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## CHAIRPERSONS' ADDRESS

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Welcome to the Nuclear Forensics International Technical Working Group's (ITWG) newsletter. If you are reading this ITWG Update as a freshly printed copy, you are very likely doing it in Vienna at the fourth International Conference on Nuclear Security, ICONS 2024.

The ICONS 2024 programme incorporates the work of ITWG experts and task groups at multiple levels, showcasing how our exercises and related activities have advanced the state of nuclear forensics practice around the world. In particular, the ITWG side event highlights the interface with forensic scientists in RN investigations, and participants in this mini-tabletop exercise have an opportunity to consider law enforcement, analytical laboratory and nuclear security elements. The ITWG congratulates the IAEA in anticipation of a productive ICONS 2024 and wishes participants success as we all work to advance our shared goal of strengthening nuclear security.

The latest ITWG Update introduces the ITWG and its leadership team to those who may be less familiar with its concept (page 1). This issue also highlights the long-standing work done in Hungary as an IAEA collaborating centre for nuclear forensics (page 5).

Whereas ICONS 2024 provides a global forum for ministers, policymakers, senior officials and nuclear security experts to discuss the future of nuclear security worldwide, the annual ITWG meetings advance nuclear forensics more at the practitioner level. This year's annual meeting, ITWG-27, will be held in Manchester, United Kingdom, on 25–27 June. Meeting preparations are well under way, and we are looking forward to another interesting and successful meeting. Hopefully, we will see you there as a participant!

With best regards,

Michael Curry and Maria Wallenius

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## INTRODUCTION TO THE ITWG AND ITS LEADERSHIP: ALMOST THREE DECADES OF GLOBAL EXPERTISE IN NUCLEAR FORENSICS

**MICHAEL CURRY AND MARIA WALLENIUS**

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Forensic science is the examination of the available evidence in a legal context with the aim of discovering linkages among people, places, things and events. Nuclear forensic science (nuclear forensics) is a subdiscipline of forensic science that can help governments investigate and prosecute nuclear crimes and strengthen their nuclear security regimes by helping to determine the origin and history of nuclear and other radioactive material out of regulatory control (MORC). Nuclear forensics is therefore recognized as an important tool for helping national and international authorities to meet their collective nuclear security obligations (such as the 1979 Convention on the Physical Protection of Nuclear Material (CPPNM) and its 2005 Amendment, and the

2010 International Convention for the Suppression of Acts of Nuclear Terrorism) and protect their interests.

The Nuclear Forensics International Technical Working Group (ITWG) is an informal and unaffiliated association of nuclear forensics practitioners who are dedicated to advancing nuclear forensics. The ITWG provides a unique technical platform for nuclear scientists, forensics specialists, law enforcement officials and policymakers to exchange information on nuclear forensics. Chief among the achievements of the ITWG are the roster of guidelines, seven collaborative materials exercises (CMXs) and annual meetings delivered over three decades. Experts from over 50 countries and 11 multilateral and international organizations have

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**Figure 1.** Map of Nuclear Forensics International Technical Working Group participants.

participated in annual meetings of the ITWG (see figure 1).

The work of the ITWG is steered by its two co-chairs and its Executive Committee, with support from the co-leads of five ITWG task groups and the ITWG Nuclear Forensics Laboratories (INFL). The informal nature of the group means that all the members of the ITWG leadership work on ITWG issues on a voluntary basis.

**ITWG co-chairs**

Michael Curry (United States) is a team leader at the US Department of State where he currently serves as the Senior Coordinator for Nuclear Forensics Cooperation. Curry has worked on a variety of arms control, non-proliferation and political-military affairs issues for almost 40 years. For the past 20 years he has focused on issues related to countering the smuggling of nuclear and radioactive material. Curry has participated in the ITWG since 2008 and served as its co-chair since 2014.

Maria Wallenius (European Commission) is a Deputy Head of Unit who coordinates nuclear forensics casework and cooperative nuclear forensics projects at the Joint Research Centre (JRC) of the European Commission in Karlsruhe, Germany. Wallenius has worked at the JRC Karlsruhe for more

than 25 years and has developed new methods of using various mass spectrometry techniques in the safeguards and nuclear forensics field. Wallenius has participated in the ITWG since 2000. She was the Guidelines Task Group co-lead in 2012–17 and the INFL co-lead in 2018–22.

