europa.eu/european-union/contact_en)

### **On the phone or by email**

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696, or
- by electronic mail via: [https://europa.eu/european-union/contact\\_en](https://europa.eu/european-union/contact_en)

## **FINDING INFORMATION ABOUT THE EU**

### **Online**

Information about the European Union in all the official languages of the EU is available on the Europa website at:

[https://europa.eu/european-union/index\\_en](https://europa.eu/european-union/index_en)

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