**Executive Committee members**

Romain Grastien (France) works for the French Alternative Energies and Atomic Energy Commission (Commissariat à l'énergie atomique et aux énergies alternatives, CEA). He is the project manager in charge of nuclear emergency response activity at the CEA. Grastien supports the Collaborative Materials Exercises and, as coordinator of the development and maintenance of the ITWG websites, is instrumental in the outreach efforts of the ITWG.

Itimad Soufi (Morocco) is the Section Head of the Nuclear Security of Materials Out of Regulatory Control Section in the Division of Nuclear Security at the International Atomic Energy Agency (IAEA). She was previously the Safety and Security Director at the National Center of Nuclear Energy, Sciences and Techniques (2003–16) and senior advisor for nuclear affairs at the Ministry of Energy and Mines (2016–18) in Morocco. Soufi also supported the Ministry of Foreign Affairs as part of the Global Initiative to

Combat Nuclear Terrorism (GICNT) (2006–17) and the Nuclear Security Summit process (2010–16). In particular, she was the Response and Mitigation Working Group Chair in the GICNT in 2012–17.

Éva Széles (Hungary) is a scientific advisor on nuclear security, including radiological crime scene management and nuclear forensics, at the Centre for Energy Research, Hungary. In 2013–20 she was head of the Nuclear Security Department and the National Nuclear Forensics Laboratory at the Centre for Energy Research (CER) in Budapest. Széles began her work at the CER in 2008 as the scientist responsible for nuclear safeguards, nuclear security and nuclear forensics R&D activities. In 2020–24, Széles was Head of the Crime Scene Management and Nuclear Forensics Unit in the Division of Nuclear Security at the IAEA. Széles has participated in the ITWG since 2011 and served as the Evidence Collection Task Group co-lead in 2013–17.

Paul Thompson (United Kingdom) is a Distinguished Scientist at the UK Atomic Weapons Establishment (AWE) and an expert in radiochemistry. Thompson started work at the AWE in 1978. In addition to his work on nuclear forensics, he has supported implementation of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) verification arrangements, as well as the IAEA Safeguards, conducted extensive research in the area of environmental radioactivity and chaired sessions and presented papers at nuclear-related conferences. He has participated in ITWG meetings since the pre-meeting in 1995 and been a member of the Executive Committee since it formed. Thompson has previously chaired the UK Royal Society of Chemistry's Radiochemical Methods Group.

Ed van Zalen (the Netherlands) is a chemical, biological, radiological and nuclear (CBRN) Programme Manager at the Netherlands Forensics Institute in The Hague. He is co-chair of the Nuclear Forensics Working Group of the GICNT. His current focus is on the development of innovative forensics methods applicable for use at a CBRN crime scene and in the laboratory. In this role, he is responsible for developing the response to a CBRN incident and the development of analytical forensics methods. Van Zalen has participated in the ITWG since 2011. He was the Outreach and Training Task Group co-lead in 2014–22 and joined the ITWG Executive Committee in 2022.

### **Evidence and Testimony Task Group**

James Blankenship (USA) is a Forensic Examiner with the US Federal Bureau of Investigation (FBI), where

he leads on analysis of weapons of mass destruction, specifically the threat of nuclear and radioactive dispersal devices. Blankenship has participated in the ITWG since 2007 and served as the Evidence and Testimony Task Group co-lead since 2013.

Jens-Tarek Eishah (Germany) is a scientific advisor in the Emergency Preparedness and Response division of the Response to Nuclear Security Events section at the German Federal Office for Radiation Protection (BfS) in Berlin. He works as a gamma spectrometry specialist, a radiation safety officer and a dangerous goods expert. He has supported various nuclear forensics examinations and is an expert on investigating illicit trafficking of radioactive materials, including evidence collection. Eishah has participated in the ITWG since 2008 and served as the Evidence and Testimony Task Group co-lead since 2018.

### **Exercise Task Group**

Olivia Marsden (UK) is Group Leader for Radiochemistry in the Materials and Analytical Science section of the AWE. The group comprises approximately 80 people working in a variety of fields, including nuclear forensics. Marsden began work at the AWE in 2004, in the analytical laboratories, and was the focal point for its participation in the third ITWG Collaborative Materials Exercise (CMX-3) in 2009. Marsden has been participating in the ITWG since 2010 and has served as the Exercise Task Group co-lead since 2012.

Jon Schwantes (USA) is a Professor and Head of the Ken & Mary Alice Lindquist Department of Nuclear Engineering at Penn State University, with a joint appointment at Pacific Northwest National Laboratory (PNNL). He has authored or co-authored 121 publications, was part of the confirmatory team for the discovery of roentgenium and led a team of researchers in 2009 that identified the oldest known reactor-produced plutonium in the world. Schwantes led the forensics examination of a breached 3000 Ci radioactive sealed source in Seattle, Washington, in 2019, was part of the Technical Assessment Team investigating contamination of the Waste Isolation Pilot Plant in 2014 and served on two response teams to the Fukushima Daiichi disaster in 2011. He has served as co-lead of the ITWG Exercise Task Group since 2010.

### **Guidelines Task Group**

Ruth Kips (USA) is the Associate Program Leader (APL) at the Office of Nuclear Smuggling Detection and Deterrence (NSDD) and the Group Leader of the Micro

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Analytical Signatures Group at Lawrence Livermore National Laboratory (LLNL). In 2012–14, Kips served as a nuclear safeguards inspector at the IAEA. In her current role, Ruth manages LLNL's international nuclear forensics programme in support of the NSDD, which aims to advance partner countries' capabilities in nuclear forensics. Kips has served as a co-lead of the Guidelines Task Group since 2023.

Jovana Nikolov (Serbia) is a Full Professor in Nuclear Physics at the University of Novi Sad Faculty of Sciences. She has a background in nuclear structure measurements and is now mostly involved in applied nuclear physics. She has been a pioneer in developing nuclear forensics capabilities in Serbia and the Western Balkans, mostly involved in training and education. Nikolov has participated in the ITWG since 2017 and became a co-lead of the Guidelines Task Group in 2022.

**Libraries and Assessment Task Group**

Chris Cochrane (Canada) is the Technical Advisor to the Director General of the Directorate of Security and Safeguards at the Canadian Nuclear Safety Commission (CNSC). He is responsible for coordination of the Canadian technical nuclear forensics capability and the Canadian National Nuclear Forensics Library. Since joining the CNSC in 2018, Cochrane has contributed to several whole-of-government nuclear forensics initiatives. Cochrane has participated in the ITWG since 2018 and served as the Libraries and Assessment Task Group co-lead since 2022.

Stephen LaMont (USA) is a Program Manager for nuclear forensics and treaty monitoring projects at the US Los Alamos National Laboratory. A radiochemist by training, LaMont has over 25 years experience of applying radiochemistry and mass spectrometry to non-proliferation, environmental safeguards and nuclear forensics. He spent five years as the Chief Scientist for the US Nuclear Materials Information Program, helping to establish the US National Nuclear Forensics Library. LaMont has participated in the ITWG since 2011 and served as the Libraries and Assessment Task Group co-lead since 2014.

**Outreach and Training Task Group**

Liz Dallas (USA) is the Group Lead of the Facility and Systems Security Group at Oak Ridge National Laboratory (ORNL) and the Sustainability Program Lead for the ORNL's support to the US DOE/National Nuclear Security Administration's (NNSA) Office of

Nuclear Smuggling Detection and Deterrence. She has worked on nuclear material detection, analysis and security for over 20 years in various roles focused on science education and training, international treaties and verification, and countering nuclear smuggling. She has supported the NSDD since 2016, working with partner countries on capacity building initiatives in nuclear forensics, and on sustainable approaches to the management and assessment of systems designed to encounter, detect and interdict radioactive MORC. Dallas assumed the responsibilities of Outreach and Training Task Group co-lead in 2022.

Liz Keegan (Australia) is a Science Programme Manager, Bulk Material Analysis Nuclear Forensics at the Australian Nuclear Science and Technology Organisation (ANSTO). She has been the lead examiner on a number of nuclear forensics investigations and is the project lead on a range of international collaborative research and capability development projects in the area of nuclear forensics. Keegan has a background in analytical chemistry and mass spectrometry, and over 30 years experience of working in nuclear science. Keegan has participated in the ITWG since 2010 and served as Outreach and Training Task Group co-lead since 2022.

**ITWG Nuclear Forensics Laboratories**

Naomi Marks (USA) is an Associate Program Leader for Nuclear Counterterrorism and Counterproliferation in the Global Security Directorate at the LLNL, as well as Deputy Director of the Glenn T. Seaborg Institute. She is Principal Investigator on a wide variety of projects in the areas of nuclear forensics, non-proliferation and international collaboration. Marks has been involved in development of the Galaxy Serpent (GS) series of exercises, notably GSv3, GSv4 and GSv5. She has participated in the ITWG since 2017 and served as the INFL co-lead since 2018.

Zsolt Varga (European Commission) is a Scientific Project Officer in the Nuclear Safeguards and Security Unit at the JRC, Karlsruhe. He works on method development for nuclear forensics signatures (elemental impurities, isotopic composition and age dating). Varga has been participating in the ITWG since 2009. He was the co-lead of the Guidelines Task Group until 2022, when he moved to co-lead the INFL.●

## RESULTS ACHIEVED IN SEVEN YEARS AS AN IAEA COLLABORATING CENTRE FOR NUCLEAR FORENSICS IN HUNGARY

ÉVA SZÉLES AND PETER VOLGYESI

Work on nuclear forensics commenced in Hungary in the mid-1990s, following several border confiscations targeted mainly at nuclear materials. The examination of seized nuclear materials was legally delegated to the Institute of Isotopes (the legal predecessor of the Centre for Energy Research, EK) by a 1996 Governmental Decree. In nearly 30 years of nuclear forensics, approximately 25 cases have been examined. In 2014, a centralized National Nuclear Forensics Laboratory was established, allowing practice of several key analytical techniques, as well as the establishment of a prototype of the National Nuclear Forensics Library. In parallel, training courses and residential assignments by the International Atomic Energy Agency (IAEA) began to be developed, piloted and hosted by the EK.

Based on its long-term experience of nuclear forensics and strengthened capacity, as well as 20 years close cooperation with the IAEA, the Centre for Energy Research was set up in 2016 and re-designated the IAEA Collaborating Centre for Nuclear Forensics in 2021. The main task of the Centre is to support IAEA member states through capacity building on nuclear forensics by developing new training programmes, and sharing experience of and scientific methods for technical capabilities. During its seven years of operation, the Collaborating Centre has offered: five IAEA Practical Introduction Training Courses on Nuclear Forensics to 39 participants from 24 member states; five IAEA residential assignment programmes to 13 participants from 11 member states; and two technical exchange visits. The IAEA residential assignment in Hungary models a real nuclear forensics examination in a realistic time frame using specific scenarios. The aim of the programme is to strengthen national cooperation between scientists and law enforcement representatives from the same country.

The Centre has successfully participated and continues to participate in all four IAEA Coordinated Research Projects (CRP) focused on nuclear forensics. Within the framework of the CRPs, methodological developments have been shared with partner states and published in IAEA TECDOCs on topics such as signature study and tomographic imaging of sealed radioactive sources, precise gamma-spectrometric analysis and age dating of nuclear materials, scientific



Radiological crime scene management live demonstration at the IAEA Technical Meeting on Nuclear Forensics in 2022.  
*Photo: Dean Calma/IAEA.*



Radiological Crime Scene Management international exercise in the framework of the INCLUDING EU H2020 project, 2021.  
*Photo: Tamas Szabolcs/CER.*

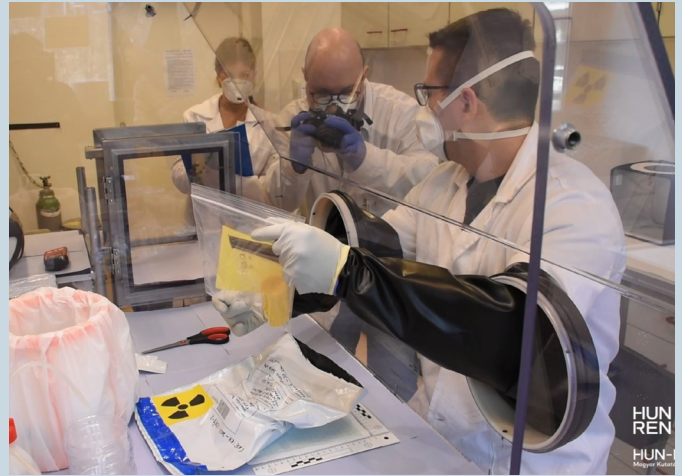
support with radiological crime scene management (RCSM), and development of in-field and remote analytical techniques.

The Centre has also supported several IAEA consultancy meetings, documents and training events by providing experts and training materials, such as video on personal protective equipment for the IAEA radiological crime scene management workshops and for its Integrated Workshop on Radiological Crime Scene Management and Nuclear Forensics, which will be implemented at the new IAEA Nuclear Security Training and Demonstration Centre in Seibersdorf. In addition, the EK supported IAEA outreach activities by providing photographs and videos taken by the IAEA at the EK's laboratories and articles for the IAEA's public website. Experts at the EK also supported several IAEA training courses and workshops hosted by other member states.

Results Achieved in Seven Years *continued from page 5*

In 2016, Hungary established the National Nuclear Security Working Group with all the relevant national stakeholders, using this platform to strengthen national nuclear security response capabilities. It also helped to develop a special operating procedure for radiological crime scene management in cooperation with the Hungarian Police and the National Bureau of Investigation, which was published in 2020.

A unique characteristic of the Hungarian RSCSM procedure is that law enforcement, nuclear forensics experts and radiological assessors work together at the radiological crime scene, in accordance with a law on involving specific experts in specific hazards at a crime scene. In this way, a harmonized procedure has been developed between scientists and crime scene investigators, resulting in strong scientific support for evidence collection. Around 400 crime scene investigators have been trained on this procedure in Hungary since 2019. Hungarian capabilities on RSCSM were demonstrated at the IAEA International Conference on Nuclear Security in 2020, at the 65th IAEA General Conference in 2021, at the IAEA Technical Meeting on Nuclear Forensics and at the First IAEA International Conference on Nuclear Law in 2022, in addition to several international exercises such as EU projects, GICNT events or the CMX-7



The first 24 hours measurements of the nuclear forensic examination in a glove box, 2024.

Photo: Tamas Szabolcs/CER.

exercise of the ITWG ‘crime scene in a box’. Four real radiological crime scenes were investigated by the specialist RSCSM team in Hungary between 2016 and 2023.

The Centre is committed to continuing its support to IAEA member states by providing new training programmes on RSCSM and through scientific research activities focused on ‘moving the laboratory to the field’, and to demonstrating how nuclear forensics can support the RSCSM’s activities. •

#### NOTABLE PUBLICATIONS ON THE WORK OF THE ITWG, NUCLEAR FORENSICS AND RELATED DISCIPLINES

- Valdovinos, H. L. et al., ‘Rapid quantification of  $^{237}\text{U}$  specific activity for nuclear forensics’, *Industrial & Engineering Chemistry Research*, vol. 63, no. 1 (2024), pp. 56–64.
- Patra, S. et al., ‘Interrogating a mixed actinide basket using high-resolution  $\gamma$ -ray spectrometry: A nuclear forensic perspective on possible smuggling scenarios’, *Analytical Chemistry*, vol. 96, no. 7 (2024), pp. 2857–65.
- Topolovac, Ž. et al., ‘Nuclear forensics case in Croatia: Elevated U and Ra radioactive material found at Karasovići border’, *Journal of Radioanalytical and Nuclear Chemistry*, vol. 333 (2024), pp. 847–52.
- Kimura, Y. et al., ‘Application of deep metric learning model to microscope image analysis for the determination of UOC samples in nuclear forensics analysis’, *Journal of Radioanalytical and Nuclear Chemistry*, 4 Jan. 2024.
- Babayew, R. et al., ‘Simulation tools for improvement of the fission track analysis method for nuclear forensics’, *Journal of Radioanalytical and Nuclear Chemistry*, 19 Jan. 2024.



RCSM exercise in the framework of the IAEA Residential Assignment program, 2019.  
 Photo: Tamas Szabolics/CER.

### UPCOMING TRAINING COURSES AND MEETINGS\*

- GI: Glowing Tulip 2.0, Den Haag, the Netherlands, 23–26 April 2024
- IAEA: International Conference on Nuclear Security (ICONS), Vienna, Austria, 20–24 May 2024
- IAEA: International Integrated Workshop on Radiological Crime Scene Management and Nuclear, Seibersdorf, Austria, 27–31 May 2024
- IAEA: Regional Training Course on Basic Introduction to Nuclear Forensics, Nairobi, Kenya, 10–14 June 2024
- IAEA: National Workshop on Radiological Crime Scene Management, Sofia, Bulgaria, 17–21 June 2024
- ITWG: 27th Annual Meeting, Manchester, United Kingdom, 25–28 June 2024
- IAEA: National Workshop on Radiological Crime Scene Management, Hanoi, Vietnam, 1–5 July 2024
- IAEA: Regional Workshop on Radiological Crime Scene Management, Yaounde, Cameroon, 8–12 July 2024
- IAEA: International Integrated Workshop on Radiological Crime Scene Management and Nuclear, Seibersdorf, Austria, 29 July–2 August 2024
- IAEA: Peer-to-Peer Workshop on Nuclear Forensics, Yogyakarta, Indonesia, 26–30 August 2024
- IAEA: Regional Training Course on Practical Introduction to Nuclear Forensics, Saclay, France, 30 September–4 October 2024
- IAEA: Regional Training Course on Practical Introduction to Nuclear Forensics, Hungary, 30 September–4 October 2024

\*Please check directly with the event organizer on the status and dates for implementation of the individual events listed above.

Dates and locations of IAEA training courses and meetings will be officially confirmed with host member states; participation in IAEA training courses and meetings is by nomination and in accordance with established IAEA procedures.

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### NUCLEAR FORENSICS

Nuclear forensics is an essential component of national and international nuclear security response plans to events involving radioactive materials diverted outside of regulatory control. The ability to collect and preserve radiological and associated evidence as material is interdicted and to conduct nuclear forensics analysis provides insights to the history and origin of nuclear material, the point of diversion, and the identity of the perpetrators.

### THE NUCLEAR FORENSICS INTERNATIONAL TECHNICAL WORKING GROUP

Since its inception in 1995, the Nuclear Forensics International Technical Working Group (ITWG) has been focused on nuclear forensic best practice through the development of techniques and methods for forensic analysis of nuclear, other radioactive, and radiologically contaminated materials. The objective of the ITWG is to advance the scientific discipline of nuclear forensics and to provide a common approach and effective technical solutions to competent national or international authorities that request assistance.

### ITWG PRIORITIES AND ACTIVITIES

As a technical working group, the priorities for the ITWG include identifying requirements for nuclear forensic applications, evaluating present nuclear forensic capabilities, and recommending cooperative measures that ensure all states can respond to acts involving illicit trafficking and unauthorized possession of nuclear or other radioactive materials. An objective of the working group is to encourage technical peer-review of the nuclear forensic discipline. These goals are met through annual meetings, exercises, and informal and formal publications.

Outreach is a primary goal of the ITWG. The working group disseminates recent progress in nuclear forensic analysis and interpretation with the broader community of technical and security professionals who can benefit from these advancements. Affiliated international partner organizations include the International Atomic Energy Agency (IAEA), the European Commission, the European Police Office (EUROPOL), the International Criminal Police Organization (INTERPOL), the Global Initiative to Combat Nuclear Terrorism (GICNT) and the United Nations Interregional Crime and Justice Research Institute (UNICRI).

### ITWG MEMBERSHIP

Nuclear forensics is both a technical capability as well as an investigatory process. For this reason the ITWG is a working group of experts including scientists, law enforcement officers, first responders, and nuclear regulators assigned by competent national authorities, affiliated contractors, and international organizations. The ITWG is open to all states interested in nuclear forensics.

ITWG participating states and organizations recognize that radiological crimes deserve thorough investigation and, when warranted, criminal prosecution. The ITWG encourages all states to possess the basic capability to categorize nuclear or other radioactive materials to assess their threat. As an international group, the ITWG shares its expertise through its membership to advance the science of nuclear forensics as well as its application to nuclear security objectives.

<http://www.nf-itwg.org/>

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